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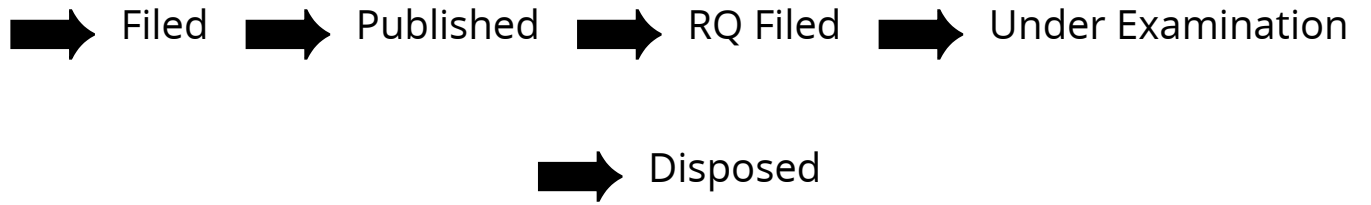
Application Details

APPLICATION NUMBER	156/DEL/2015
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	19/01/2015
APPLICANT NAME	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
TITLE OF INVENTION	SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING SYSTEM
FIELD OF INVENTION	ELECTRONICS
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PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	27/09/2016
PUBLICATION DATE (U/S 11A)	19/08/2016
REPLY TO FER DATE	18/08/2020

Application Status

APPLICATION STATUS	Reply Filed. Application in amended examination
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We Claim:

1. A system (100) for real-time remote monitoring of multiple soil parameters simultaneously for precision agriculture or horticulture of plurality of landscape sites, comprising:

a soil sensor network (204), at each of the plurality of landscape sites comprising plurality of sensor nodes for measuring one or more soil parameters;

a soil sense unit (200) coupled to the soil sensor network (204) for processing each sensor node measured signal output comprising:

a processor (201) for processing said signal output from each sensor nodes into a digital form;

a memory module (202) for storing measured parameters and threshold values of one or more soil parameter;

a display screen (205) coupled to processor (201) for displaying said processed one or more sensor node signal output; and

a transmitting module (207) coupled to the processor (201) for transmitting processed signal output based on a predefined user selectable mode;

a soil data acquisition server (104) located remotely from the plurality of landscape sites, said server wirelessly coupled with the transmitting module (207) for storing and monitoring of transmitted soil sensed parameters of a landscape site;

wherein the soil sense unit (200) in a selected mode compares the measured parameters with threshold value and send an alert to a remote communication device on threshold breach of the one or more soil sensed parameter.

2. The system as claimed in claim 1, wherein soil sensor network (204) comprises soil sensor such as soil moisture, temperature, pH, ambient temperature, light and water level sensor.
3. The system as claimed in claim 1, wherein soil sensor nodes communicates with soil sense unit (200) over Bluetooth low energy profile.
4. The system as claimed in claim 1, wherein soil sense unit (200) further comprises a solar panel power system.
5. The system as claimed in claim 1, wherein soil sense unit (200) further communicates with plurality of communication devices via transmitting module (207).
6. The system as claimed in claim 1, wherein communication with the transmitting module (207) of soil sense unit (200) and remote sites comprises communicating via an Internet or a cellular network.
7. The system as claimed in claim 1, wherein communicating with the plurality of communication devices comprises communicating via an Internet or a cellular network.
8. The system as claimed in claim 1, wherein soil sense unit (200) further comprises responding to queries from at least one end-user with short text messages (SMS), web pages, or screens to be displayed on a mobile phone application.
9. The system as claimed in claim 1, wherein communicating with the soil sense unit (200) comprises communicating between the server system and the at least one gateway at each of the plurality of sites, using a GPRS network, an Edge network, a 3G network, a UMTS

network, a cellular network, a wireless broadband data communication service, or WiMAX.

10. The system of as claimed in claim 1, wherein soil data acquisition server (104) can be accessed by an application program installed on a communication device.

11. A method for real-time remote monitoring of multiple soil parameters simultaneously for precision agriculture or horticulture of plurality of landscape sites, comprising:

receiving, by soil sense unit (200), one or more measured soil parameters signal from plurality of sensor nodes at a landscape sites;

processing, by soil sense unit (200), said one or more measured parameters signal, in a preferred selectable mode, wherein the selectable mode comprises a farmer mode or a scientific mode;

storing, by soil sense unit (200) said one or more measured parameters and a threshold value of one or more soil parameter;

displaying on screen by soil sense unit (200) said one or more measured parameters;

transmitting by soil sense unit (200) said one or more measured parameters based on preferred selectable mode wherein in the farmer mode transmitting an alert to an end user upon detection of one or more threshold breach and in the scientific mode transmitting measured parameter to a remote soil data acquisition server (104);

storing and monitoring of transmitted said one or more measured parameters of landscape site by a soil data acquisition server (104) located remotely.

12. The method as claimed in claim 11, wherein measuring of at least one or more soil parameters further comprises measuring with the sensor at least one of a moisture content level of the soil, a potential hydrogen (pH) level of the soil, a temperature level of the soil, and an intensity level of light that reaches the soil.
13. The method as claimed in claim 12, wherein soil data acquisition server (104) can be accessed by an application program installed on a communication device.

Dated this 18th day of January, 2016

Rashmi Tyagi

RASHMI TYAGI
AGENT FOR APPLICANT

Date: 18 August 2020

Our reference: FER/156DEL2015

To
The Controller of Patents
The Patent Office, at New Delhi

Kind attention of: Rajni Bala
Controller of Patents
Last Date: 18 August 2020

Dear Sir,

Re:

Applicant : Indira Gandhi Delhi Technical University for Women
Application No. : 156/DEL/2015
Filed on : 19 January 2015
Title : Soil Multi-Parameters Remote Monitoring and Alerting System

This is further to the First Examination Report (FER) issued on 18 February 2020 in respect of the above-mentioned patent application. The Applicant, herein, submits response to all the objections raised in the FER. The last date to put the patent application in order for grant is 18 August 2020.

RESPONSE TO THE FER

Summary of Amendments:

1. Originally filed claims 1-15 were pending at the time of receiving the FER. The Applicant has deleted the original claim 2 and claim 4. The Applicant has amended and renumbered the claims as claims 1-13. The applicant respectfully submits that the scope of the amended claims 1-13 falls wholly within the scope of the originally filed claims 1-15, and no new subject matter has been added. The renumbering of the claims is as following:

Original claim 3 renumbered to amended claim 2,
Original claim 5 renumbered to amended claim 3,
Original claim 6 renumbered to amended claim 4,
Original claim 7 renumbered to amended claim 5,
Original claim 8 renumbered to amended claim 6,
Original claim 9 renumbered to amended claim 7,
Original claim 10 renumbered to amended claim 8,
Original claim 11 renumbered to amended claim 9,

Original claim 12 renumbered to amended claim 10,
Original claim 13 renumbered to amended claim 11,
Original claim 14 renumbered to amended claim 12 and
Original claim 15 renumbered to amended claim 13

The support and basis for amended claims are given below:

Proposed Claims	Specification Support
Claim 1	Page 05, Lines 21-35; Page 06, Lines 5-16
Claim 5	Page 07, Lines 22-29; Page 08, Lines 16-23
Claim 6	Page 07, Lines 22-29
Claim 8	Page 08 Lines 16-23
Claim 11	Page 07, Lines 33-35; Page 08, Lines 5-35; Page 09, Lines 5-26

The applicant, therefore, respectfully requests the Learned Controller for reconsideration of the present application in view of the forgoing amendments and following remarks.

Part-I

Objection 1: Novelty

The Learned controller has objected the novelty of originally filed claims 1-15 in view of document:

1. D1: CN101697069A

Applicant submits the following submissions with regard to novelty of the claimed invention:

1. D1 discloses an invention to understand the changes of the basic conditions of the soil specifically changes in the temperature, moisture content, and pH thus making it suitable for irrigation application only whereas the system of proposed invention supports simultaneous monitoring of multiple parameters namely soil moisture, soil temperature, soil pH, Soil EC, ambient temperature, light and water therefore unlike prior art making it suitable for not only irrigation but also for fertilization and other soil nutrient/fertility analysis. Thus, the proposed invention when compared to cited document D1 is an integrated, compact and cost effective solution for remote monitoring of soil parameters. It is an integrated system with multi-sensor inputs compared to cited document, multi-model support mainly user and scientific modes

for operations and data sharing via user driven dynamic configurable communication interfaces of multi-communication media. Hence proposed invention is novel.

2. Further, according to D1 soil parameters including temperature, humidity, and pH sensor are monitored by a soil monitoring device installed in the soil to be monitored wherein temperature sensor, the humidity sensor, and the pH sensor are connected to a data acquisition module. The collected soil parameters are sent to a first GSM module of a monitoring center through a GSM network, and the monitoring center includes: a second GSM module configured to cooperate with the first GSM module to receive data sent by the first GSM module. The data saving module is used to save the data received by the GSM module according to the time series whereas as in the proposed invention a system for wireless monitoring of plurality of landscape sites for agriculture or horticulture is provided. The system (100) includes a soil sensor network(s), a soil sense unit (10), a communication device (103) and data acquisition server (104). In the proposed invention the sensor nodes communicate with sense unit (10) through wired or wireless profile and send measured parameters in analogue signal. The soil sense unit further stores these various soil parameters value in a local memory for further processing. The soil sense unit (10) processes the measured parameter and transmit to a remote user based on a predefined selectable mode wherein the selectable mode comprises farmer mode or scientific mode. The processing in farmer mode comprises detecting one or more parameters threshold breaching and transmitting an alert to an end user and the processing in scientific mode comprising transmitting measured parameter to a remote soil data acquisition server for analysis & related actions. Thus such a unit for processing and transmitting measured parameter based on a predefined selectable mode and simultaneously alerting the user is absent in cited document D1.
3. The Document D1 support a single communication technology for sending and receiving measured data i.e. GSM module whereas proposed system supports multiple communication technologies that can be used as per user driven configuration depending on the range and availability of conducive environment i.e. BLE for short range and local information sharing whereas ZigBee for medium range and GSM/GPRS for higher range of operations. Thus, proposed invention overcome the limitation of cited document D1 by providing communication over broad range and hence stands novel.

Accordingly, it is respectfully stated that the cited prior art does not teaches about multi-model support mainly user and scientific modes for operations, for local data monitoring, storage and analysis both at local as well as remote data analysis centre as per configured mode and dynamic configuration of communication media. Further, alerting system on breach of threshold value to take timely action is also not present in the cited document D1.

Objection 2: Inventive Step

The Learned controller has objected the inventive merit of originally filed claims 1-15 in view of document:

1. D1: CN101697069A
2. D2: CN202648697U
3. D3: CN203479796U

Applicant submits the following submissions with regard to inventiveness of the claimed invention:

1. The invention disclosed in document D1 (CN101697069A), relates to monitoring of soil parameters including temperature, humidity, and pH sensor by a soil monitoring device installed in the soil to be monitored wherein temperature sensor, the humidity sensor, and the pH sensor are connected to a data acquisition module whereas as in the proposed invention a system for wireless monitoring of plurality of landscape sites for agriculture or horticulture is provided. The system (100) includes a soil sensor network(s), a soil sense unit (10), a communication device (103) and data acquisition server (104). Thus, the proposed invention is an improvement and technical enhancement over the similar prior art overcoming the limitations of measuring only few soil parameters which restricts its application to irrigation only on the contrary the proposed invention has more applications with more functionalities as it monitors more parameters, these applications may include soil fertility evaluation, nutrient analysis, and irrigation.
2. According to D1 the collected soil parameters are sent to a first GSM module of a monitoring center through a GSM network, and the monitoring center includes: a second GSM module configured to cooperate with the first GSM module to receive data sent by the first GSM module. The data saving module is used to save the data

received by the GSM module according to the time series whereas in the proposed invention the sensor nodes communicate with sense unit (10) through wired or wireless profile and send measured parameters in analogue signal. The soil sense unit (10) further stores these various soil parameters value in a local memory for further processing along with transmitting measured parameter to a remote soil data acquisition server for analysis & related actions.

3. Further, the monitoring center (6) of cited art D1 includes a data summary module (9) for long-term data analysis and comparison of soil in different plots whereas sense unit (10) of proposed invention stores the measured soil parameters value in a local memory for further processing. Thus, the proposed invention also solve the problem of delayed information delivery by providing local data monitoring, storage and analysis both at local as well as remote data analysis centre as per configured mode and dynamic configuration of communication media.
4. D1 does not disclose a multi-model support whereas the soil sense unit (10) of proposed invention is configured to operate in two user selectable modes namely farmer mode and scientific mode. The first mode is farmer mode where user is a farmer and receives information about his land present status and alert for critical conditions. The second mode is scientific mode where all the recorded data at soil sense unit is transmitted to a remote data server for storing the information for long time forecasting or analysis by researchers.
5. In the cited art D1 an alerting system on detecting critical values is also absent whereas the system of present invention provides alerts to the user for critical conditions and on threshold breach to take timely action.
6. In the cited document D2 (CN202648697U) a base station type soil moisture content remote real-time monitoring system which comprises a number of monitoring stations and a data center is disclosed. The monitoring station comprises a soil temperature sensor, soil moisture sensors, a data collection controller, a second GPRS wireless communication module. The soil temperature sensor and the soil moisture sensors are respectively connected with the data collection controller which collects the measurement data and the measured data are transmitted to the data centre through a

second GPRS data transmission module. The soil moisture sensors are layeredly buried, and simultaneously detect and control the moisture of layers of soil to prevent excessive irrigation. However, the cited document monitors soil parameter in real-time and transmits data to a remote location for necessary action it is specifically designed to monitor soil moisture content solely to prevent excessive irrigation and majorly depends on the layering and burying structure of the sensor and as such the soil moisture sensor is buried underground according to the difference of monitoring base station institute monitored area crop or vegetation. Take on the lawn as example, because the root system on lawn is more shallow, so the water cut of upper layer of soil is the control object of system in the following 10cm in earth's surface, soil moisture sensor is installed at the 10cm place for monitoring its moisture variation. Similarly, the installing of sensor at 15cm and 25cm place is used for the middle level of the monitoring following 15cm to 20cm in earth's surface for monitoring irrigation water. The proposed invention does not have any limitation of sensor layering and burying structure instead a plurality of sensor nodes are uniformly installed at landscape sites and measures multiple soil parameters such as soil moisture, soil temperature, soil pH, Soil EC, ambient temperature, light and water therefore unlike prior art making the proposed system suitable for not only irrigation but also for fertilization and other soil nutrient/fertility analysis.

7. According to D2 the user can pass through internet visit data inquiry service website whenever and wherever possible, also can judge whether to send alarming short message to designated user in conjunction with image data according to setting threshold whereas in the proposed invention the soil sense unit (10) based on preferred selected mode automatically send an alert upon predefined threshold breach to the end user and such does not involves any manual operation.
8. Further, according to D2 the soil temperature sensor and the soil moisture sensors are respectively connected with the data collection controller. The data collection controller collects the measured data of the soil temperature sensor and the soil moisture sensors and transmits to the data centre through GPRS data transmission module whereas proposed system supports multiple communication technologies that can be used as per user driven configuration depending on the range and availability of conducive environment i.e. BLE for short range and local information sharing

whereas ZigBee for medium range and GSM/GPRS for higher range of operations. Moreover, proposed invention provides for local storage and display of collected data for on-field monitoring and analysis as well as scalable data sharing and alert reporting through local and remote data centres. The system of proposed invention provides multi-model and multi-user interface for its users through SMS/Real-time display via local LCD, web interface via internet over smart phones.

9. According to D3 (CN203479796U) a soil moisture detection system comprises a plurality of soil moisture sensors and an Android tablet computer is provided, wherein the signal output ends of the plurality of soil moisture sensors are connected with the signal input end of a bluetooth module, and the bluetooth module and the android tablet computer perform bidirectional data exchange. The parameter data after the detection is automatically and uniformly displayed item by item, and convenient to view and analyse, thus saving lots of time and increasing the working efficiency of the detection whereas as in the proposed invention a system for wireless monitoring of plurality of landscape sites for agriculture or horticulture is provided. The system (100) includes a soil sensor network(s), a soil sense unit (10), a communication device (103) and data acquisition server (104) for monitoring all major soil parameters such as soil pH, soil temperature, Soil EC and soil moisture which plays an important role in crop growth. Other parameters that are sensed by the system of present invention are environment temperature, light and on field water level. Thus, the proposed invention is an improvement and technical enhancement over the similar prior art overcoming the limitations of measuring only few soil parameters which restricts its application to irrigation only on the contrary the proposed invention has more applications with more functionalities as it monitors more parameters, these applications may include soil fertility evaluation, nutrient analysis, and irrigation.

10. According to D3 an Android tablet computer is provided, wherein the signal output ends of the plurality of soil moisture sensors are connected with the signal input end of a bluetooth module, and the bluetooth module and the android tablet computer perform bidirectional data exchange. Thus the Document D3 support a single communication technology for sending and receiving measured data i.e. bluetooth module which also has range limitation whereas in the proposed invention the sensor nodes communicate with sense unit (10) through wired or wireless profile and send

measured parameters in analogue signal through multiple communication technologies that can be used as per user driven configuration depending on the range and availability of conducive environment i.e. BLE for short range and local information sharing whereas ZigBee for medium range and GSM/GPRS for higher range of operations. Thus, proposed invention overcomes the limitation of cited document D3 by providing communication over broad range.

11. According to D3 the parameter data after the detection is automatically and uniformly displayed item by item, on the android tablet and convenient to view and analyse, thus saving lots of time and increasing the working efficiency of the detection whereas in the proposed invention the sense unit (10) of proposed invention stores the measured soil parameters value in a local memory for further processing and also transmit measured value to a remote user based on a predefined selectable mode and dynamic configuration of communication media for further analysis and necessary action.

12. According to D3 the soil moisture detection system disclosed by the utility model is used for detecting farmland soil and also has limitation of data transmission due short range of bluetooth module. Moreover, the system of D3 is an on-site detection system and requires manual operation for data transmission whereas the system of proposed invention is completely automatic and for real time remote monitoring of multiple soil parameters for precision agriculture or horticulture of plurality of landscape sites and as such possess no limitation of communication module as well as monitoring site.

To summarize the present subject matter relates to a system for monitoring multiple soil parameters for precision agriculture or horticulture of plurality of landscape sites. The applicant respectfully submits that the amended claims 1-13 are inventive because of the at least following differentiating features:

1. In the proposed invention there is real-time/remote simultaneous monitoring of multiple parameters at least five soil moisture, soil temperature, air temperature including EC and PH operates in all-weather condition that makes it suitable for not only irrigation but also for fertilization and other soil nutrient/fertility analysis whereas existing systems of cited prior art D1, D2 and D3 caters for real-time/remote monitoring of either single or at maximum three soil parameters being soil moisture,

soil temperature and air temperature and thus suitable only for irrigation application. Further, the inclusion of light sensor in the proposed invention adds more to the monitoring of ambient conditions for plant growth.

2. The proposed invention caters multi-model support which is user specific with additional functionalities of data sharing analysis. The system of proposed invention provides a multi-model interface for users such as farmers, researchers and agronomists via selectable modes as per requirement. None of the prior art support for local data monitoring and storage whereas proposed system supports monitoring, storage and analysis both at local as well as remote data analysis centre as per configured mode. Further, local data retrieval via USB is not present in any of the prior art system whereas same exists in proposed system.
3. The proposed invention supports dynamic configuration of communication media which is user configurable such BLE, GSM, GPRS, ZIGBEE etc. and dynamic information sharing locally such as, on mobile phones via SMS/textual means, on smart phones via mobile application and on web interface through internet. Thus, providing easy access and utilization of information as per user requirements and support for both wired (Serial-RS232/ethernet) and wireless communication interface.
4. The system of proposed invention is cost effective and a compact solution for ease of operation that supports for both precision agriculture and horticulture applications because of availability of multiple sensors ensuring applicability to multiple agriculture/horticulture applications irrespective of site/land conditions. It is a standalone device for local monitoring and accessibility via simple mobile phone using SMS/Text messages and also allows for remote monitoring at the same time thus providing anytime/anywhere access to information without limitation of location and environment.
5. The system of the proposed invention provides on field primary support to user via inbuilt lightweight database and analytics. It has the capability to acts as a sensor node, base station and data centre for local analytics for multiple operations as per user defined configuration. In addition, it comprises a display such LCD/TFT for local monitoring of collected data.

6. The system of the proposed invention having networking capability using most popular communication technologies like ZigBee and GSM/GPRS can further acts as a prime component for formation of a sensor network.

7. The proposed invention being an integrated stand-alone system for real-time remote monitoring of multiple soil parameters of multiple sites and alert transmission via multiple communication interfaces to users operating the system in multi-modes comprises of various technical feature as elaborated above to realize the complete invention and thereof makes the invention non-obvious.

Accordingly, it is respectfully stated that the technical feature used to realize the complete invention is different from the cited prior art D1, D2 and D3 and hence makes the proposed invention non-obvious.

Applicant respectfully submits that the amended claim 1 is not obvious over D1, D2 and D3 since none of the references (either alone or combined) discloses a system (100) for real-time remote monitoring of multiple soil parameters simultaneously for precision agriculture or horticulture of plurality of landscape sites, comprising a soil sensor network (204), at each of the plurality of landscape sites further comprising plurality of sensor nodes for measuring one or more soil parameters; a soil sense unit (200) coupled to the soil sensor network (204) for processing each sensor node measured signal output comprising: a processor (201) for processing said signal output from each sensor nodes into a digital form, a memory module (202) for storing measured parameters and threshold values of one or more soil parameter, a display screen (205) coupled to processor (201) for displaying said processed one or more sensor node signal output, and a transmitting module (207) coupled to the processor (201) for transmitting processed signal output based on a predefined user selectable mode. Also provided in the proposed system (100) is a soil data acquisition server (104) located remotely from the plurality of landscape sites, said server wirelessly coupled with the transmitting module (207) for storing and monitoring of transmitted soil sensed parameters of a landscape site, wherein the soil sense unit (200) in a selected mode compares the measured parameters with threshold value and send an alert to a remote communication device on threshold breach of the one or more soil sensed parameter, as defined by amended claim.

Therefore, a skilled artisan would not modify any of the cited references with an expectation of successfully arriving at that which is claimed as the invention because there is no teaching or disclosure of the aforementioned features defined by amended system claim 1 and subsequent method claim 11. The dependent claims 2-10 and claim 12-13 are novel and inventive by virtue of their dependency on claim 1 and 11 respectively.

Accordingly, it is respectfully stated that none of the cited prior arts, either taken alone or in any combination thereof, will motivate a person ordinarily skilled in the art to arrive at the claimed invention. The Learned Controller is, therefore, requested to reconsider and waive the objection favorably.

Objection 3: Non Patentability

The learned controller has objected the patentability of Claim(s) 1-10 under the provision of clause (K) of Section 3 for the following reasons:

Claims 1-15 seek protection for a 'computer implemented method' and as worded the method being claimed in claims 1-15 appears to be a mere algorithm implemented through software. In other words the claimed method is a mere software application/product and hence not patentable u/s 3(K) of Patents Act, 1970.

Applicant respectfully submits the following submissions with regard to patentability of the claimed invention:

Applicant has amended the claims 1-13 to overcome the above objection. Also Applicant believes that amended claims 1-13 do not represent an algorithm and are allowable u/s 3(k) of the Patents Act, 1970. Hence, Applicant respectfully traverses the rejection and presents the following reply:

The Manual of Patents Practice and Procedure (MPPP), with regard to Section 3(k), cites that *“Algorithms in all forms including but not limited to, a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise, are excluded from patentability.”*

Further, with reference to revised Guidelines for Examination of Computer-related Inventions (CRIs) published on June 30, 2017, states that *“Even when the issue is related to*

hardware/software relation, the expression of the functionality as a “method” is to be judged on its substance. It is well-established that, in patentability cases, the focus should be on the underlying substance of the invention, not the particular form in which it is claimed. The Patents Act clearly excludes computer programmes per se and the exclusion should not be allowed to be avoided merely by camouflaging the substance of the claim by its wording.”

Applicant respectfully states that the claimed subject matter in amended claims 1-13 does not describe or relate to “a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise”. Instead applicant claimed invention is related to solve a technical problem of delayed information delivery in existing technique by providing local storage and display of collected data for on-field monitoring and analysis as well as scalable data sharing and alert reporting through local and remote data centres. The proposed invention is an improvement and technical enhancement over the similar prior art with more functionalities to solve the problem by possessing the capacity to handle more number of sensors as compared to prior art, applicability to more agricultural and horticulture applications for irrigation, soil fertility evaluation, and soil nutrient analysis/classification for fertilization as well as capability to handle multiple communication media/interfaces as compared to prior art.

Further, applicant has included hardware limitation such as plurality of sensor nodes inserted at the landscape site and a soil sense unit (200) that implements the steps claimed in the amended claims 1-13. Additionally, the proposed invention is an integrated, compact and cost effective solution for remote monitoring of soil parameters. It is an integrated system composed of combination of hardware and software with multi-sensor inputs more than prior art, multi-model support such as user and scientific modes for operations and data sharing via user driven dynamic configurable communication interfaces of multi-communication media. The system is composed of interconnection of hardware (sensors, signal conditioning circuitry, low-cost processor, analog to digital (A/D) convertors, memory device, communication modules (BLE, GSM, ZIGBEE), LCD display, solar panel, solar charging and power circuitry, Li-ion battery), physical structure (compact casing, solar panel stand) and software (embedded software for data acquisition, pre-processing, data-storage

(Lightweight data-base), data analysis (Light-weight if-else threshold conditions), data transmission software). So considering the invention as mere algorithm implemented through software is not justifiable.

Hence amended claims 1-13 are allowable u/s 3(k) of the patents Act 1970. Thus, the applicant believes that none of the amended claims 1-13 are directed solely towards software steps or algorithm or sequence of computational steps. Therefore subject matter of said amended claims 1-13 does not fall within scope of clause (k) of section (3) of the Patents Act, 1970 (as amended). Therefore invention claimed in said amended claims 1-13 is patentable and applicant respectfully requests the Learned Controller to waive the above objection.

Objection 4: Sufficiency of Disclosure

1. Reference numerals are missing from the 'abstract' given by the applicant. The applicant is required to freshly prepare an 'abstract' in accordance with the instructions contained in Rule 13{7} of the Patent Rules, 2003 (as amended).

The applicant submits that reference numerals have been given wherever necessary in abstract and the abstract is freshly prepared to include the technical feature of the invention in accordance with the instructions contained in Rule 13{7} of the Patent Rules, 2003 (as amended). Accordingly, the objection stands moot.

Objection 5: Clarity and Conciseness

1. The independent claims should be cast in the two- part form where appropriate, with those features known in combination from the prior art being placed in the preamble and the remaining features being included in the characterising part.

The applicant submits that the original independent claim 1 and 13 has been amended in the two- part form to claim 1 and claim 11 respectively. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

2. In absence of, reference numerals in the claims, subject matter of claims not seems to be clear u/r 13(4) and u/s 10(5) of The Patent Act. Hence comply with this requirement.

The applicant submits that reference numerals have been given wherever necessary in the amended claims 1-13. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

Part-II

Objection 6: Formal requirements

1. Date and Signature of Applicant: All the submitted documents and forms have been presumed as originally signed by the authorized signatory under the provisions of the Patents Act, 1970. If not, submit the originally signed copy of the same failing to which the document may not be considered filed.

The applicant submits that all the documents are originally signed by the authorized Patent Agent under the provisions of the Patents Act, 1970. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

2. Statement & Under Taking (Form 3 Details): Details as required under section 8(1) and 8(2) of the Act should be submitted.

The applicant submits the updated Form 3 details as follows:

- (i) that applicant have not made any application for the same/substantially the same invention outside India.
- (ii) that the rights in the application(s) has/have been assigned to none.

Other Requirements

1. The Applicant submits that the claims are amended to include the novel and inventive features with respect to cited prior art. Further, the Applicant submits that the amendments to the claims are made in such a way that subject matter of the amended claims is completely supported by the originally filed specification and thus, complying with the requirement of section 59. A markup copy of the claims for the amendments is submitted herewith. The Learned Controller is humbly requested to take above submission on record.

PRAYER

It is therefore prayed that:

- (a) the objections may be dropped;
- (b) the application may be favorably considered for early grant; and
- (c) a personal hearing may be granted in the event of any outstanding issue.

Dated this 18th day of August 2020

Rashmi Tyagi

RASHMI TYAGI

IN/PA-1594

AGENT FOR THE APPLICANT

To,

The Controller of Patents

The Patent Office, at New Delhi

Enclosures:

- 1. Claims-Clean**
- 2. Abstract-Clean**
- 3. Annexure 1 (Claims-track and Abstract-track)**

We Claim:

1. A system (100) for real-time remote monitoring of multiple soil parameters simultaneously for precision agriculture or horticulture of plurality of landscape sites, comprising:

a soil sensor network (204), at each of the plurality of landscape sites, ~~the soil sensor network~~ comprising plurality of sensor nodes for ~~performing real-time measurement of~~ measuring one or more soil parameters ~~simultaneously~~;

a soil sense unit (200) coupled to the soil sensor network (204) for processing each sensor node measured signal output, ~~wherein the soil sense unit~~ comprising:

a processor (201) for processing said signal output from ~~sensors~~ each sensor nodes into a digital form;

a memory module (202) for storing measured parameters and threshold values of one or more soil parameter;

a display screen (205) coupled to processor (201) for displaying said processed one or more sensor node signal output; and

a transmitting module (207) coupled to the processor (201) for transmitting processed signal output based on a predefined user selectable mode;

a soil data acquisition server (104) located remotely from the plurality of landscape sites, said server wirelessly coupled with the transmitting module (207); for storing and monitoring of transmitted soil sensed parameters of a landscape site;

wherein the soil sense unit (200) in a selected mode compares the measured parameters with threshold value and send an alert to a remote communication device on threshold breach of the one or more soil sensed parameter.

~~2. The system as claimed in claim 1, wherein the processing of signal comprises converting of sensor nodes measured signal output into digital form for further transmission or displaying purposes.~~

~~3.2.~~ 3.2. The system as claimed in claim 1, wherein soil sensor network [\(204\)](#) comprises soil sensor such as soil moisture, temperature, pH, ambient temperature, light and water level sensor.

~~4.~~ 4. ~~The system as claimed in claim 1, wherein the soil sense unit compares measured parameters with threshold value and send alert to remote communication device on threshold breach of the one or more soil sensed parameter.~~

~~5.3.~~ 5.3. The system as claimed in claim 1, wherein soil sensor nodes communicates with soil sense unit [\(200\)](#) over Bluetooth low energy profile.

~~6.4.~~ 6.4. The system as claimed in claim 1, wherein soil sense unit [\(200\)](#) further comprises a solar panel power system.

~~7.5.~~ 7.5. The system as claimed in claim 1, wherein soil sense unit [\(200\)](#) further communicates with plurality of communication devices via transmitting ~~unit~~[module \(207\)](#).

~~8.6.~~ 8.6. The system as claimed in claim 1, wherein communication with the transmitting ~~unit~~[module \(207\)](#) of soil sense unit [\(200\)](#) and remote sites comprises communicating via ~~the~~[an](#) Internet or a cellular network.

~~9.7.~~ 9.7. The system as claimed in claim 1, wherein communicating with the plurality of communication devices comprises communicating via ~~the~~[an](#) Internet or a cellular network.

~~10.8.~~ 10.8. The system as claimed in claim 1, wherein soil sense unit [\(200\)](#) further comprises responding to queries from at least one end-user with short text messages (SMS), web pages, or screens to be displayed on a ~~cell~~[mobile](#) phone application.

~~11.9.~~ 11.9. The system as claimed in claim 1, wherein communicating with the soil sense unit [\(200\)](#) comprises communicating_; between the server system and the at

least one gateway at each of the plurality of sites, using a GPRS network, an Edge network, a 3G network, a UMTS network, a cellular network, a wireless broadband data communication service, or WiMAX.

~~42.10.~~ The system of as claimed in claim 1, wherein soil data acquisition server (104) can be accessed by an application program installed on a communication device.

~~43.11.~~ A method for real-time remote monitoring of multiple soil parameters simultaneously for precision agriculture or horticulture of plurality of landscape sites, comprising:

receiving, by soil sense unit (200), one or more measured soil parameters signal from plurality of ~~sensors~~ sensor nodes at a landscape sites; and

processing, by soil sense unit (200), said one or more measured parameters signal, in a preferred selectable mode, wherein the selectable mode comprises a farmer mode or a scientific mode;

~~wherein the processing in farmer mode comprising detecting one or more threshold breaching and transmitting a alert to an end user; and~~

~~wherein the processing in scientific mode comprising transmitting measured parameter to a remote soil data acquisition server.~~

storing, by soil sense unit (200) said one or more measured parameters and a threshold value of one or more soil parameter;

displaying on screen by soil sense unit (200) said one or more measured parameters;

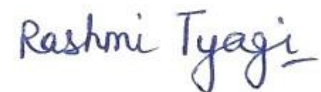
transmitting by soil sense unit (200) said one or more measured parameters based on preferred selectable mode wherein in the farmer mode transmitting an alert to an end user upon detection of one or more threshold breach and in the scientific mode transmitting measured parameter to a remote soil data acquisition server (104);

storing and monitoring of transmitted said one or more measured parameters of landscape site by a soil data acquisition server (104) located remotely.

~~44.12.~~ The method as claimed in claim ~~43~~11, wherein ~~the measurement~~measuring of ~~the~~ at least one or more soil parameters further ~~comprising:~~comprises measuring with the sensor at least one of a moisture content level of the soil, a potential hydrogen (pH) level of the soil, a temperature level of the soil, and an intensity level of light that reaches the soil.

~~45.13.~~ The method as claimed in claim ~~43~~12, wherein soil data acquisition server (104) can be accessed by an application program installed on a communication device.

Dated this 18th day of January, 2016



RASHMI TYAGI
AGENT FOR APPLICANT

ABSTRACT

**SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING
SYSTEM**

The present invention provides a system [\(100\)](#) and method for real-time [remote](#) monitoring of [multiple](#) soil parameters and alerting for critical conditions. The system includes [a soil sensor network \(104\) comprising multiple ~~sensors~~ sensor nodes at the landscape site](#) for detection of key soil parameters such as temperature, moisture, EC and soil pH simultaneously, a [processing-soil sense unit \(200\)](#) for processing of raw data received from [sensors-sensor nodes](#) and providing results in digital form which is [displayed on a screen \(205\) and](#) transmitted through [a](#) wireless media (Bluetooth/GSM/ZigBee) to end user or to a remote monitoring data logging server [\(104\)](#). The server [\(104\)](#) keeps the record of all data received and [sends information about present status of the site and also an alert for critical conditions to the user~~alert farmer~~ upon breach of predefined threshold value.](#)



**INTELLECTUAL
PROPERTY INDIA**
एकस्व/PATENTS|अभिकल्प/DESIGNS|
व्यापार चिह्न/TRADE MARKS|भौगोलिक
उपदर्शन/GEOGRAPHICAL INDICATIONS



सत्यमेव जयते
भारत सरकार
GOVERNMENT OF INDIA

एकस्व कार्यालय /THE PATENT OFFICE
बौद्धिक सम्पदा भवन / I.P.O. BUILDING
प्लॉट नं. 32/ PLOT NO. 32
सेक्टर -14/ SECTOR 14, द्वारका/ DWARKA
नई दिल्ली/NEW DELHI -110078
दूरभाष /Tel. No. : 011-25300200
फ़ैक्स /Fax : 011-28034301/02/15
ई मेल /Email : delhi-patent@nic.in
वेबसाइट /Website:<http://ipindia.nic.in>

सं.संख्या/Ref.No /आवेदन संख्या/Application No/ 156/DEL/2015

दिनांक/Date of Dispatch/Email: 18/02/2020

सेवा में,/To

RASHMI TYAGI,

#250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India

Email : rashmi@elpisinnovation.com,rashmi.tyagi@hotmail.com

विषय: एकस्व अधिनियम, 1970 की धारा 12 व 13 तथा एकस्व नियम, 2003 के अधीन परीक्षण रिपोर्ट

Subject: Examination report under sections 12 & 13 of the Patents Act, 1970 and the Patents Rules, 2003.

1. उपर्युक्त आवेदन के संदर्भ में परीक्षण रिपोर्ट (अर्थात, एकस्व नियम, 2003 (यथा संशोधित) के नियम 24-ख(3) में विनिर्दिष्ट आपत्तियों का प्रथम कथन) इसके साथ संलग्न है। यह रिपोर्ट परीक्षण हेतु अनुरोध दिनांक 27/09/2016 के उत्तर में जारी की गयी है। परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि (अर्थात, इस रिपोर्ट में लगाई गयी सभी आवश्यकताओं के अनुपालन की अवधि) आवेदक को आपत्तियों का प्रथम कथन जारी होने की तिथि से छः माह है।

Please find enclosed herewith an Examination Report (i.e. a first statement of objections as specified in Rule 24-B(3) of The Patents Rules, 2003 (as amended)) in respect of above-mentioned application. This report is issued with reference to a request for examination dated 27/09/2016. The last date for filing a response to the Examination Report (i.e. a period to comply with all the requirements raised in this examination report) is six months from the date on which the first statement of objections is issued to the Applicant.

2. यदि रिपोर्ट के अंतर्गत लगाई गयी आवश्यकताओं का अनुपालन एकस्व नियम, 2003 (यथा संशोधित) के नियम 24 ख(5) में विनिर्दिष्ट अवधि के भीतर अंदर अनुपालन नहीं किया गया तो एकस्व अधिनियम 1970 की धारा 21(1) के अधीन वर्तमान आवेदन को परित्यक्त माना जाएगा।
The instant application shall be deemed to have been abandoned under Section 21(1) of The Patents Act, 1970, unless all the requirements raised in this report are complied with in the period as specified in Rule 24-B (5) of The Patents Rules, 2003 (as amended).

3. आपका ध्यान एकस्व नियम, 2003 के नियम 24 ख(6) के प्रावधानों की ओर भी आमंत्रित किया जाता है।
Your attention is also invited to the provisions of Rule 24-B (6) of the Patents Rules 2003.

4. आपको सलाह दी जाती है कि शीघ्र निपटान हेतु अपना उत्तर शीघ्र प्रस्तुत करें।
You are advised to file the reply at the earliest for early disposal.

Rajni Bala
नियंत्रक पेटेंट/ Controller of Patents

संलग्न/Enclosed: अपरोक्त अनुसार/As above

टिप्पणी: यह इलेक्ट्रॉनिक रूप से उत्पन्न रिपोर्ट है।

NOTE: This is an electronically generated report.

सभी पत्राचार नियंत्रक एकस्व को उपरोक्त पते पर भेजा जाये।

All communications should be sent to the Controller of Patents at the above mentioned address.

परीक्षण रिपोर्ट / Examination Report

आवेदन संख्या /Application Number	156/DEL/2015
दाखिल करने की तिथि /Date of Filing	19/01/2015
पूर्विका दिनांक /Date of Priority	--
पीसीटी अंतर्राष्ट्रीय आवेदन की संख्या व दिनांक / PCT International Application No. & Date	--
आवेदक /Applicant	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
परीक्षण हेतु अनुरोध की संख्या व दिनांक /Request for Examination No. & Date	R20161027737 27/09/2016
प्रकाशन की तिथि /Date of Publication	19/08/2016

इस परीक्षण रिपोर्ट के चार भाग हैं, अर्थात रिपोर्ट का सारांश, विस्तृत तकनीकी रिपोर्ट, औपचारिक आवश्यकताएँ तथा रिकॉर्ड में दस्तावेज़ / This examination report consists of four parts, namely summary of the report, detailed technical report, formal requirements and documents on record.

भाग -1: रिपोर्ट का सारांश

PART-I: SUMMARY OF THE REPORT

क्र. सं. /Sl. No.	अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ /Requirements under the Act	दावों की संख्या /Claim Numbers	टिप्पणी /Remarks
1.	धारा 2(1)(ब) के तहत आविष्कार /Invention u/s 2(1)(j)	नवीनता /Novelty	दावे /Claims: हाँ /Yes
		आविष्कारी कदम / Inventive step	दावे /Claims: 1-15 हाँ /Yes
		औद्योगिक उपयोगिता /Industrial Applicability	दावे /Claims: 1-15 हाँ /Yes
			दावे /Claims: 1-15 हाँ /Yes
2.	धारा 3 के अधीन पेटेंट-अयोग्यता (यदि हाँ, खंड 3(क-त) /Non-patentability u/s 3 (if yes, specify section3(a-p))	दावे /Claims: 1-15	हाँ /Yes k
		दावे /Claims:	नहीं /No
3.	[धारा 10(5) व 10(4) (ग)] के अधीन दावे /Claims [u/s 10(5) & 10(4) (c)]	स्पष्टता/ संक्षिप्तता /Clarity / Conciseness	दावे /Claims: हाँ /Yes
			दावे /Claims: 1-15 हाँ /Yes

भाग -II विस्तृत तकनीकी रिपोर्ट

PART-II: DETAILED TECHNICAL REPORT

क. उद्धरित दस्तावेजों की सूची /A.List of documents cited:

(क) पेटेंट साहित्य / (a). Patent Literature :

क्र. सं. / Sl.no	दस्तावेजों का विवरण /Details of documents	प्रकाशन तिथि(दिन/माह/वर्ष) / Publication date	उद्धरित दस्तावेज का प्रासंगिक विवरण (पृष्ठ व अनुच्छेद संख्या) / Relevant description (page and paragraph no.) of cited document	उद्धरित दस्तावेज के प्रासंगिक दावे / Relevant claims of cited document	अभिकथित आविष्कार के दावे /Claims of alleged invention
1	D1:CN101697069A	21/04/2010	whole text; Abstract,fig 1, para [0004-0028]	1-5	1-15

2	D2:CN202648697U	02/01/2013	whole text; Abstract,para[0007,0024]	1-3	1-15
3	D3:CN203479796U	12/03/2014	whole text; Abstract	1-2	1-15

(ख) गैर-पेटेंट साहित्य / (b). Non-patent literature

कोई दस्तावेज़ उद्धृत नहीं है / No Document Cited

ख. अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियां / B. Detailed observations on the requirements under the Act:

(1). नवीनता / NOVELTY:

(I) ऊपर उद्धरित दस्तावेज़ के संदर्भ (1-15) में दिये गए प्रकटन के पूर्वानुमान को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-15) में नवीनता की कमी है /

Claim(s) (1-15) lack(s) novelty, being anticipated in view of disclosure in the document cited above under reference D1 for the following reasons:

Subject matter of claims 1-15 does not constitute an invention under section 2(1)(j) of the Patents Act, 1970 (as amended) because it is not novel in view of D1.

Claim by claim analysis as below:-

Reference mentioned in parentheses with respect to cited documents

1. Regarding independent Claim 1:

A system for monitoring soil parameters for precision agriculture(fig 1, para 0019) or horticulture of plurality of landscape sites, comprising: a soil sensor network, at each of the plurality of landscape sites, the soil sensor network comprising plurality of sensor nodes for performing real-time measurement of one or more soil parameters simultaneously(fig 1, para 0022); a soil sense unit coupled to the soil sensor network for processing each sensor node measured signal output, wherein the soil sense unit comprising: a processor for processing said signal output from sensors;(Abstract, fig 1, "Data collecting module") a memory module for storing measured parameters and threshold values of one or more soil parameter;(para 0010,0014,0015, " change of the basic situation of the soil, plant growth in the soil is judged whether there is an urgent need to moisture") a display screen coupled to processor for displaying said processed one or more sensor signal output; and a transmitting module coupled to the processor for transmitting processed signal output;(Abstract, "First GSM Module") a soil data acquisition server located remotely from the plurality of landscape sites(Abstract, Fig 1, "Monitor center"), said server wirelessly coupled with the transmitting module, for storing and monitoring of transmitted soil sensed parameters of landscape site.(Abstract, "data storage module")

2. Regarding independent Claim 13

Subject matter of the above claim is similar to claims 1. Hence same reasoning as applied to claims 1 also applies to claim 13.

3. Regarding dependent claim 2-12,14-15

Additional features of the above mentioned claims are implicitly disclosed in D1(para 0004-0028, Abstract, Fig1&2)

(2). आविष्कारी कदम / INVENTIVE STEP:

(I) ऊपर उद्धरित दस्तावेज़(जों) के संदर्भ D1,D2,D3 में स्पष्ट अध्यापन(जों) को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-15) में

आविष्कारी कदम की कमी है

Claim(s) (1-15) lack(s) inventive step, being obvious in view of teaching (s) of cited document(s) above under reference D1,D2,D3 for the following reasons:

For the sake of confirmation, Subject matter of claims 1-15 is also disclosed in D2 and D3 (see cited portion in report).

(3).पेटेंट अयोग्यता /NON PATENTABILITY:

(I) निम्नलिखित कारणों से धारा 3 के खंड (k) के प्रावधान के तहत दावा(वे) (1-15) सांविधिक रूप से पेटेंट योग्य नहीं हैं /

Claim(s) (1-15) are statutorily non-patentable under the provision of clause (k) of Section 3 for the following reasons:

Claims 1-15 seek protection for a 'computer implemented method' and as worded the method being claimed in claims 1-15 appears to be a mere algorithm implemented through software. In other words the claimed method is a mere software application/product and hence not patentable u/s 3(K) of Patents Act, 1970.

(4).प्रकटन की दक्षता /SUFFICIENCY OF DISCLOSURE:

(I) सार /Abstract:

Reference numerals are missing from the 'abstract' given by the applicant. The applicant is required to freshly prepare an 'abstract' in accordance with the instructions contained in Rule 13{7} of the Patent Rules, 2003(as amended).

(5).स्पष्टता एवं संक्षिप्तता /CLARITY AND CONCISENESS:

(I) दावा(वे) 1-15 के संबंध में स्पष्ट रूप से परीभाषित नहीं हैं.

Claim(s) 1-15 are not clearly worded in respect of:

1.The independent claims should be cast in the two- part form where appropriate, with those features known in combination from the prior art being placed in the preamble and the remaining features being included in the characterising part.

2.In absence of, reference numerals in the claims, subject matter of claims not seems to be clear u/r 13(4) and u/s 10(5) of The Patent Act. Hence comply with this requirement.

भाग – III: औपचारिक आवश्यकताएँ /PART-III: FORMAL REQUIREMENTS

आपत्तियाँ /Objections	टिप्पणी /Remarks
Date and Signature of Applicant	All the submitted documents and forms have been presumed as originally signed by authorized signatory under the provisions of patents Act,1970. if not, submit the originally signed copy of the same failing to which the document may not be considered filed.
Statement & Under Taking (Form 2)	Details regarding application for Patents which may be filed outside India from time to time for the same or substantially the same invention should be furnished within Six

Parting (Part 1) Details)	months from the date of filing of the said application under clause(b) of sub section(1) of section 8 and rule 12(1) of Indian Patent Act.
---------------------------	--

भाग-IV: रिकॉर्ड में दस्तावेज़ /PART-IV: DOCUMENTS ON RECORD

निम्नलिखित दस्तावेज़ों के आधार पर यह परीक्षण रिपोर्ट तैयार की गयी है

The examination report has been prepared based on the following documents:

कार्यसूची तिथि / Docket Date	कार्यसूची संख्या /Docket Number	प्रविष्टि संख्या विवरण /Entry Number Description
19 Jan 2015	1785	1-New Application For Patent With Provisional /Complete Specification
02 Dec 2015	38892	OTHERS(NON CASH)
02 Dec 2015	38892	OTHERS(NON CASH)
02 Dec 2015	38892	OTHERS(NON CASH)
18 Jan 2016	1957	2-Complete After Provisional Specification - Form 2 Check For No. OF Pages & Claims
18 Feb 2016	6171	5-Declaration As To Inventorship - Form 5
05 Apr 2016	12817	OTHERS(NON CASH)
05 Apr 2016	12817	OTHERS(NON CASH)
27 Sep 2016	45286	28(i)-Request For Examination After 18 months Publication - Form 18

नियंत्रक का नाम /Name of the Controller: **Rajni Bala**

नियंत्रक स्थान /Controller Location: **Delhi**

टिप्पणी: परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि / Note: Last date for filing response to the Examination Report:
18/08/2020

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. **Applicant:** Indira Gandhi Delhi Technical University for Women

Nationality: Indian

Address: Kashmere Gate, New Delhi-110006

2. **Statement in case of request for examination made by the applicants**

We hereby request that our application for patent no. **156/DEL/2015** filed on **19th January, 2015** for the invention titled **“SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING SYSTEM”** shall be examined under sections 12 and 13 of the Act.

3. **Address for Service:**

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh – 201007, India

Mobile No.:+91-9968284766

E-mail: rashmi.tyagi@hotmail.com

Dated 26th day of September, 2016

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANT)

To,
The Controller of Patents
The Patent Office, at New Delhi



314416

EI: RT: 156/DEL/2015

April 05, 2016

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF FORM-5 IN ORIGINAL

Dear Sir,

**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No. 156/DEL/2015
e-Filed: January 19, 2015**

Title: Soil Multi-Parameters Remote Monitoring & Alerting System

We are submitting herewith original Form-5 for application 156/DEL/2015 titled "Soil Multi-Parameters Remote Monitoring & Alerting System" e-filed on January 19, 2015 for grant of patent.

Enclosures:

1. Form-5 (in original)
2. Form-5 E-filing Receipt (copy)

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi

Rashmi Tyagi

(IN/PA 1594)

#250, Street No. 06, New Colony Kerhera,
Mohán Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 91 9968284766

Email: rashmi@elpisinnovation.com

TPO DELHI 05-04-2016 16:05

FORM 5

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENT RULES, 2003

DECLARATION AS TO INVENTORSHIP

[See Section 10 (6) and rule 13 (6)]



1. NAME OF APPLICANT(S): **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY**
FOR WOMEN of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 156/DEL/2015 dated 19.01.2015 are:-

2. INVENTORS(S)

(a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **MOTIA Sanjay**
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, USET, Guru Gobind Singh Indraprastha University, Sector-16C, Dwarka, New Delhi - 110078, India

(a) NAME : **KUMAR Pawan**
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, USET, Guru Gobind Singh Indraprastha University, Sector-16C, Dwarka, New Delhi - 110078, India

(a) NAME : **SHARMA Manisha**
(b) NATIONALITY : Indian
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Dated this **18th** day of **February, 2016**

Rashmi Tyagi

Name: **RASHMI TYAGI (IN/PA-1594)**

AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

**1. NAME OF APPLICANT(S): INDIRA GANDHI DELHI TECHNICAL UNIVERSITY
FOR WOMEN** of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 156/DEL/2015 dated 19.01.2015 are:-

2. INVENTORS(S)

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Dated this **18th** day of **February, 2016**

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To,
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FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING
SYSTEM”**
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
Kashmere Gate, New Delhi-110006, India

The following specification describes the invention and the manner in which it is to be performed.

5 **FIELD OF THE INVENTION**

The present invention relates to a system and method for remote monitoring of multiple soil parameters in real-time. More particularly, the invention relates to soil sensing multi-mode, multi parameters and multi communication technology for remote monitoring of multiple soil parameters in real-time and providing alert to user for critical conditions and providing the necessary information about the soil to researchers' and user.

BACKGROUND OF THE INVENTION

15 Majority of the prior art devices or instruments measures either of any one soil parameter such as soil temperature, moisture, soil electrical conductivity (EC) & pH or any two. Further these instruments used for measurement of soil moisture and temperature provides the data in analogue form and only few gives digital data. In addition, most of available soil pH meters are electrode based and provides the data in analogue form and only few gives digital output. Further the existing devices or instruments operate only in one mode and mostly have no provision for multimode communication with user friendly mobile app.

25 Thus there is a need for a system which can overcome the disadvantages of prior art. Therefore, in present invention a system & method for remote monitoring in real-time of multiple soil parameters is provided that will operate in two different modes to facilitate the researchers and farmers specific requirements. The system of present invention is an integrated & compact solution for sensing & monitoring various soil parameters and has potential application in field of precision agriculture and research with IoT.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

10 FIG. 1 is a schematic block diagram illustrating a system for wireless monitoring of plurality of landscape sites for agriculture or horticulture accordance with one or more embodiments of the invention.

FIG. 2 is a block diagram illustrating soil sense unit according to the
15 preferred embodiment of the present invention;

FIG. 3 illustrates a flow-diagram of soil sense unit work flow according to another preferred embodiment of the present invention.

20 FIG. 4 illustrates a flow-diagram of soil sense unit work flow according to the preferred embodiment of the present invention.

SUMMARY

An object of the present invention provides a system for monitoring soil
25 parameters for precision agriculture or horticulture of plurality of landscape sites, comprising a soil sensor network, at each of the plurality of landscape sites, the soil sensor network comprising plurality of sensor nodes for performing real-time measurement of one or more soil parameters simultaneously, a soil sense unit coupled to the soil sensor
30 network for processing each sensor node measured signal output, wherein the soil sense unit comprising, a processor for processing said signal output from sensors, a memory module for storing measured parameters and threshold values of one or more soil parameters, a display screen coupled to processor for displaying said processed one or more sensor
35 signal output and a transmitting module coupled to the processor for

5 transmitting processed signal output, a soil data acquisition server located remotely from the plurality of landscape sites, said server wirelessly coupled with the transmitting module, for storing and monitoring of transmitted soil sensed parameters of landscape site.

10 An object of the present invention provides a method for monitoring soil parameters for precision agriculture or horticulture of plurality of landscape sites, comprising receiving by soil sense unit one or more measured soil parameters signal from plurality of sensors at a landscape sites and processing by soil sense unit said one or more measured parameters in a
15 preferred selectable mode wherein the selectable mode comprises farmer mode or scientific mode, wherein the processing in farmer mode comprising detecting one or more parameters threshold breaching and transmitting an alert to an end user and wherein the processing in scientific mode comprising transmitting measured parameter to a remote
20 soil data acquisition server for analysis & related actions.

A further object of the present invention provides a standalone system for monitoring of soil parameters which utilizes solar energy as power source.

25 An another object of the present invention provides user friendly mobile application for remote monitoring, alerting and collecting the soil data for further analysis and necessary action.

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only
10 provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a system for remote and real-time
15 monitoring of location specific parameters such as soil moisture, soil temperature, soil pH, Soil EC, ambient temperature, light and water Level. The system of present invention is a cost effective integrated solution to the farmers and scientists or researchers for precision agriculture or horticulture communicating in multiple ways.

20
FIG. 1 is a schematic block diagram illustrating a system for wireless monitoring of plurality of landscape sites for agriculture or horticulture in accordance with one or more embodiments of the present invention. The system (100) includes a soil sensor network(s), a soil sense unit (10), a
25 communication device (103) and Data acquisition server (104). The soil sensor network(s) comprises various sensor nodes (11, 12, 13, 14 & 15) or sensors for monitoring soil parameters such as soil moisture, temperature, pH, ambient temperature, light and water level. In a preferred embodiment one or more sensors has capability of measuring two or more
30 parameter simultaneously such as moisture and water level at a landscape site. The sensor nodes communicate with sense unit (10) through wired or wireless profile and send measured parameters in analogue signal. The soil sense unit stores these various soil parameters value in a local memory for further processing. The soil sense unit (10) processes the
35 measured parameter and transmit to a remote user based on a predefined

5 selectable mode. The soil sense unit (10) of present invention is configured to operate in two modes first in farmer mode and second is scientific mode. In the farmer mode selection, the sense unit (10), process the sensed parameters and compares it with pre-defined threshold value limit specified by user. In any situation when sense unit (10) identifies any
10 threshold breach it transmits a notification in a form of text or SMS alert to the communication device (103) of user via network (102). In scientific mode selection, the sense unit (10) transmits measured data in digital form to the data acquisition server (104) via network (102). The Data acquisition server (104) at a remote location from various landscape sites stores this
15 information for further statistical analysis and monitoring by researchers and scientists.

FIG. 2 illustrates a soil sense unit (200) block diagram according to the preferred embodiment of the present invention. The soil sense unit (200)
20 comprises a processing unit as computing environment (201), a display (205), memory module (202) and transmitting unit (207). The soil sense unit of present invention employs a solar-panel (2031) powered power unit (203) for powering processor (201) and plurality of soil sensors (204) that can sense all major soil elements such as soil pH, soil temperature, Soil
25 EC and soil moisture which plays an important role in crop growth. Other parameters that can also be sensed by the system of present invention are environment temperature, light and on field water level.

The various components of the soil parameters monitoring system of
30 present invention which is described above are explained herein detail.

An important component of the system of the present invention for remotely monitoring soil parameters consists of soil sensors (204) that can sense soil moisture, temperature, Soil EC and pH value. It also
35 includes elements that can measure the environmental temperature and

5 light. These sensors when inserted into the field, sense the moisture, temperature, Soil EC and pH of the soil simultaneously and the sensed information is measured as raw voltage which is further processed to display the resultant as desired by the user.

10 The next major component of the system of the present invention is sense unit (200) which includes a processor for creating a computing environment (201) consisting of the low cost, small sized microcontroller based SoC that receives the analogue raw voltage as sensed by the soil sensors (204) and converts it into digital form with on board analogue to
15 digital converter. The information in digital form is further processed for sending to display unit (205) for displaying of the same on LCD or TFT. The computing environment (201) also consists of an application software that does the necessary processing for calibration, conversion of raw data into meaningful information, storage of data into main memory
20 etc.

The sense unit (200) further includes a memory module (202) that stores the processed data into its data storage with some lightweight database. The transmitting unit (207) provides multiple wired or wireless interfaces
25 with the external remote location. In order to transfer the processed information to the end user situated at a remote location, there is a communication mechanism, which communicates over Bluetooth or GSM or ZigBee communication technology over Mobile App wirelessly and through USB interface for direct transfer as per need. The soil sense unit
30 (200) of present invention operates in two user selectable modes i.e. farmer mode and scientific mode as described later in detail.

Fig. 3 illustrates the work flow of the soil sense unit (200) according to an embodiment of present invention. The soil sense unit receives plurality of
35 measured soil parameters signal at step (301) from plurality of sensors

5 installed at a landscape site and processes the measured parameters at
step (302) and stores the value in local memory. The sense unit is
configured to operate in preferred user selectable mode at step (303)
where the selectable mode comprises farmer mode or scientific mode. In
farmer mode one or more parameters threshold breaching is detected at
10 step (3031) and an alert at step (3032) is transmitted to an end user in
the form of a text message to his communication device. In scientific
mode measured parameter is transmitted at step (3033) to a remote soil
data acquisition server and is stored in repository at step (3034) for
further analysis and monitoring by researcher or scientists.

15

Fig. 4 illustrates the work flow of the soil sense unit (200) according to
preferred embodiment of present invention. The flow chart illustrates soil
sense unit installed at a landscape site at step (401) to communicate with
a central repository server, sensors, and user's communication device
20 such as smart phone etc. In a preferred embodiment, present invention
provides a smart phone application to be installed in user's smart phone
device for communication with the soil sense unit and central repository
server. The soil sense unit communicates with sensors installed at
different location in landscape sites and sensors transmit measured
25 parameters to soil sense unit through wired connection or wireless mode.
A wireless mode of communication used by sensors could be a Bluetooth
low energy mode of communication. The measured soil parameters such
as soil temperature, pH, moisture etc is received at step (402) and stored
into the local memory of soil sense unit. The soil sense device of present
30 invention is configured to operate in two user selectable modes at step
(403) namely farmer mode and scientific mode. The first mode is farmer
mode where user is a farmer and receives information about his land
present status and alert for critical conditions. The second mode is
scientific mode where all the recorded data at soil sense unit is

5 transmitted to a remote data server for storing the information for long time forecasting or analysis by researchers.

In the farmer mode of step (431) of soil sense unit the signal received from sensors are pre-processed and threshold value for it is identified at
10 step (4311). If sensed value is greater than the threshold value then the farmer is notified at step (4313) in a form of alert about the status of land. If sensed value is less than the threshold value, the sense unit does data optimization & logging at local database/memory in a conventional manner at step (4312). In a further more step at (4314) related
15 information or action to be performed is also transmitted to user's mobile device in form of message.

In the scientific mode of step (432) the soil sense unit operates either in customized mode at step (4321) or default mode at step (4322) as
20 selected by the scientist or researcher for monitoring of soil parameters. In customized mode of operation at step (4321) the information related to soil parameters is transmitted at specified interval or time and is stored in a remote database for statistical analysis at step (4325). In default mode of operation all the sensed parameters are optimized and stored locally in
25 the memory at step (4324) and statistical analysis is performed on it at step (4325).

The another embodiment of present invention provides a system which monitors various soil parameters remotely and provides alerts to user for
30 critical condition & offers the following advantages:

It is a low cost solution for measurement of the soil parameters remotely in real-time.

5 It is a compact solar powered standalone system which integrates various sensing elements or sensors to continuously and remotely monitor key soil elements such as soil moisture, soil temperature, soil pH, ambient temperature, light and water level required for precision agriculture.

10 The system of the present invention is suited for all weather conditions and operates in two different modes to meet the requirements of the farmers and the researchers as well.

The system of the present invention provides real-time data logging for
15 storing and retrieving various soil parameters and also has provision for setting schedules of soil data acquisition.

The system of the present invention provides user with alerts for critical conditions and on threshold breach.

20

The system of the present invention also provides user to easily access acquired data, data storage and further processing through Mobile App user interface.

25 In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A single element or other unit may fulfil the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these
30 measures cannot be used to advantage.

The present invention can be implemented in any convenient form, for example using dedicated hardware, or a mixture of dedicated hardware and software. The present invention may be implemented as computer
35 software implemented by one or more networked processing apparatuses.

5 The network can comprise any conventional terrestrial or wireless
communications network, such as the Internet. The processing
apparatuses can comprise any suitably programmed apparatuses such
as a general purpose computer, personal digital assistant, mobile
telephone (such as a Wireless Application Protocol (WAP) or 3G-
10 compliant phone) and so on. Since the present invention can be
implemented as software, each and every aspect of the present invention
thus encompasses computer software implementable on a programmable
device.

15 The computer software can be provided to the programmable device using
any storage medium or carrier medium for storing processor readable
code such as a flexible disk, a compact disk read only memory (CD-ROM),
a digital versatile disk read only memory (DVD-ROM), DVD recording
only/rewritable (DVD-R/RW), electrically erasable and programmable read
20 only memory (EEPROM), erasable programmable read only memory
(EPROM), a memory card or stick such as USB memory, a memory chip,
a mini disk (MD), a magneto optical disc (MO), magnetic tape, a hard disk
in a server, a solid state memory device or the like, but not limited to
these.

25

The hardware platform includes any desired kind of hardware resources
including, for example, a central processing unit (CPU), a random access
memory (RAM), and a hard disk drive (HDD). The CPU may be
implemented by any desired kind of any desired number of processor. The
30 RAM may be implemented by any desired kind of volatile or non-volatile
memory. The HDD may be implemented by any desired kind of non-
volatile memory capable of storing a large amount of data. The hardware
resources may additionally include an input device, an output device, or a
network device, depending on the type of the apparatus. Alternatively, the
35 HDD may be provided outside of the apparatus as long as the HDD is

5 accessible. In this example, the CPU, such as a cache memory of the
CPU, and the RAM may function as a physical memory or a primary
memory of the apparatus, while the HDD may function as a secondary
memory of the apparatus.

10 In the above-described example embodiment, a computing environment
can be created using a computer used with a computer-readable program,
described by object-oriented programming languages such as C++, Java
(registered trademark), JavaScript (registered trademark), Perl, Ruby,
Python or legacy programming languages such as machine language,
15 assembler language to control functional units used for the apparatus or
system. For example, a particular computer (e.g., personal computer, work
station) may control information processing apparatus or an image
processing apparatus using a computer-readable program, which can
execute the above-described processes or steps. In the above described
20 embodiments, at least one or more of the units of apparatus can be
implemented in hardware or as a combination of hardware/software
combination. In example embodiment, processing units, computing units,
or controllers can be configured using various types of processors, circuits,
processing devices, processing circuits or the like such as a programmed
25 processor, a circuit, an application specific integrated circuit (ASIC), used
singly or in combination. A circuit is a structural assemblage of electronic
components including conventional circuit elements, integrated circuits
including application specific integrated circuits, standard integrated
circuits, application specific standard products, and field programmable
30 gate arrays. Further, a circuit includes central processing units, graphics
processing units, and microprocessors, which are programmed or
configured according to software code. A circuit does not include pure
software, although a circuit does include the above-described hardware
executing software.

5 In the present invention all references of device may be assumed as communication device interchangeably and includes mobile phone, phone device, tablets, portable device and computing device. Further, terms like “server” “system” and “platform” are used interchangeably and synonymously throughout this document.

10

Numerous additional modifications and variations are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the disclosure of the present invention may be practised otherwise than as specifically described herein. For example,
15 elements and/or features of different examples and illustrative embodiments may be combined each other and/or substituted for each other within the scope of this disclosure and appended claims.

5 **We Claim:**

1. A system for monitoring soil parameters for precision agriculture or horticulture of plurality of landscape sites, comprising:
 - a soil sensor network, at each of the plurality of landscape sites, the soil sensor network comprising plurality of sensor nodes for performing real-time measurement of one or more soil parameters simultaneously;
 - a soil sense unit coupled to the soil sensor network for processing each sensor node measured signal output, wherein the soil sense unit comprising:
 - 15 a processor for processing said signal output from sensors;
 - a memory module for storing measured parameters and threshold values of one or more soil parameter;
 - a display screen coupled to processor for displaying said processed one or more sensor signal output; and
 - 20 a transmitting module coupled to the processor for transmitting processed signal output;
 - a soil data acquisition server located remotely from the plurality of landscape sites, said server wirelessly coupled with the transmitting module, for storing and monitoring of transmitted soil sensed parameters of landscape site.
 - 25
2. The system as claimed in claim 1, wherein the processing of signal comprises converting of sensor nodes measured signal output into digital form for further transmission or displaying purposes.
- 30 3. The system as claimed in claim 1, wherein soil sensor network comprises soil sensor such as soil moisture, temperature, pH, ambient temperature, light and water level sensor.

- 5 4. The system as claimed in claim 1, wherein the soil sense unit compares measured parameters with threshold value and send alert to remote communication device on threshold breach of the one or more soil sensed parameter.
- 10 5. The system as claimed in claim 1, wherein soil sensor nodes communicates with soil sense unit over Bluetooth low energy profile.
- 15 6. The system as claimed in claim 1, wherein soil sense unit further comprises a solar panel power system.
- 20 7. The system as claimed in claim 1, wherein soil sense unit further communicates with plurality of communication devices via transmitting unit.
- 25 8. The system as claimed in claim 1, wherein communication with the transmitting unit of soil sense unit and remote sites comprises communicating via the Internet or a cellular network.
- 30 9. The system as claimed in claim 1, wherein communicating with the plurality of communication devices comprises communicating via the Internet or a cellular network.
- 35 10. The system as claimed in claim 1, wherein soil sense unit further comprises responding to queries from at least one end-user with short text messages (SMS), web pages, or screens to be displayed on a cell phone application.
11. The system as claimed in claim 1, wherein communicating with the soil sense unit comprises communicating, between the server

- 5 system and the at least one gateway at each of the plurality of sites, using a GPRS network, an Edge network, a 3G network, a UMTS network, a cellular network, a wireless broadband data communication service, or WiMAX.
- 10 12. The system of as claimed in claim 1, wherein soil data acquisition server can be accessed by an application program installed on a communication device.
13. A method for monitoring soil parameters for precision agriculture or horticulture of plurality of landscape sites, comprising:
- 15 receiving, by soil sense unit, one or more measured soil parameters signal from plurality of sensors at a landscape sites; and
- processing, by soil sense unit, said one or more measured parameters, in a preferred selectable mode, wherein the selectable mode comprises farmer mode or scientific mode,
- 20 wherein the processing in farmer mode comprising detecting one or more threshold breaching and transmitting a alert to an end user; and
- 25 wherein the processing in scientific mode comprising transmitting measured parameter to a remote soil data acquisition server.
14. The method as claimed in claim 13, wherein the measurement of the at least one soil parameter further comprising: measuring with the sensor at least one of a moisture content level of the soil, a potential hydrogen (pH) level of the soil, a temperature level of the soil, and an intensity level of light that reaches the soil.
- 30

- 5 15. The method as claimed in claim 13, wherein soil data acquisition server can be accessed by an application program installed on a communication device.

Dated this 18th day of January, 2016

RASHMI TYAGI
AGENT FOR APPLICANT

ABSTRACT
SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING
SYSTEM

The present invention provides a system and method for real-time monitoring of soil parameters and alerting for critical conditions. The system includes multiple sensors for detection of key soil parameters such as temperature, moisture, EC and soil pH simultaneously, a processing unit for processing of raw data received from sensors and providing results in digital form which is transmitted through wireless media (Bluetooth/GSM/ZigBee) to end user or to a remote monitoring data logging server. The server keeps the record of all data received and alert farmer and/or scientist about the current status of soil parameters.

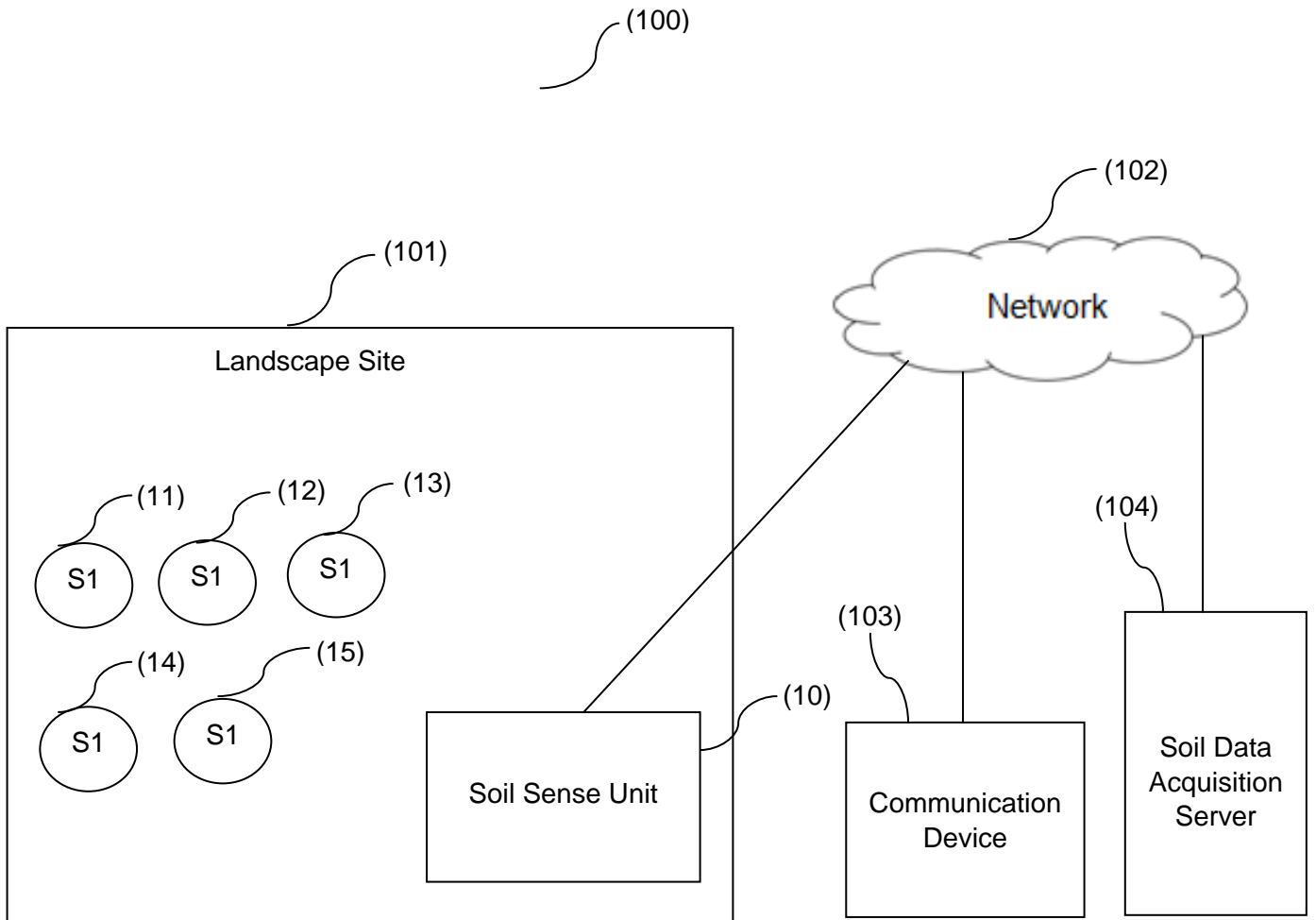


FIG. 1

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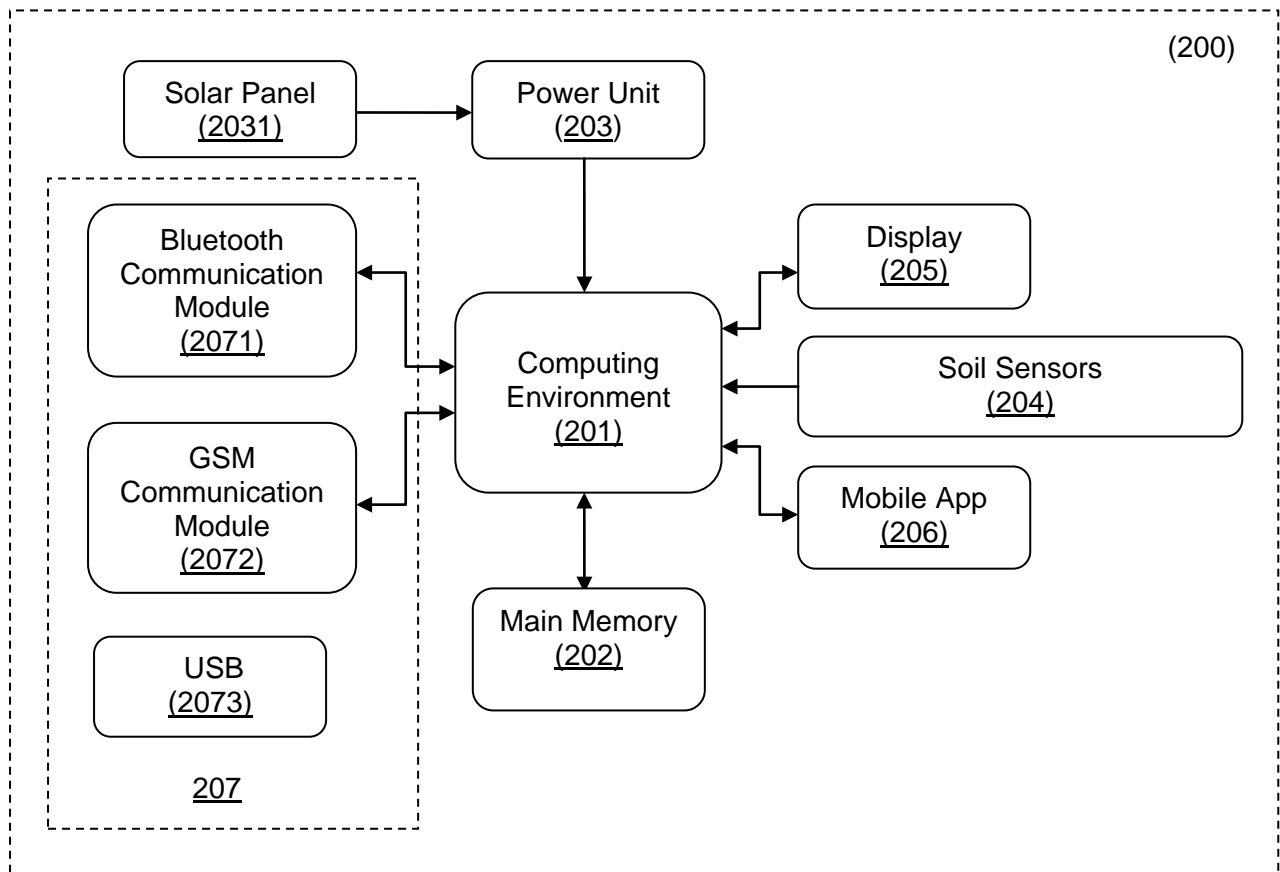


FIG. 2

RASHMI TYAGI
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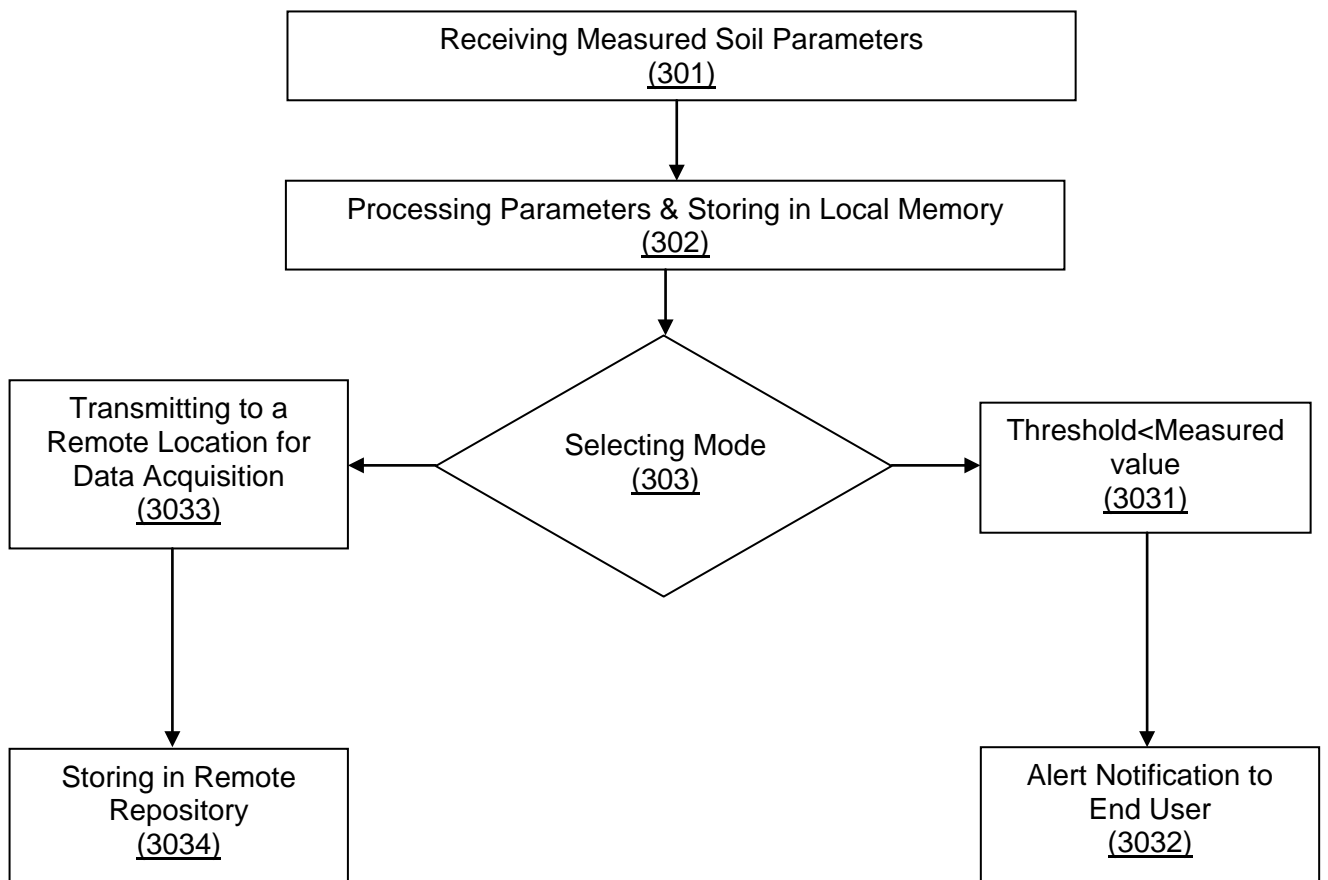


FIG. 3

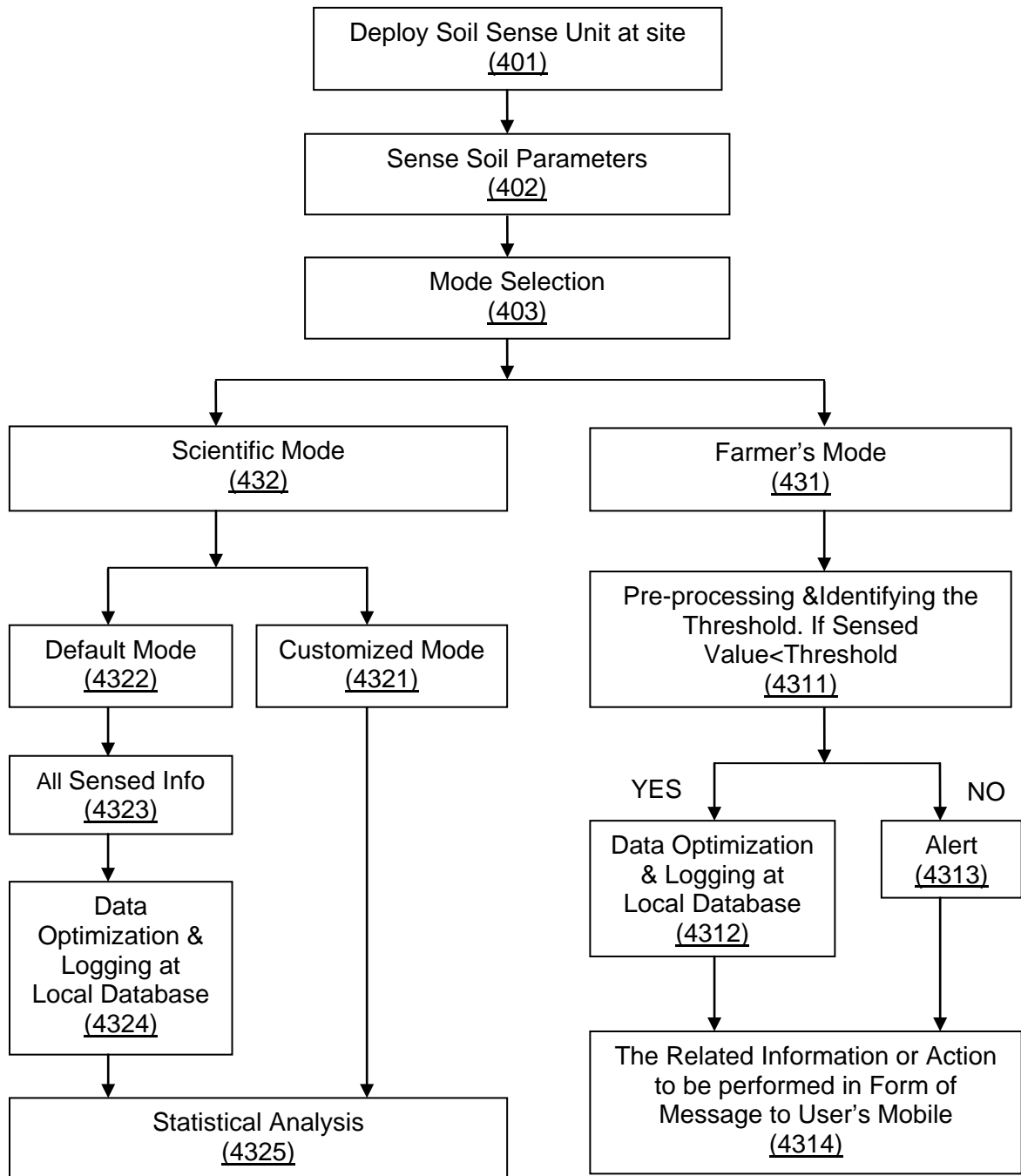


FIG. 4

RASHMI TYAGI
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240317

EI: RT: 156/DEL/2015

December 02, 2015

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF GENERAL POWER OF AUTHORITY (GPA) & FORM-1 IN ORIGINAL

Dear Sir,

**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No. 156/DEL/2015
e-Filed: January 19, 2015
Title: Soil Multi-Parameters Remote Monitoring & Alerting System**

We are submitting herewith General Power or Authority (GPA) and FORM-1 for provisional Patent application **156/DEL/2015** titled "**Soil Multi-Parameters Remote Monitoring & Alerting System**" e-filed on January 19, 2015 for grant of patent.

Enclosures:

1. General Power of Authority (in original)
2. Form-1 (in original)

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi

Rashmi Tyagi

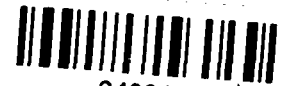
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240314

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7, 54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No: Filing Date: Amount of Fee Paid: CBR No: Signature:
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KUMAR, Pawan	Indian	PhD Scholar, USET, Guru Gobind Singh Indraprastha University, Sector-16C, Dwarka, New Delhi - 110078, India
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3. TITLE OF THE INVENTION

"SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING SYSTEM"

4. ADDRESS FOR CORRESPONDENCE OF AUTHORIZED PATENT AGENT IN INDIA

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5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
N.A.	N.A.	N.A.	---	---

6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International application number	International filing date as allotted by the receiving office
N.A.	N.A.

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) application number	Date of filing Original (first) application
N.A.	N.A.

8. PARTICULARS FOR FILING PATENT OF ADDITION

Main application/Patent Number	Date of filing of main application
N.A.	N.A.

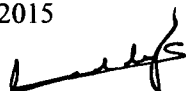
9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 17.01.2015

(b) Signature:



(c) Name: REDDY, S. Ramnarayana

(a) Date: 17.01.2015

(b) Signature: Sanjay Motia

(c) Name: MOTIA, Sanjay

(a) Date: 17.01.2015

(b) Signature: Pawan

(c) Name: KUMAR, Pawan

(a) Date: 17.01.2015

(b) Signature: Manisha

(c) Name: SHARMA, Manisha

(a) Date: 17.01.2015

(b) Signature: Garima

(c) Name: Garima

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:

(b) Signature

(c) Name

(iii) Declaration by the applicant(s):

I/we, the applicant(s) hereby declare(s) that:-

- ✓ I am/We are in possession of the above-mentioned invention.
- ✓ The provisional specification relating to the invention is filed with this application.
- ✗ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ✓ There is no lawful ground of objection to the grant of patent to me/us.
- ✓ I am/We are the assignee or legal representative or true & first inventors.
- ✗ The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention.
- ✗ I/We claim the priority from the above mentioned application(s) file in the convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from

which I/We derive the title.

- * My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para – 6.
- * The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed onunder section 16 of the Act.
- * The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

- (a) Form 2 (Provisional Specification) [Total No. of pages: 10; Specification: 07, Drawings: 03]
- (b) Form 3 (Statement & undertaking)
- (c) General Power of Authority (Original)

Fee Rs. 8,000/- through AXIS Bank (Credit Card) online payment gateway on 19.01.2015.

I/We hereby declare that to best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/we request that a patent may be granted to me/us for the said invention.

Dated this 17th day of **January 2015**

Signature: *Rashmi Tyagi*

Name: **RASHMI TYAGI**

(IN/PA-1594)

AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office,
Intellectual Property Office Building,
Plot No. 32, Sector 14, Dwarka,
New Delhi-110075



सत्यमेव जयते

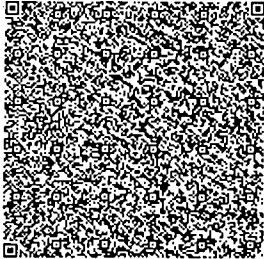
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(One Hundred only)



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THE PATENTS ACT, 1970 GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint Rashmi Tyagi, Indian, of Elpis Innovation of the address of correspondence #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India, jointly and severally, to act on our

DELHI 02-12-2015 16:34

Statutory Alert:

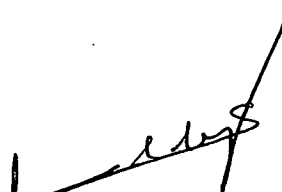
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2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and we request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To

The Controller of Patents,

The Patent Office, at New Delhi

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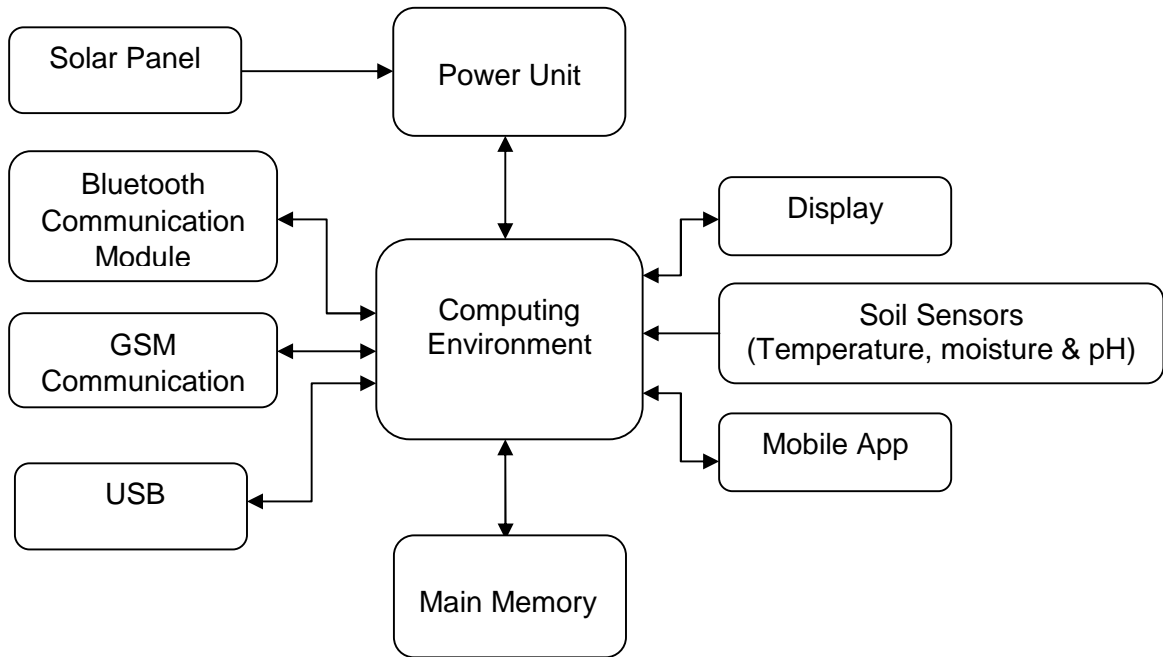


FIG. 1

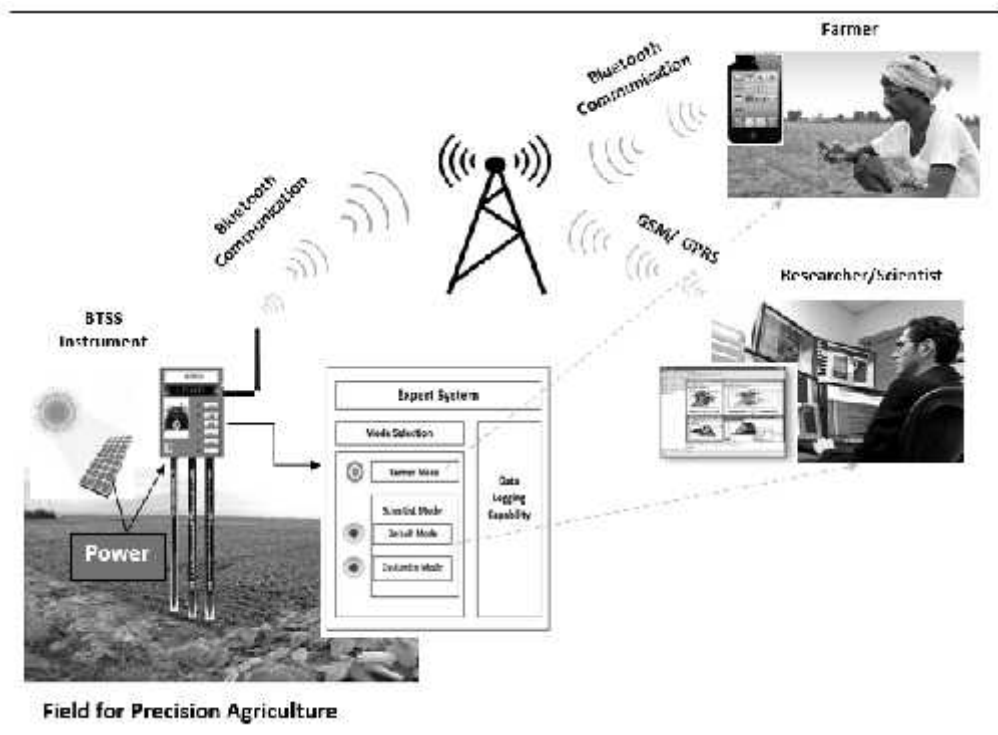


FIG. 2

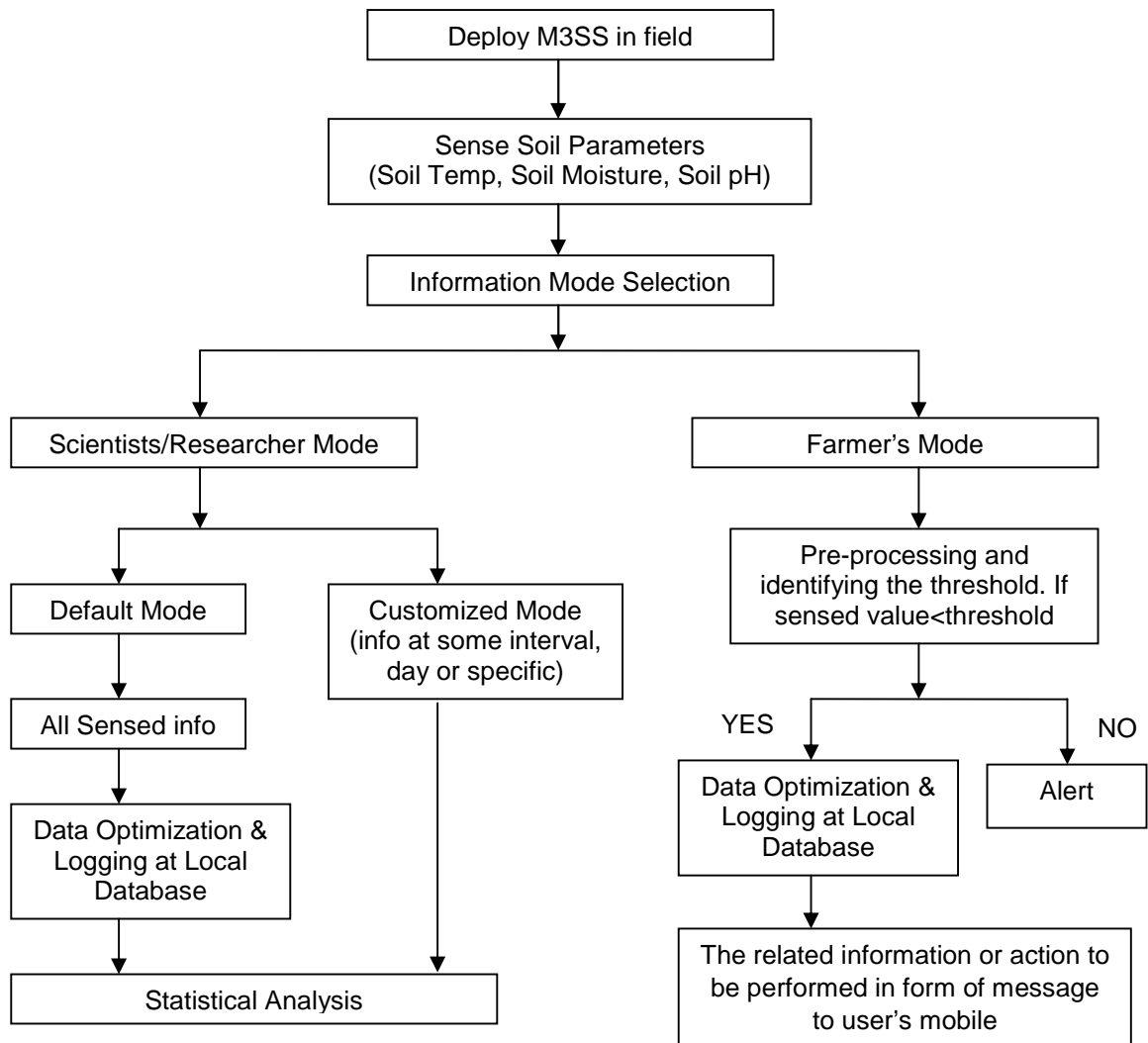


FIG.3

FORM 3
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See section 8; rule 12)

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of Kashmere Gate, New Delhi-110006, India, hereby declare:

- (i) that we have not made any application for the same/substantially the same invention outside India.

- (ii) that the rights in the application(s) has/have been assigned to none.

that we undertake that up to the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within three months from the dates of filing of such applications.

Dated this 17th day of **January 2015**

Name: **RASHMI TYAGI**
(IN/PA-1594)
AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office,
Intellectual Property Office Building,
Plot No. 32, Sector 14, Dwarka,
New Delhi-110075

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION
(Section 10 & Rule 13)

**“SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING
SYSTEM”**

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

INDIAN

Kashmere Gate, New Delhi-110006, India

The following specification describes the invention.

5 **FIELD OF THE INVENTION**

The present invention relates to a system and method for remote monitoring of multiple soil parameters in real-time. More particularly, the invention relates to soil sensing using multi mode, multi parameters and multi communication (M3SS) technology for remote monitoring of multiple soil parameters in real-time and providing alert to user for critical conditions and provides the necessary information about the soil to researchers.

BACKGROUND OF THE INVENTION

Majority of the prior art devices or instruments measures either of any one soil parameter such as soil temperature, moisture soil electrical conductivity (EC) & pH any two. Further these instruments for measurement of soil moisture and temperature provides the data in analogue form and only few gives digital data. Also, most of available soil pH meters are electrode based and provides the data in analogue form and only few gives digital output. The existing systems operate only in one mode and mostly have no provision for multi mode communication with user friendly mobile app.

Thus there is a need for a system which can overcome the disadvantages of prior art. Therefore, in present invention a system & method for remote monitoring in real-time of multiple soil parameters is provided that will operate in two different modes to facilitate the researchers and farmers specific requirements. The system of present invention is integrated & compact for monitoring various soil parameters and has potential application in field of precision agriculture and research with IoT.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

FIG. 1 illustrates a system block diagram according to the preferred embodiment of the present invention;

5 FIG. 2 illustrates architecture of M3SS according to the preferred embodiment of the present invention;

FIG. 3 illustrates a flow-diagram of M3SS work flow according to the preferred embodiment of the present invention.

10

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

15 The present invention provides a system for remote and real-time monitoring of location specific parameters such as soil moisture, soil temperature, soil pH, Soil EC, ambient temperature, light and water Level. The system of present invention is a cost effective integrated solution to the farmers or scientists or researchers for precision agriculture or horticulture communicating in multiple ways.

20 The system of present invention is solar-powered and employs low cost processor and multi-sensors that can sense all major soil elements such as soil pH, soil temperature, Soil EC and soil moisture which plays an important role in crop growth. Other parameters that can also be sensed by the system of present invention are environment temperature, light and on field water level.

25

The system of the present invention comprises of following components:

a. **Soil Sensors:** This unit consists of sensors that can sense soil moisture, temperature, Soil EC and pH value. It also consists of elements that can measure the environmental temperature and light. These sensors when inserted into the field, sense the moisture, temperature, Soil EC and pH of the soil simultaneously and the sensed information is measured as raw voltage which needs further processing to display the resultant as desired by the user.

35 b. The next major component of the M3SS is soil parameters remote monitoring & alerting system. Its computing environment consists of the low cost, small size microcontroller based SoC that receives the analog raw voltage as sensed by the sensors and converts it into digital form

5 with on board analog to digital converter. The information in digital form
is further processed for sending the processed information to display unit
for display of same on LCD or TFT. The computing environment also
consists of an application software that does the necessary processing
for calibration, conversion of raw data into meaningful information,
10 storage of data into main memory etc. It is the most critical and integral
part of present system. The system of present invention operates in two
modes i.e. scientist/researcher mode and farmer mode where:

15 • **Farmer Mode:** Farmer will get necessary information and various
alerts about the soil for necessary action.

• **Scientist/researcher Mode:** Comprises of default and
customized information mode where depending upon the
requirement either entire sensed information or the data at
various intervals of time in a specific day, time can be captured
20 transmitted wirelessly through mobile App or direct transfer
through USB.

c. The third component is the main memory that stores the processed data
into its data storage with some lightweight database.

25 d. In order to transfer the processed information to the end user situated at
a remote location, there is a communication mechanism, which
communicates over Bluetooth (BT) and GSM communication technology
with Mobile App wirelessly and through USB interface for direct transfer
30 as per need.

e. Another important component of present system is the energy or power
source that is a solar panel in the product. The solar panel makes the
product a standalone system.

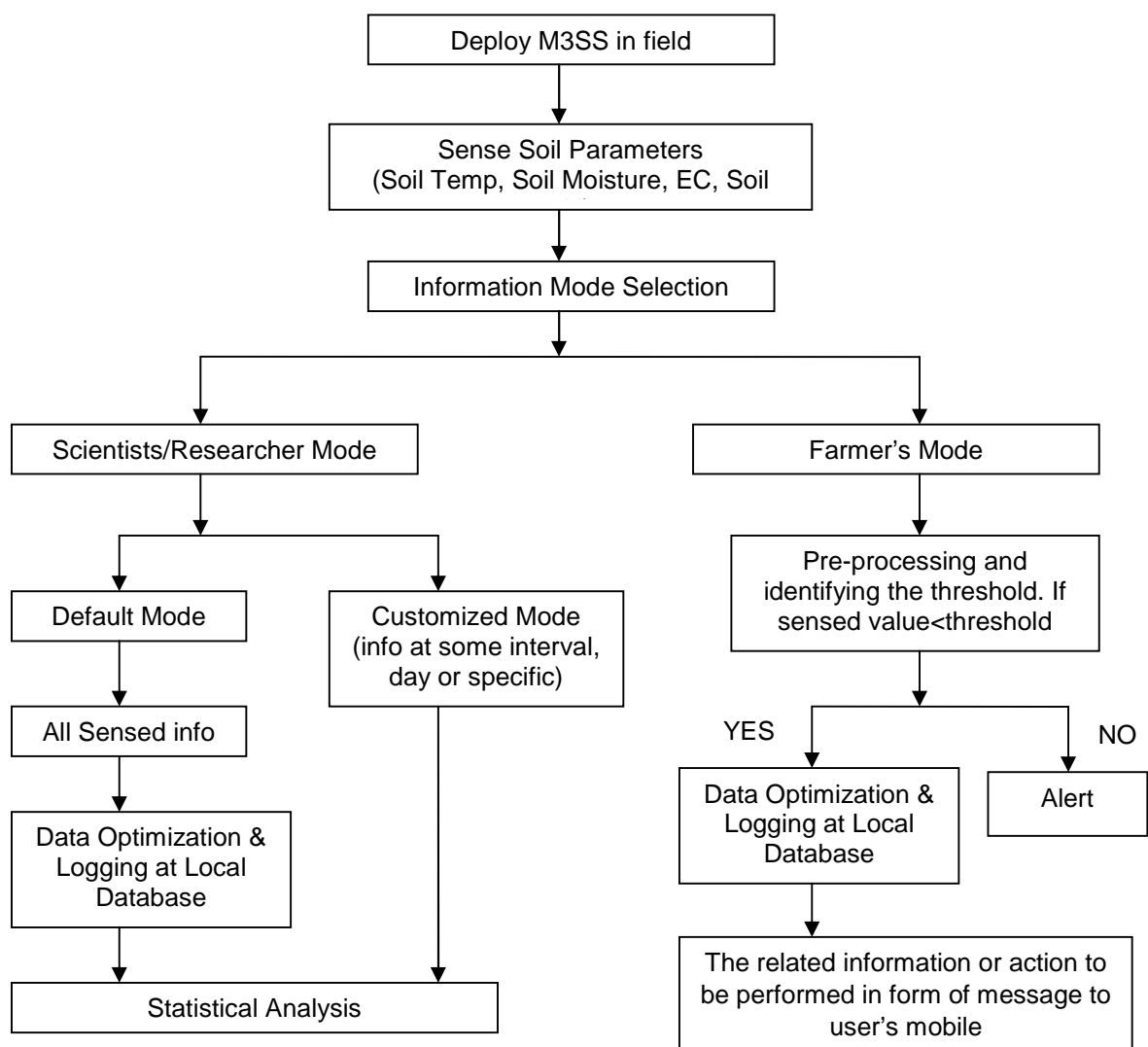
35 f. M3SS provides user friendly mobile application for remote monitoring
controlling and collecting the soil data for further analysis and necessary
action.

5 **The system of present invention which monitors various soil parameters remotely and provides alerts to user for critical condition offers the following advantages:**

- It is a low cost solution for measurement of the soil parameters remotely in real-time.
- 10
- It is a compact Solar powered standalone system which integrates various sensing elements or sensors to continuously and remotely monitor key soil elements such as soil moisture, soil temperature, soil pH, ambient temperature, light and water level required for precision agriculture.
- 15
- It is suited for all weather conditions and operates in two different modes to meet the requirements of the farmers and the researchers as well.
- 20
- The system provides real-time data logging for storing and retrieving various soil parameters and also has provision for setting schedules of soil data acquisition.
- 25
- The system provides user with alerts for critical conditions and on threshold breach.
- It also provides user to easily access acquired data, data storage and further processing through Mobile App user interface.

SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING SYSTEM

The present invention provides a system and method for real-time monitoring of soil parameters and alerting for critical conditions. The system includes multiple sensors for detection of key soil parameters such as temperature, moisture, EC and soil pH simultaneously, a processing unit for processing of raw data received from sensors and providing results in digital form which is transmitted through wireless media (Bluetooth/GSM) to end user or to a remote monitoring data logging server. The server keeps the record of all data received and alert farmer and/or scientist about the current status of soil parameters.



ABSTRACT
SOIL MULTI-PARAMETERS REMOTE MONITORING AND ALERTING
SYSTEM

The present invention provides a system (100) and method for real-time remote monitoring of multiple soil parameters and alerting for critical conditions. The system includes a soil sensor network (104) comprising multiple sensor nodes at the landscape site for detection of key soil parameters such as temperature, moisture, EC and soil pH simultaneously, a soil sense unit (200) for processing of raw data received from sensor nodes and providing results in digital form which is displayed on a screen (205) and transmitted through a wireless media (Bluetooth/GSM/ZigBee) to end user or to a remote monitoring data logging server (104). The server (104) keeps the record of all data received and sends information about present status of the site and also an alert for critical conditions to the user upon breach of predefined threshold value.



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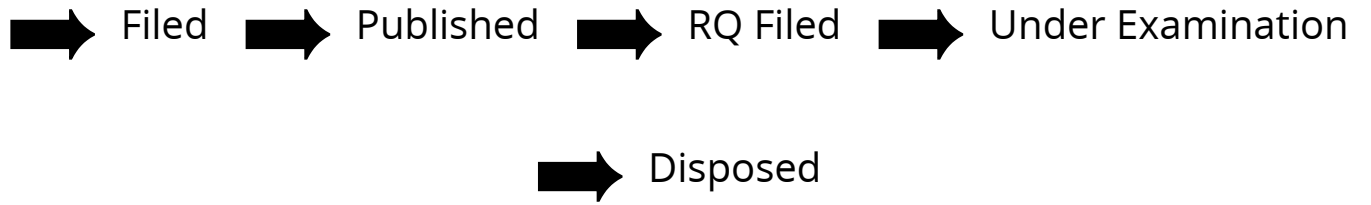
Application Details

APPLICATION NUMBER	249/DEL/2015
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	28/01/2015
APPLICANT NAME	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
TITLE OF INVENTION	"A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMART PHONE"
FIELD OF INVENTION	COMPUTER SCIENCE
E-MAIL (As Per Record)	rashmi@elpisinnovation.com
ADDITIONAL-EMAIL (As Per Record)	rashmi@elpisinnovation.com
E-MAIL (UPDATED Online)	rashmi.tyagi@hotmail.com
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	27/09/2016
PUBLICATION DATE (U/S 11A)	19/08/2016
REPLY TO FER DATE	13/09/2020

Application Status

APPLICATION STATUS	Reply Filed. Application in amended examination
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In case of any discrepancy in status, kindly contact ipo-helpdesk@nic.in

5 **We Claim:**

1. A system (100) for creating customizable mobile device for learning and development comprising:

a memory database (102);

10 a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101);

an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102)

15 consisting plurality of multi-input/output interface different from each other, wherein the interface unit comprises

-an application program interface (103);

-an external memory communication interface (105)

-a multiple sensors communication interface (106);

20 -a network communication interface (107); and

-a universal communication interface (104).

2. The system (100) as claimed in claim 1, wherein the application program interface (103) is customizable to select one or more application
25 specific operating system environments.

3. The system (100) as claimed in claim 1, wherein memory interface (105) provides communication to high speed memory devices.

30 4. The system (100) as claimed in claim 1, wherein sensors communication interface (106) provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity sensor, accelerometer sensor, gyroscope, light sensor, GPS, and fingerprint
35 sensors.

5

5. The system (100) as claimed in claim 1, wherein the universal communication interface (104) provides communication to plurality of input/output devices selected from the group consisting of touch screen, display, keyboard, speaker, microphone and camera.

10

6. The system (100) as claimed in claim 1, wherein the network communication interface (107) provides communication with one or more communication technology selected from the group consisting of Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

15

Dated this 28th day of January, 2016



RASHMI TYAGI
IN/PA-1594
AGENT FOR APPLICANT

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND
HARDWARE INTERFACES OF SMARTPHONE”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
Kashmere Gate, New Delhi-110006, India**

The following specification describes the invention and the manner in which it is to be performed.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of smartphone development. More particularly, the invention relates to a method and system for enabling a unified platform capable of customizing hardware and operating system for building smartphone.

10

BACKGROUND OF THE INVENTION

There exists today a wide variety of small, typically handheld, electronic appliances known generally as mobile internet devices or smartphones. In the current state of the art, all such devices are designed by their manufacturers to include a variety of hardware capabilities to address as many potential end users as possible. Similarly, manufacturers determine the form factor, that is, the size, shape, weight, color, and other physical attributes, of each product, with the goal to satisfy the greatest possible number of users with the fewest specific combinations. Finally, manufacturers configure the operating software of their devices to provide a variety of functions such that a particular function or related group of functions is performed in exactly the same way on as many device models as possible.

25 The practice of limiting the number of hardware and software combinations benefits the device manufacturers by reducing the complexity of the various systems and procedures they use for product development, manufacturing, sales, and customer support. However, current and emerging mobile devices provide a great deal of programmability through the provision of software applications, or “apps”. These apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device.

5 Further, add-on software apps inherently cannot offer any ability to change
the specific hardware built into a mobile device. While most mobile devices
provide connectors and slots for adding or connecting hardware modules
that provide optional capabilities, and coupled with software apps these
hardware add-ons can be quite sophisticated, here too this practice is
10 limited to adding modules that aren't in the base device.

Finally, neither add-on software apps nor plug-in hardware modules offer
any ability to change the form factor of a device completely. End users
with a variety of special needs are generally left unsatisfied by the
15 available options.

Further, other development kits available allows to customize, create
and/or modify either software or hardware so as to make the device
compatible for any new feature or to develop an improved product. What is
20 needed, then, is system where end users or others acting on behalf of a
group of end users may create personal or custom configurations of
mobile devices or modify an existing one.

Accordingly, it would be advantageous to have an improved development
25 system for experimenting with every concept of mobile computing so as to
build and innovate new products.

Thus, considering all these facts the present invention provides an
integrated development system having improved flexibility, reduced cost,
30 and reduced associated workload that facilitates the user or others for
improved optimization, greater configurability and customization of both
hardware and software components.

SUMMARY

An object of the present invention provides a system for creating
35 customizable mobile device for learning and development comprising, a

5 memory database, a processing unit coupled to the memory database
storing therein one or more instructions to be executed by the processing
unit, an interfacing unit operatively coupled to processing unit to perform
plurality of input/output functions simultaneously based on one or more
instructions stored in the memory database, the interface unit comprising
10 plurality of multi-input/output interface different from each other, wherein
the interface unit further comprises an application program interface, an
external memory communication interface, a multiple sensors
communication interface, a network communication interface and a
universal communication interface.

15

Another object of the present invention provides a system for creating
customizable mobile device for learning and development comprising, a
memory database, a processing unit operatively coupled to memory
database for executing one or more instruction stored therein and a multi-
20 input/output interface for providing communication with one or more
smartphone operating system, network communication technology,
sensors and I/O devices.

A further object of the present invention provides a system which allows
25 the user to create any application or choose the already created
experiments from the provided list to run and test the concepts for
necessary understanding and analysis specific to the mobile computing,
embedded systems, sensor interfacing and wired/wireless communication
protocols.

30

Another object of the present invention provides a system for performing
several experiments to demonstrate the concepts in real environment
related to such as but not limited to language C & Python programming,
socket & shell programming, sensor networks, mobile communication,
35 databases, embedded systems, etc. and manual or in book or CD form

- 5 “How to create the experiments with step by step procedure” as an unified integrated solution. A web based add-on complimentary material or projects are also provided online free of cost to users.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

FIG. 1 illustrates basic architecture and various components of development system according to a preferred embodiment of the present invention;
15

FIG. 2 illustrates primary components layout of development system according to a preferred embodiment of the present invention;

20

FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention;

FIG. 4 illustrates booting process sequence diagram of development system according to a preferred embodiment of the present invention.
25

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only
10 provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a mobile device, smartphone development
15 system for real-time designing, interfacing & programming of the various components of smartphone. The system of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating
20 software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof.

The development system of present invention includes real hardware, software, sensing and communicating components to build a smartphone.
25 Thus it provides three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

30 Accordingly, the system of present invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera, Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only
35 provides the freedom to modify, customize and create operating system,

5 hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART, USB, SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

10 FIG. 1 illustrates architecture block diagram of system according to a preferred embodiment of the present invention. The system (100) includes a processing unit (101), a memory database (102) and interface unit (not shown) of processing unit which couples the processor with and/or to the various communication interface such as I/O interface (104), memory
15 interface (105), sensory interface (106), communication interface (107) and Application/OS interface (103).

According to an embodiment of present invention the processing unit (101) is a computing platform to perform all customized operation, which
20 comprises a processor and an interface unit for communication with plurality of application specific communication interface. The processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and
25 Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

30 The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as
35 SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106)

5 provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

10

In an embodiment of present invention a customized mobile device or smartphone is provided in which one or more hardware element and/or software element can be selected according to user need to create a new smartphone device, application software and testing environment for further development.

15

FIG. 2 illustrates layout of primary components of development system according to a preferred embodiment of the present invention. Here the figure illustrates different hardware component used in the development of platform of present invention. However, the scope of present invention is not limited to these only. The detailed description of each component and its functioning is explained later in the specification.

20

FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention. The system of present invention runs on a highly customizable operating system (MyOS) allowing integration of multiple hardware component and software component into a single platform. The system (300) consists of hardware element (301), which runs on MyOS operating system. The MyOS operating system is specifically designed for a unified platform capable of customizing hardware and operating system for building smartphone. When system is switched ON, hardware (301) memory is booted with operating system (MyOS) and input/output (303) interface with one or more user selected sensors (304) and communication technology (305) creates a customized

25

30

5 phone environment for user applications (306) development and execution.

The development system of the present invention is low cost and open source solution for users, students, faculty and developers to experiment and innovate new designs, products and solutions for education, entertainment, agriculture and health application and offers following advantages:

- 15 • Provides unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS and Application software.
- Allows operating system customization for the kernel porting and specific requirement.
- Uses Python as a preferred programming environment to integrate both hardware, operating system, and the application.
- 20 • Acts as an integrated solution for sensor interfacing, programming and mobile application development through open source tools and technologies.
- Provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

According to an embodiment of present invention the mobile device or smartphone development system of the present invention comprises primarily of following components:

The one or more hardware components used in the system are described herein:

- a) Computing Platform: Raspberry Pi(R-Pi) is being used as a preferred computing platform. It uses the Broadcom SoC with ARM11 processor and operates at 700 MHz. It is widely used low

5 cost platform for various product design and developments presently.

b) Camera Module: This module can be used to take high definition video, as well as stills photographs with options like time-lapse, 10 slow motion and video cleverness. It is a five mega pixel fixed focus camera that supports 1080p30, 720p60 and VGA90 video modes as well as still captures.

c) Touch Screen: It features a 2.8" display with 320x240, 16-bit color 15 pixels and a resistive touch overlay. The plate uses the high speed SPI interface and can use the mini display as a console for displaying text, images or video etc.

d) Sensors: Various sensors such as temperature, humidity, 20 accelerometer, smoke & pulse sensor are integrated with R-Pi.

The communication technology supported by present system may comprise following network communication modules:

a) GSM: GSM (Global System for Mobile communications) is an 25 open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time- 30 slots.

b) Bluetooth: Class-2 Bluetooth module with Serial Port Profile, which can be configured as either Master or Slave, a drop-in replacement for wired serial connections.

35

- 5 c) GPS: It provides the real time position information in NMEA format. This data includes the complete PVT (position, velocity, time) solution computed by the GPS receiver.
- 10 d) ZigBee: ZigBee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios based on an IEEE 802.15.4 standard.
- 15 e) Wi-Fi: It is wireless LAN based on IEEE 802.11 standard that allows an electronic device to inter networking using 2.4 GHz UHF and 5 GHz SHF ISM radio bands.

The application software component supported by present mobile device development platform comprises:

- 20 a) MyOS: To meet the user requirements standard embedded Linux kernel is optimized and configured for the intended hardware and software, to get new functionalities and to test new features as per application specific requirements. The MyOS is configured for platform application however it can be recompiled, customized and
- 25 ported into the platform for a specific requirement.
- b) Set of application programs and projects are created to experiment the concepts of various subjects as mentioned earlier.

30 The present invention accordingly provides a universal development system for experimenting the concepts of mobile computing, embedded systems, communication protocols and networks, sensors, interfacing peripherals as an integrated solution.

35 The system architecture of the present invention primarily consists of:

5 (a) OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size.

(b) Hardware interfacing as per user requirement that include application specific sensors, actuators, MIC, speaker, buzzer,
10 camera, display, user interface, communication module, vibrators, I/O memory or SD card extension etc.

(c) Programming for mobile system design or for mobile application programming (app development) using python.

15

According to an embodiment of the present invention on power-on development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors,
20 communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

25 FIG. 4 illustrates a booting process sequence diagram of development system according to a preferred embodiment of the present invention. The process starts at step (401), when system is switched ON, at the time of initialization, customized operating system (MyOS) gets loaded from card memory into RAM at step (402). This enables loading of the kernel of customized operating system (MyOS) in to the memory that consists of
30 integrated development environment (IDE) for application development.

In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A
35 single element or other unit may fulfill the functions of several items recited

5 in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

The present invention can be implemented in any convenient form, for
10 example using dedicated hardware, or a mixture of dedicated hardware and software. The present invention may be implemented as computer software implemented by one or more networked processing apparatuses. The network can comprise any conventional terrestrial or wireless communications network, such as the Internet. The processing
15 apparatuses can comprise any suitably programmed apparatuses such as a general purpose computer, personal digital assistant, mobile telephone (such as a Wireless Application Protocol (WAP) or 3G-compliant phone) and so on. Since the present invention can be implemented as software, each and every aspect of the present invention
20 thus encompasses computer software implementable on a programmable device.

The computer software can be provided to the programmable device using any storage medium or carrier medium for storing processor readable
25 code such as a flexible disk, a compact disk read only memory (CD-ROM), a digital versatile disk read only memory (DVD-ROM), DVD recording only/rewritable (DVD-R/RW), electrically erasable and programmable read only memory (EEPROM), erasable programmable read only memory (EPROM), a memory card or stick such as USB memory, a memory chip,
30 a mini disk (MD), a magneto optical disc (MO), magnetic tape, a hard disk in a server, a solid state memory device or the like, but not limited to these.

The hardware platform includes any desired kind of hardware resources
35 including, for example, a central processing unit (CPU), a random access

5 memory (RAM), and a hard disk drive (HDD). The CPU may be implemented by any desired kind of any desired number of processor. The RAM may be implemented by any desired kind of volatile or non-volatile memory. The HDD may be implemented by any desired kind of non-volatile memory capable of storing a large amount of data. The hardware
10 resources may additionally include an input device, an output device, or a network device, depending on the type of the apparatus. Alternatively, the HDD may be provided outside of the apparatus as long as the HDD is accessible. In this example, the CPU, such as a cache memory of the CPU, and the RAM may function as a physical memory or a primary
15 memory of the apparatus, while the HDD may function as a secondary memory of the apparatus.

In the above-described example embodiment, a computing environment can be created using a computer used with a computer-readable program,
20 described by object-oriented programming languages such as C++, Java (registered trademark), JavaScript (registered trademark), Perl, Ruby, Python or legacy programming languages such as machine language, assembler language to control functional units used for the apparatus or system. For example, a particular computer (e.g., personal computer, work
25 station) may control information processing apparatus or an image processing apparatus using a computer-readable program, which can execute the above-described processes or steps. In the above described embodiments, at least one or more of the units of apparatus can be implemented in hardware or as a combination of hardware/software
30 combination. In example embodiment, processing units, computing units, or controllers can be configured using various types of processors, circuits, processing devices, processing circuits or the like such as a programmed processor, a circuit, an application specific integrated circuit (ASIC), used singly or in combination. A circuit is a structural assemblage of electronic
35 components including conventional circuit elements, integrated circuits

5 including application specific integrated circuits, standard integrated
circuits, application specific standard products, and field programmable
gate arrays. Further, a circuit includes central processing units, graphics
processing units, and microprocessors, which are programmed or
configured according to software code. A circuit does not include pure
10 software, although a circuit does include the above-described hardware
executing software.

In the present invention all references related to mobile device may be
assumed as mobile phone, smartphone, phone device, tablets, portable
15 device and computing device and may be used interchangeably. Further,
terms like “system” and “platform” are used interchangeably and
synonymously throughout this document.

Numerous additional modifications and variations are possible in light of
20 the above teachings. It is therefore to be understood that within the scope
of the appended claims, the disclosure of the present invention may be
practiced otherwise than as specifically described herein. For example,
elements and/or features of different examples and illustrative
embodiments may be combined each other and/or substituted for each
25 other within the scope of this disclosure and appended claims.

5 **We Claim:**

1. A system (100) for creating customizable mobile device for learning and development comprising:

a memory database (102);

10 a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101);

an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102)

15 consisting plurality of multi-input/output interface different from each other, wherein the interface unit comprises

-an application program interface (103);

-an external memory communication interface (105)

-a multiple sensors communication interface (106);

20 -a network communication interface (107); and

-a universal communication interface (104).

2. The system (100) as claimed in claim 1, wherein the application program interface (103) is customizable to select one or more application
25 specific operating system environments.

3. The system (100) as claimed in claim 1, wherein memory interface (105) provides communication to high speed memory devices.

30 4. The system (100) as claimed in claim 1, wherein sensors communication interface (106) provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity sensor, accelerometer sensor, gyroscope, light sensor, GPS, and fingerprint
35 sensors.

5

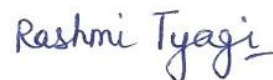
5. The system (100) as claimed in claim 1, wherein the universal communication interface (104) provides communication to plurality of input/output devices selected from the group consisting of touch screen, display, keyboard, speaker, microphone and camera.

10

6. The system (100) as claimed in claim 1, wherein the network communication interface (107) provides communication with one or more communication technology selected from the group consisting of Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

15

Dated this 28th day of January, 2016

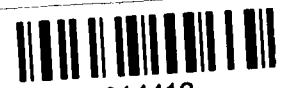


RASHMI TYAGI
IN/PA-1594
AGENT FOR APPLICANT

ABSTRACT

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMARTPHONE

The present invention relates to a system (100) and method providing a unified platform for real time programming, designing and customizing smartphone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform (100) includes a processing unit (101) for controlling and managing the operation of one or more interface controllers. The one or more interface controller comprise memory interface (105), communication interface (107), input/output interface (104), sensor interface (106), application programming interface (103) for application programming and operating system customization.



314412

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7, 54 & 135 and rule 20(1)]		(FOR OFFICE USE ONLY)																																	
		Application No:																																	
		Filing Date:																																	
		Amount of Fee Paid:																																	
		CBR No:																																	
		Signature:																																	
1. APPLICANT(S)																																			
<table border="1"><thead><tr><th>Name</th><th>Nationality</th><th colspan="2">Address</th></tr></thead><tbody><tr><td>INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN</td><td>Indian</td><td colspan="2">Kashmere Gate, New Delhi-110006, India</td></tr></tbody></table>				Name	Nationality	Address		INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN	Indian	Kashmere Gate, New Delhi-110006, India																									
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2. INVENTOR(S)																																			
<table border="1"><thead><tr><th>Name</th><th>Nationality</th><th colspan="2">Address</th></tr></thead><tbody><tr><td>REDDY, S. Ramanarayana</td><td>Indian</td><td colspan="2">HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr><tr><td>CHANDE, Suresh</td><td>Indian</td><td colspan="2">Finland</td></tr><tr><td>AGARWAL, Nidhi</td><td>Indian</td><td colspan="2">Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr><tr><td>KUMAR, Sanjay</td><td>Indian</td><td colspan="2">Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr><tr><td>MISHRA, Narendra</td><td>Indian</td><td colspan="2">Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr><tr><td>KUMAR, Pardeep</td><td>Indian</td><td colspan="2">Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr><tr><td>KAUR, Jasleen</td><td>Indian</td><td colspan="2">Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India</td></tr></tbody></table>				Name	Nationality	Address		REDDY, S. Ramanarayana	Indian	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India		CHANDE, Suresh	Indian	Finland		AGARWAL, Nidhi	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India		KUMAR, Sanjay	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India		MISHRA, Narendra	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India		KUMAR, Pardeep	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India		KAUR, Jasleen	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India	
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KAUR, Jasleen	Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India																																	

IPO DELHI 05-04-2016 16:05

3. TITLE OF THE INVENTION

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMART PHONE

4. ADDRESS FOR CORRESPONDENCE OF AUTHORISED PATENT AGENT IN INDIA

#250, Street No. 06, New Colony Kerhara,
Mohan Nagar, Ghaziabad,
Uttar Pradesh - 201007, India

Mobile No.: +91 9968284766

E-mail: rashmi@elpisinnovation.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
N.A.	N.A.	N.A.	---	---

6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International application number	International filing date as allotted by the receiving office
N.A.	N.A.

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) application number	Date of filing Original (first) application
N.A.	N.A.

8. PARTICULARS FOR FILING PATENT OF ADDITION

Main application/Patent Number	Date of filing of main application
N.A.	N.A.

9. DECLARATIONS:**(i) Declaration by the inventor(s)**

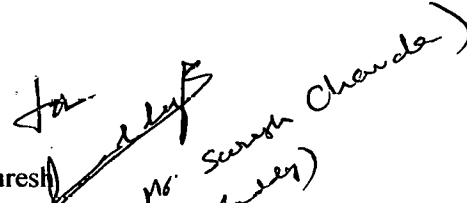
I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: REDDY, S. Ramanarayana

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: CHANDE, Suresh

(d) Date: 28.01.2015

(e) Signature: 

(f) Name: AGARWAL, Nidhi

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KUMAR, Sanjay

(a) Date: 28.01.2015

(b) Signature: 

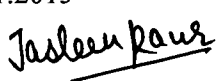
(c) Name: MISHRA, Narendra

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KUMAR, Pardeep

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KAUR, Jasleen

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:

(b) Signature

(c) Name

(iii) Declaration by the applicant(s):

I/we, the applicant(s) hereby declare(s) that:-

- ✓ I am/We are in possession of the above-mentioned invention.
- ✓ The provisional specification relating to the invention is filed with this application.
- ✗ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ✓ There is no lawful ground of objection to the grant of patent to me/us.
- ✓ I am/We are the assignee or legal representative or true & first inventors.
- ✗ The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention.
- ✗ I/We claim the priority from the above mentioned application(s) file in the convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- ✗ My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para – 6.
- ✗ The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed onunder section 16 of the Act.
- ✗ The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

- (a) Form 2 (Provisional Specification) [Total No. of pages: 15; Specification: 10, Drawings: 05]
- (b) General Power of Authority (Copy, for original refer to 156/DEL/2015)

Fee Rs. 8,000/- through **(Credit Card)** online payment gateway on 28.01.2015.

I/We hereby declare that to best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/we request that a patent may be granted to me/us for the said invention.

Dated this 28th day of **January 2015**

Signature: *Rashmi Tyagi*

Name: **RASHMI TYAGI**

(IN/PA-1594)

AGENT FOR THE APPLICANT

To,

The Controller of Patents

The Patent Office,

Intellectual Property Office Building,

Plot No. 32, Sector 14, Dwarka,

New Delhi-110075

FORM 3
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See section 8; rule 12)

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of Kashmere Gate, New Delhi-110006, India, hereby declare:

- (i) that we have not made any application for the same/substantially the same invention outside India.
- (ii) that the rights in the application(s) has/have been assigned to none.

that we undertake that up to the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within three months from the dates of filing of such applications.

Dated this **28th** day of **January 2015**

Rashmi Tyagi

Name: **RASHMI TYAGI**
(IN/PA-1594)
AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office,
Intellectual Property Office Building,
Plot No. 32, Sector 14, Dwarka,
New Delhi-110075

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

**1. NAME OF APPLICANT(S): INDIRA GANDHI DELHI TECHNICAL UNIVERSITY
FOR WOMEN** of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 249/DEL/2015 dated 28.01.2015 are:-

2. INVENTORS(S)

(a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **CHANDE Suresh**
(b) NATIONALITY : Indian
(c) ADDRESS : Finland

(a) NAME : **AGARWAL Nidhi**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **KUMAR Sanjay**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **MISHRA Narendra**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University
for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **KUMAR Pardeep**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University
for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **KAUR Jasleen**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University
for Women, Kashmere Gate, New Delhi-110006, India

Dated this **18th** day of **February, 2016**

Rashmi Tyagi

Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi



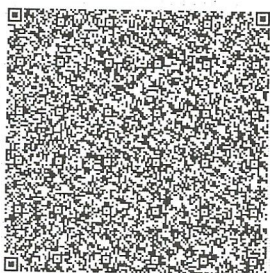
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INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

e-Stamp

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Certificate Issued Date : 12-Jan-2015 12:55 PM
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Original GPA is submitted for Application No. 156/DEL/2015

Rashmi Tyagi

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1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi, (IN/PA-1594) Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007**, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and

We request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

RT: NA-249/DEL/2015

September 13, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF PETITION FOR CONDONING DELAY IN FILING FORM-3

Dear Sir,

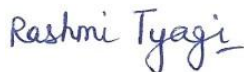
**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 249/DEL/2015
e-Filed: January 28, 2015
Title: A System for Building, Customizing Software and Hardware Interfaces
of Smartphone**

We are submitting herewith petition for condoning delay in filing Form-3 physically at Patent Office. The Applicant has rectified the irregularity occasioned by filing updated Form-3 to overcome objection in FER on 13/09/2020 along with the Petition.

We, therefore, humbly request that irregularity with regard to filing Form-3 may be condoned.

Thanking you,

Sincerely Yours,



**Rashmi Tyagi
IN/PA-1594
Agent for Applicant
250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007**

**Contact: 9968284766
Email: rashmi.tyagi@hotmail.com**

To
The Controller of Patents,
The Patent Office, at New Delhi

RT: NA-249/DEL/2015

September 13, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF PETITION FOR CONDONING DELAY IN FILING FORM-5

Dear Sir,

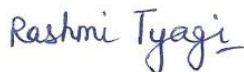
**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 249/DEL/2015
e-Filed: January 28, 2015
Title: A System for Building, Customizing Software and Hardware Interfaces
of Smartphone**

We are submitting herewith petition for condoning delay in filing Form-5 physically at Patent Office. The Applicant has rectified the irregularity occasioned by filing updated Form-5 to overcome objection in FER on 13/09/2020 along with the Petition.

We, therefore, humbly request that irregularity with regard to filing Form-5 may be condoned.

Thanking you,

Sincerely Yours,



**Rashmi Tyagi
IN/PA-1594
Agent for Applicant
250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007**

**Contact: 9968284766
Email: rashmi.tyagi@hotmail.com**

To
The Controller of Patents,
The Patent Office, at New Delhi

RT: NA-249/DEL/2015

September 13, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

**SUB: SUBMISSION OF PETITION FOR CONDONING DELAY IN FILING FORM-1
TOWARDS PROOF OF RIGHT**

Dear Sir,


**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 249/DEL/2015
e-Filed: January 28, 2015
Title: A System for Building, Customizing Software and Hardware Interfaces
of Smartphone**

We are submitting herewith petition for condoning delay in filing Form-1 towards Proof of Right. The Applicant has rectified the irregularity occasioned by filing Form-1 to overcome objection in FER on 13/09/2020 along with the Petition.

We, therefore, humbly request that irregularity with regard to filing Form-1 may be condoned.

Thanking you,

Sincerely Yours,



**Rashmi Tyagi
IN/PA-1594
Agent for Applicant
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**Contact: 9968284766
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To
The Controller of Patents,
The Patent Office, at New Delhi

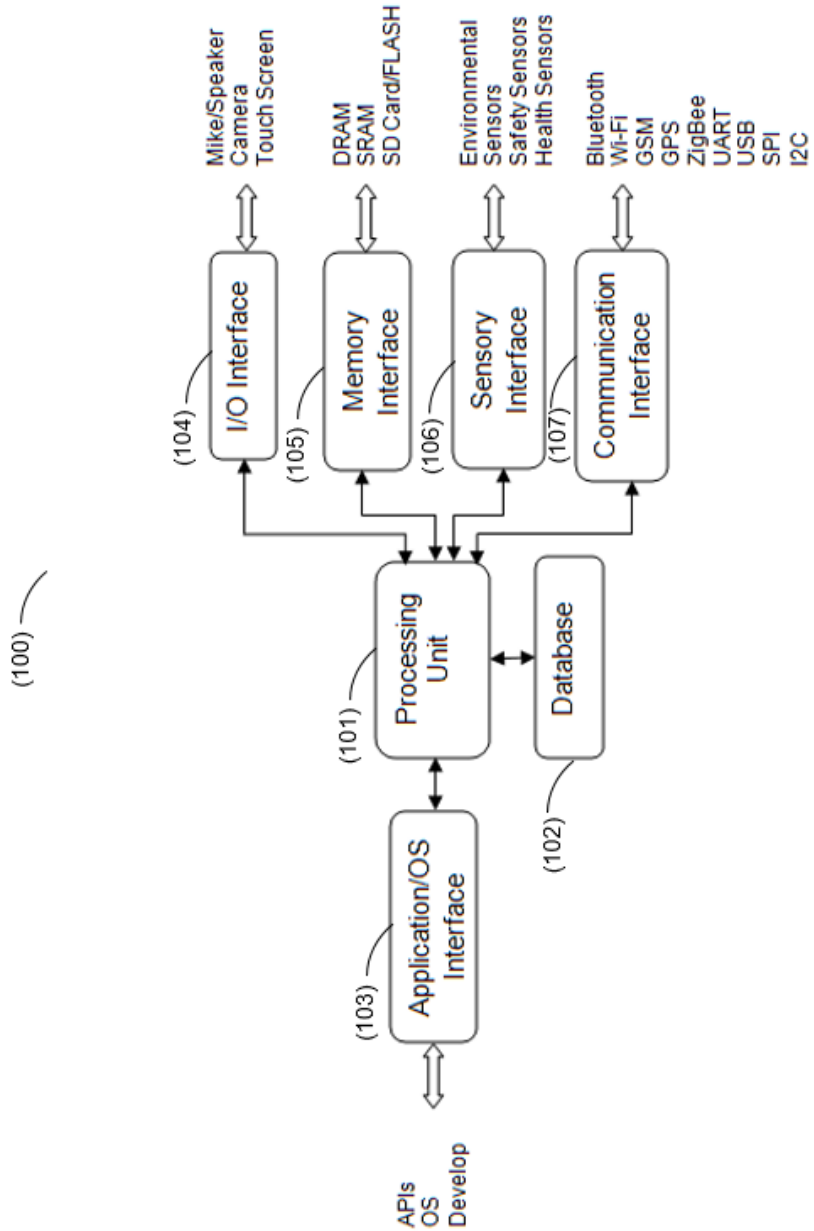


FIG.1

Rashmi Tyagi

RASHMI TYAGI
(IN/PA-1594)
AGENT FOR APPLICANT

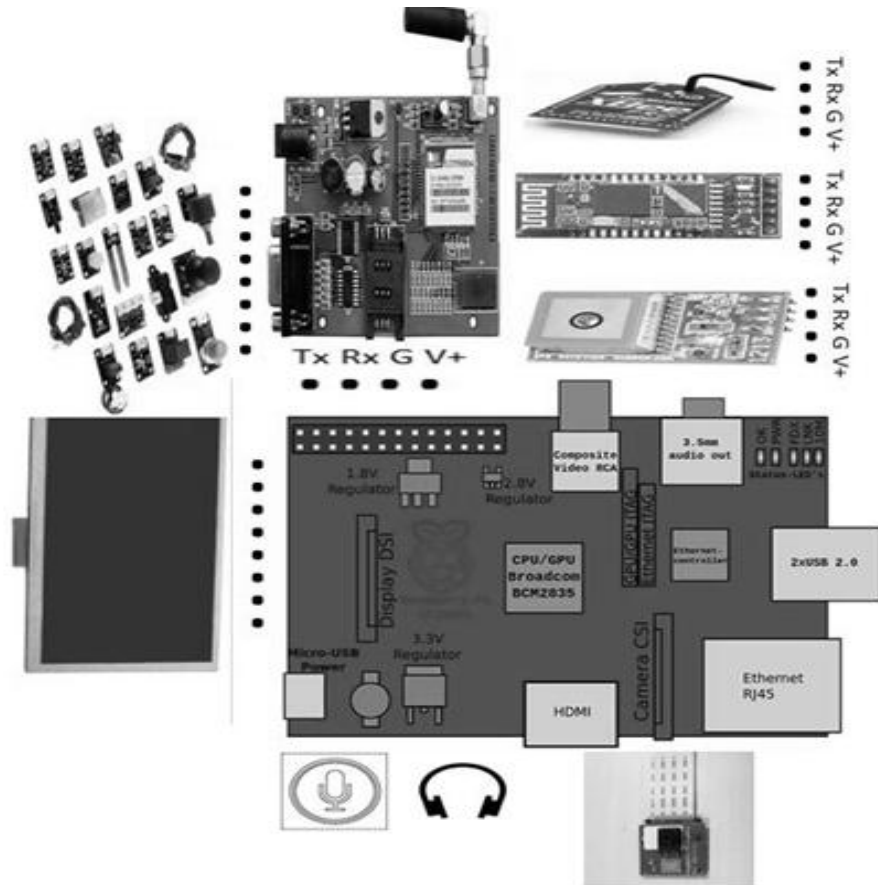


FIG. 2

Rashmi Tyagi

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AGENT FOR APPLICANT

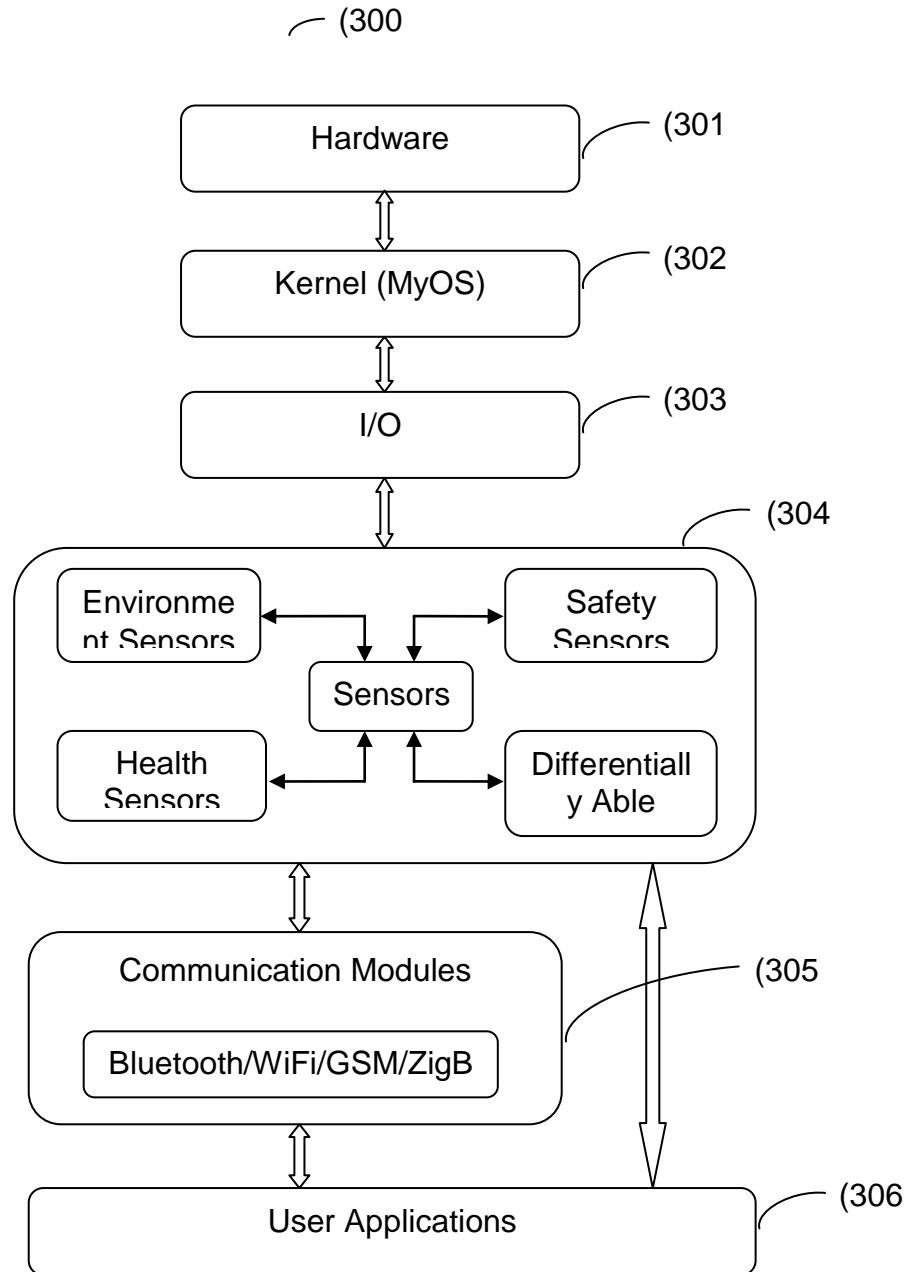


FIG. 3

Rashmi Tyagi

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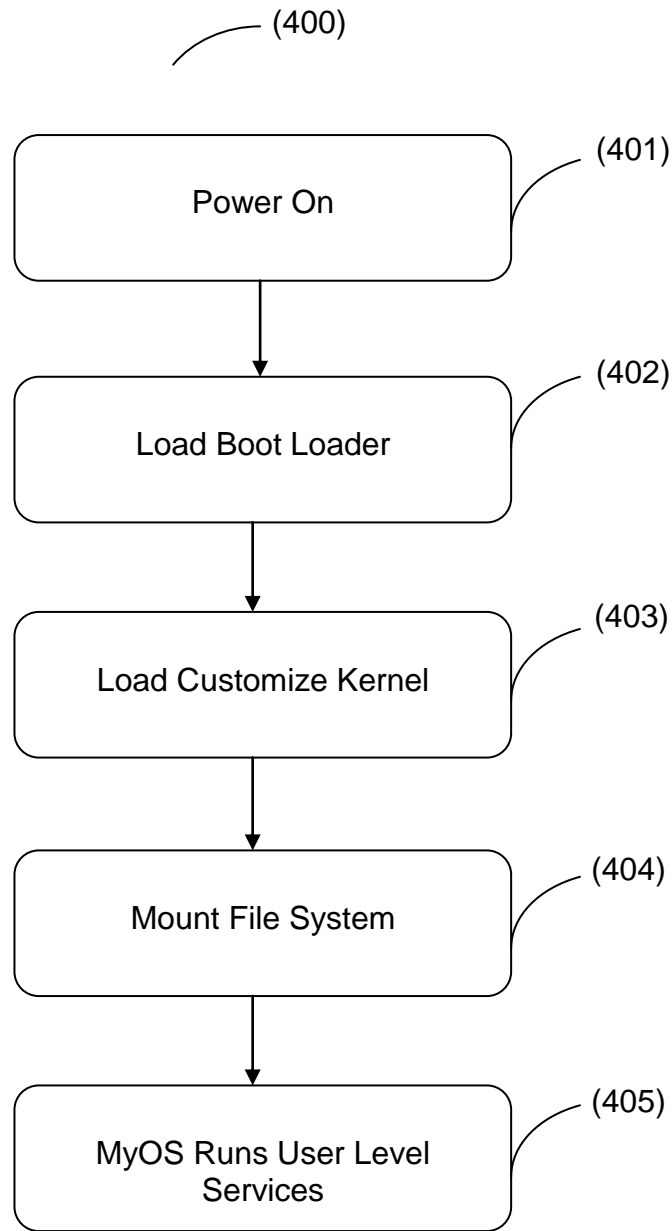


FIG. 4

Rashmi Tyagi

RASHMI TYAGI
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AGENT FOR APPLICANT

Date: 13 September 2020

Our reference: FER/249DEL2015

To
The Controller of Patents
The Patent Office, at New Delhi

Kind attention of: Ms. Anjali
Controller of Patents
Last Date: 13 September 2020

Dear Sir,

Re:

Applicant : Indira Gandhi Delhi Technical University for Women
Application No. : 249/DEL/2015
Filed on : 28 January 2015
Title : A System for Building, Customizing Software and Hardware
Interfaces of Smartphone

This is further to the First Examination Report (FER) issued on 13 March 2020 in respect of the above-mentioned patent application. The Applicant, herein, submits response to all the objections raised in the FER. The last date to put the patent application in order for grant is 13 September 2020.

RESPONSE TO THE FER

Summary of Amendments:

1. Applicant humbly submits that the Originally filed claims 1-7 were pending at the time of receiving the FER. The Applicant has deleted the original claim 7. The Applicant has amended the original claims 1-6. The applicant respectfully submits that the scope of the amended claims 1-6 falls wholly within the scope of the originally filed claims 1-7, and no new subject matter has been added.

The applicant, therefore, respectfully requests the Learned Controller for reconsideration of the present application in view of the forgoing amendments and following remarks.

Part-I

Objection 1: Novelty

The Learned controller has objected the novelty of originally filed claims 1-7 in view of document:

1. D1: US8875095B2

Applicant submits the following submissions with regard to novelty of the claimed invention:

(i) D1 discloses a systems and methods for developing, customizing, and deploying mobile device applications through a mobile application development and deployment platform. Preferably, these systems and methods are implemented in an internet based environment that allows non-technical users to build sophisticated, highly customizable cross-platform mobile applications whereas in proposed invention a system or a platform is provided for creating customizable mobile device for learning and development. The system of present invention is for real-time designing, interfacing & programming of the various components of smartphone. The system of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof. Further, the system of present invention includes real hardware as well as software, sensing and communicating components to build a smartphone. Thus it provides three dimensional freedom to end users and others to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs. Hence it is novel in view of cited document D1.

(ii) According to D1 a platform is provided that allows for a high degree of customizability and allows users to create sophisticated application through the customization and combination of various components, such as app-types, modules, content elements, and templates that can access features of various mobile devices and mobile operating systems. Thus D1 is specific to development of customized mobile applications whereas the system of proposed invention integrates the design & development of customizable handheld smart devices. The system of proposed invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera,

Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material as a complete integrated solution.

(iii) According to D1 the platform allows users to select, input, create, customize, and combine various content, design characteristics, and application components, such as modules, some of which utilize features and functionality associated with various mobile devices and mobile operating systems whereas the system of proposed invention comprises a memory database, a processing unit coupled to the memory database and an interfacing unit. The interface unit also comprises plurality of multi-input/output interface different from each other, an application program interface, an external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface. Thus, through said interfaces of proposed invention a user customize and configure hardware & software of a mobile device. Hence the system of proposed invention is novel in view of cited art.

(iv) In the system of D1 server **200** hosts, operates and/or provides access to a mobile development service which can be accessed by various developers, such as non-technical users, application designers or software developers and/or any other types of users who desire to build and/or deploy a mobile app. In certain embodiments, the mobile development service may be in the form of a software development environment running on server 200. In certain other embodiments, the mobile development service may be any suitable form of hardware, software or a combination of hardware and software that allows developers to create, modify and/or deploy mobile apps. In certain of these embodiments, developers may access server computer **200** through developer computer **100**, as depicted in FIG. 1. Developer computer **100** may be a personal computer, laptop, tablet PC, mobile device or any other suitable computer hardware and/or software that is capable of communicating with, and/or providing developers with access to, server **200** whereas in the proposed invention the processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation. The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory

interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106) provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

(v) Further, according to D1 the platform allows users to compile, and generate a configuration file for, the mobile application that can be distributed to end users for execution on various mobile devices and mobile operating systems. When the mobile application is installed on, or executed by the mobile device, the configuration file may enable the retrieval of various data associated with the mobile application whereas in the proposed invention a customized mobile device or smartphone is provided in which one or more hardware element and/or software element can be selected according to user need to create a new smartphone device, application software and testing environment for further development.

Accordingly, it is respectfully stated that the cited prior art does not teaches about customization of a mobile device or a smartphone development system for real-time designing, interfacing & programming of the various components of smartphone. Also the use of the system as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating software packages, and applications by incorporation or customization of existing items or components thereof is nowhere disclosed. Thus the system of present invention for creating customizable mobile device for learning and development is novel.

Objection 2: Inventive Step

The Learned controller has objected the inventive merit of originally filed claims 1-7 in view of document:

D2: US8719781B2;

D3: US8694968B2

Applicant Submission:

It is well settled that in determining the differences between the prior art and the claims, the question under is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. To this end, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.

Furthermore, to establish a prima facie case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation to modify the reference or to combine reference teachings; (2) there must be reasonable expectation of success; and (3) the prior art reference must teach or suggest all the claim limitations. Thus, Applicant respectfully traverses the rejection because the approach disclosed in D2-D3 and approach claimed in the instant application is not only different, but portions of D2-D3 upon which the Learned Controller relied do not render the claimed invention render obvious.

Claim 1 recites:

1. A system (100) for creating customizable mobile device for learning and development comprising:

a memory database (102);

a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101);

an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102) consisting plurality of multi-input/output interface different from each other, wherein the interface unit comprises

-an application program interface (103);

-an external memory communication interface (105)

-a multiple sensors communication interface (106);

-a network communication interface (107); and

-a universal communication interface (104).

Applicant submits the following submissions with regard to inventiveness of the claimed invention:

(i) D2 discloses a universal and adaptive software development platform for data-driven applications and a method of developing a software application configured to run on a

computing device in an adaptive fashion and independent of operating system, database system, and presentation medium whereas the proposed invention provides a system for creating a customizable mobile device including customization of both hardware and software components for learning and development. Further the system allows the user to create any application or choose the already created experiments from the provided list to run and test the concepts for necessary understanding and analysis specific to the mobile computing, embedded systems, sensor interfacing and wired/wireless communication protocols. Furthermore, the proposed invention provides a system for performing several experiments to demonstrate the concepts in real environment related to such as but not limited to language C & Python programming, socket & shell programming, sensor networks, mobile communication, databases, embedded systems, etc. Thus, unlike D2 the proposed invention provides a mobile device or smartphone development system for real-time designing, interfacing & programming of the various components of smartphone.

(ii) D2 comprises the steps of using an operating system-independent computer programming language to create the software application comprised of one or more modules; using a persistence layer in the software application abstracting access to a database residing on a physical storage medium wherein the persistence layer abstracting access to data records at runtime without hardcoding specific information about each record type; using a record management layer in the software application collecting and manipulating data record information in the persistence layer through both an application programming interface and one or more user interfaces and providing management functionality at runtime for a given record type; using an adaptive presentation layer in the software application generating a plurality of views from a single set of data models that display on a plurality of presentation media and wherein the presentation layer auto-generating views at runtime based on the structure of the data models such that the views reflect changes in the database; and releasing the software application for use on one or more computing devices whereas the proposed invention for creating a customizable mobile device includes real hardware, software, sensing and communicating components to build a smartphone. Thus it provides three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs. Further, the system of present invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS,

GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera, Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only provides the freedom to modify, customize and create operating system, hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART, USB, SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

(iii) D2 discloses an application platform that abstracts the computing platform, the database layer, and the rendering medium. The application platform has an application programming interface (“API”) which is consistent and identical on every platform making it platform independent. The application platform also abstracts away particulars of the data access layer to provide persistence independence. The abstraction of the database layer includes two sub-layers. In the bottom layer database independence is achieved and a uniform interface is exposed that treats data records (e.g. table rows) as plain objects. In the upper data layer are constructs that facilitate automated generation of user interfaces for record navigation and management. The resulting system provides the immediate ability to manage database records, programmatically as well as on the user side, without the need to re-implement the basic management tasks over and over again. Thus the disclosed invention relates to applications that are capable of abstracting different presentation media. Abstracting presentation media means separating software development to a maximum degree from the medium on which it will be used, whether it is a computer desktop, a web browser or a mobile device whereas the proposed invention does not relates to abstracting presentation media rather it provides a system for creating customizable mobile device for learning and development comprising a memory database, a processing unit and an interfacing unit wherein the interfacing unit comprises plurality of multi-input/output interface different from each other and an application program interface, an external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface. As such proposed invention provides a platform to perform all customized operation wherein the interfacing unit of the proposed system communicates with plurality of application specific communication interface and the processing unit communicates with various interfaces for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and Mac OS environment and other application operating system

environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

(iv) In the cited document D2 the disclosed platform is not dependent on the rendering medium. This platform distinguishes itself the most in its abstraction of the rendering medium, or presentation layer. It allows a developer to create an application once and make it available in several presentation forms such as the desktop, the web or mobile devices with very little added effort. This application platform enables a developer to create several different application types in the same manner. For instance, application types may include web applications, rich client desktop application, thin client desktop application, mobile application, games, and server side services without any user interface whereas in the system of proposed invention there is a universal development system for experimenting the concepts of mobile computing, embedded systems, communication protocols and networks, sensors, interfacing peripherals as an integrated solution. The system architecture of the primarily consists of OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size, hardware interfacing as per user requirement that include application specific sensors, actuators, MIC, speaker, buzzer, camera, display, user interface, communication module, vibrators, I/O memory or SD card extension etc. and programming for mobile system design or for mobile application programming (app development) using python. In the proposed invention development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors, communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

Accordingly, it is respectfully stated that the cited prior art does not teaches about customization of a mobile device or a smartphone development system for real-time designing, interfacing & programming of the various components of smartphone including software as well as hardware.

2. D3: US8694968B2

Applicant submits the following submissions with regard to inventiveness of the claimed invention:

(i) In D3 the mobile device development kit is provided as a web-based service for customization and testing of mobile devices whereas the proposed invention involves the real time mobile device development kit with I/O interface, memory interface, network communication technology and sensor modules and therefore provides flexibility to the users in terms of real time customization.

(ii) D3 discloses a computer-implemented method for creating, managing and distributing a mobile device operating software package, the method comprising: receiving a selection of at least one of a logic and data element from at least one of a shape, component, connections, color, and label palette to add to a data and logic canvas and a user interaction element from at least one of a graphic, widget, audio/video, or haptic palette to add to a multimedia user interaction canvas to form a mobile device operating software package; testing the mobile device operating software package using a generic device model testing module; submitting the mobile device operating software package to a distribution center; and distributing the mobile device operating software package to a mobile device whereas the proposed invention provide a system for creating customizable mobile device for learning and development comprising a memory database, a processing unit, an interfacing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database wherein the interface unit also comprises plurality of multi-input/output interface different from each other, an application program interface, an external memory communication interface, a multiple sensors communication interface, a network communication interface, a universal communication interface. Therefore, the system of proposed invention is different architecturally as well as steps involved are not disclosed in D3.

(iii) In D3 Operating Software Package perform all desired functions available to the user of a mobile device. For example, an Operating Software Package provide basic telephony and address book functionality and allow nothing else, it may provide an alternate user interface to every traditional function of a typical mobile device, or it may provide any combination in between. Further, an Operating Software Package may incorporate specific Applications and Application Components by design, and it may or may not permit an end user to extend its functionality by downloading and running Applications using the proprietary foneClay Apps system whereas in the proposed invention the development system for customization of mobile device includes real hardware, software, sensing and

communicating components to build a customized smartphone. The proposed system comprises a interface unit for communication with plurality of application specific communication interface. The processing unit communicates with various interfaces for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation. The I/O interface allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as SDRAM, DRMA and SD CARD/FLASH. The sensor interface provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C. Thus it provides three dimensional freedom to end users and others, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

(iv) The system of D3 does not involve any learning platform for users whereas the proposed invention also integrates customizable systems for users or students practical learning and as such the students can create any customized experiment or can select an already created experiment and test the concepts for practical understanding of various subjects such as mobile computing, embedded systems, sensors interfacing etc. This feature is useful for student's enhancement.

The applicant respectfully submits that the claims 1-6 are inventive because of the at least following differentiating features:

(i) The system of proposed invention is for creating a customizable mobile device in real time and provides for customization of both hardware and software components to build a completely new device or modifying the existing one as per user requirement through multiple interfaces provided such as an application program interface, an external memory communication interface, a multiple sensors communication interface (106), a network communication interface and a universal communication interface.

(ii) The system of proposed invention is an integrated, compact and stand alone development system having improved flexibility, reduced cost, and reduced associated workload that facilitates the user or others for improved optimization, greater configurability and customization of both hardware and software components.

(iii) The proposed invention provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

(iv) The proposed provides a unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS and Application software.

(v) The proposed invention allows operating system customization for the kernel porting and specific requirement.

(vi) In the proposed invention Python is used as a preferred programming environment to integrate both hardware, operating system, and the application.

(vii) The system of proposed invention acts as an integrated solution for sensor interfacing, programming and mobile application development.

(viii) The proposed system allows the user to create any application or choose the already created experiments from the provided list to run and test the concepts for necessary understanding and analysis specific to the mobile computing, embedded systems, sensor interfacing and wired/wireless communication protocols.

(ix) The development system of the proposed invention is low cost and open source solution for users, students, faculty and developers to experiment and innovate new designs, products and solutions for education, entertainment, agriculture and health application.

(x) The proposed system is also used for performing several experiments to demonstrate the concepts in real environment related to such as but not limited to language C & Python programming, socket & shell programming, sensor networks, mobile communication, databases, embedded systems, etc.

Accordingly, it is respectfully stated that the technical feature used to realize the complete invention is different from the cited prior art D2 and D3 and hence makes the proposed invention non-obvious.

Applicant respectfully submits that the amended claim 1 is not obvious over D2 and D3 since none of the references (either alone or combined) discloses ‘a system (100) for creating

customizable mobile device for learning and development comprising a memory database (102); a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101); an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102), the interface unit comprises consisting plurality of multi-input/output interface different from each other, wherein the interface unit comprises an application program interface (103); an external memory communication interface (105); a multiple sensors communication interface (106); a network communication interface (107); and a universal communication interface (104)' as defined by the claim 1.

Therefore, a skilled artisan would not modify any of the cited references with an expectation of successfully arriving at that which is claimed as the invention because there is no teaching or disclosure of the aforementioned features defined by amended system claim 1 and subsequent dependent claims 2-6. The dependent claims 2-6 are novel and inventive by virtue of their dependency on claim 1.

Accordingly, it is respectfully stated that none of the cited prior arts, either taken alone or in any combination thereof, will motivate a person ordinarily skilled in the art to arrive at the claimed invention. The Learned Controller is, therefore, requested to reconsider and waive the objection favorably.

Objection 3: Non Patentability

The learned controller has objected the patentability of Claim(s) 1-7 under the provision of clause (K) of Section 3 for the following reasons:

Without prejudice to objection U/S 2(1)(j), the subject matter of the claims as filed in the instant application falls within scope of clause (k) of section (3) of the Patents Act, 1970 (as amended). Therefore the invention claimed in the said claims is not patentable. In the method claims, steps are algorithmic steps. These can be implemented by software means only which works based on algorithms. Also system claims do not contribute in the constructional or structural aspects of the alleged invention and the alleged contribution lies only in algorithmic steps which make the system functional.

Applicant respectfully submits the following submissions with regard to patentability of the claimed invention:

The Applicant believes that claims 1-6 do not represent an algorithm and are allowable u/s 3(k) of the Patents Act, 1970. Hence, Applicant respectfully traverses the rejection and presents the following reply:

The Manual of Patents Practice and Procedure (MPPP), with regard to Section 3(k), cites that *“Algorithms in all forms including but not limited to, a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise, are excluded from patentability.”*

Further, with reference to revised Guidelines for Examination of Computer-related Inventions (CRIs) published on June 30, 2017, states that *“Even when the issue is related to hardware/software relation, the expression of the functionality as a “method” is to be judged on its substance. It is well-established that, in patentability cases, the focus should be on the underlying substance of the invention, not the particular form in which it is claimed. The Patents Act clearly excludes computer programmes per se and the exclusion should not be allowed to be avoided merely by camouflaging the substance of the claim by its wording.”*

Applicant respectfully states that the claimed subject matter in claims 1-6 does not describe or relate to “a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise”. Instead applicant claimed invention is related to solve a technical problem of current and emerging mobile devices providing a great deal of programmability through the provision of software applications, or “apps”. However, these apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device. Further, add-on software apps inherently cannot offer any ability to change the specific hardware built into a mobile device. While most mobile devices provide connectors and slots for adding or connecting hardware modules that provide optional capabilities, and coupled with software apps these hardware add-ons can be quite sophisticated, here too this practice is limited to adding modules that aren’t in the base device. Finally, neither add-on software apps nor plug-in hardware modules offer any ability to change the form factor of a device completely. End

users with a variety of special needs are generally left unsatisfied by the available options. Moreover, other development kits available allows only to customize, create and/or modify either software or hardware so as to make the device compatible for any new feature or to develop an improved product. So to overcome these existing limitations a system is proposed where end users or others acting on behalf of a group of end users may create personal or custom configurations of mobile devices or modify an existing one both at hardware and software level in real-time. Accordingly, proposed system is an improved development system for experimenting with every concept of mobile computing so as to build and innovate new products and therefore provides an integrated development system having improved flexibility, reduced cost, and reduced associated workload that facilitates the user or others for improved optimization, greater configurability and customization of both hardware and software components as compared to prior art.

Further, the applicant has included hardware limitation such as plurality of interfacing unit including an application program interface (103), an external memory communication interface (105), a multiple sensors communication interface (106), a network communication interface (107), a universal communication interface (104) that implements the steps claimed in the claims 1-6. Additionally, the proposed invention is an integrated, compact and cost-effective solution for design and development of customizable smart devices. It is an integrated system composed of mixture of hardware and software. The system is composed of interconnection of database, processing unit, sensors interface unit (sensors communication interface that provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity sensor, accelerometer sensor, gyroscope, light sensor, GPS, and fingerprint sensors), universal interface unit (universal communication interface provides communication to plurality of input/output devices selected from the group consisting of touch screen, display, keyboard, speaker, microphone and camera), network communication interface (one or more communication technology selected from the group consisting of Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C). So considering the invention as mere algorithm implemented through software is not justifiable.

Hence the claims 1-6 are allowable u/s 3(k) of the patents Act 1970. Thus, the applicant believes that none of the claims 1-6 are directed solely towards software steps or algorithm or sequence of computational steps. Therefore subject matter of said claims 1-6 does not fall

within scope of clause (k) of section (3) of the Patents Act, 1970 (as amended). Therefore invention claimed in said claims 1-6 is patentable and applicant respectfully requests the Learned Controller to waive the above objection.

Objection 4: Unity of Invention

Claims 1-7 do not form a single inventive concept. Claims 1-6 and 7 form different set of inventive concepts hence not allowable as a single application u/s 10(5) of the Patents Act, 1970 (as amended).

The applicant submits that original claims 7 has been deleted to form a single inventive concept. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

Objection 5: Sufficiency of Disclosure

The complete specification does not fully and particularly describe the invention and its operation and the method by which it is to be performed in respect of:

The complete specification does not fully and particularly describe the invention and its operation or use and the method by which it is to be performed. Also the complete specification does not disclose the best method of performing the invention which is known to the applicant and for which he is entitled to claim protection.

The applicant submits that proposed invention relates to a system for creating customizable mobile device for learning and development comprising, a memory database, a processing unit coupled to the memory database storing therein one or more instructions to be executed by the processing unit, an interfacing unit operatively coupled to processing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database, the interface unit comprising plurality of multi-input/output interface different from each other, wherein the interface unit further comprises an application program interface, an external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface.

The following paragraphs from complete specification describe the system of proposed invention and its working in details:

Page 7; Lines 18-35 & Page 8; Lines 1-5: *“According to an embodiment of present invention the processing unit (101) is a computing platform to perform all customized operation, which comprises a processor and an interface unit for communication with*

plurality of application specific communication interface. The processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106) provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.”

Page 8; Lines 24-35 & Page 9; Lines 5-6: *“FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention. The system of present invention runs on a highly customizable operating system (MyOS) allowing integration of multiple hardware component and software component into a single platform. The system (300) consists of hardware element (301), which runs on MyOS operating system. The MyOS operating system is specifically designed for a unified platform capable of customizing hardware and operating system for building smartphone. When system is switched ON, hardware (301) memory is booted with operating system (MyOS) and input/output (303) interface with one or more user selected sensors (304) and communication technology (305) creates a customized phone environment for user applications (306) development and execution.”*

Page 12; Lines 16-31: *“According to an embodiment of the present invention on power-on development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors, communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.*

FIG. 4 illustrates a booting process sequence diagram of development system according to a preferred embodiment of the present invention. The process starts at step (401), when system is switched ON, at the time of initialization, customized operating system (MyOS) gets loaded from card memory into RAM at step (402). This enables loading of the kernel of customized operating system (MyOS) in to the memory that consists of integrated development environment (IDE) for application development.”

Therefore, applicant humbly requests the Learned Controller to consider the quoted paragraphs from specification towards description of best mode of working and waive the above objection.

Objection 6: Scope

Claim(s) 1-7 does/do not define the scope of invention for which the protection is claimed for the following reasons:

1. Words and phrases like "according to", "as recited in", "characterized in that" or "further comprising" should not be used in claims. These words and phrases make the scope of invention indefinite.

The Applicant submits that the original claims 1-6 are properly worded to clearly define the invention. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

2. The technical features of the claims are not referenced with numerals in parenthesis to enhance the intelligibility of the claims.

The applicant submits that reference numerals have been given in parenthesis wherever necessary in claims to enhance the intelligibility of the claims. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

Part-III

Objection 7: Formal requirements

1. **Statement & Undertaking:** The period within which the applicant shall file the statement and undertaking under sub section (1) of section 8 is six months from the date of filing the application. Annexure to Form 3 has not been filed in accordance to rule 12 (1A) of the Patents Rules 2003 (as amended).

The applicant submits that the Form 3 was submitted online along with provisional specification within prescribed time on January 28, 2015 which is also uploaded by IPO on the record on January 30, 2015.

Further, Applicant also submits the petition to condone delay in filing Form 3 physically after filing online. Furthermore, the updated Form 3 details are as follows:

(i) that applicant have not made any application for the same/substantially the same invention outside India.

(ii) that the rights in the application(s) has/have been assigned to none.

Therefore, Applicant humbly requests the Learned Controller to take the Form 3 with petition on the patent office records and waive the above objection.

2. Format of Specification (Rule 13):

(i) Complete specification has not been prepared following font, margin and line numbering requirements of rule 9 of The Patent Rules, 2003 (as amended).

The applicant submits that the complete specification is amended and prepared in font, margin and line numbering requirements of rule 9 of The Patent Rules, 2003 (as amended).

(ii) Irrelevant content, like reference of foreign applications, white spaces and other information from header and footer of the pages, has not been deleted from the Complete Specification.

The applicant submits that the complete specification is amended and irrelevant content, reference of foreign applications, white spaces and other information from header and footer of the pages, has been deleted from the Complete Specification.

Therefore, Applicant humbly requests the Learned Controller to take the complete specification on the patent office records and waive the above objection.

3. Format of Drawings: Name of applicant, number of sheets of drawings, consecutive number of sheets and signature of applicant or his agent should be on drawings as per rule 15 of The Patent Rules, 2003 (as amended). Drawings are not submitted as per rule 15 of The Patent Rules, 2003 (as amended).

The applicant submits that the drawing sheets are amended to include name of applicant, number of sheets of drawings, consecutive number of sheets and signature of agent on drawing sheets as per rule 15 of The Patent Rules, 2003 (as amended). Further, the drawings are amended and submitted as per rule 15 of The Patent Rules, 2003 (as amended). Therefore, Applicant humbly requests the Learned Controller to take the drawings on the patent office records and waive the above objection.

4. Other Deficiencies:

(i) Form-5, Form-3, drawings and claims are not signed by the authorised patent agent.

The applicant submits that the Form-3, Form-5, drawing and claims duly signed by the by the authorised patent agent are submitted. Therefore, Applicant humbly requests the Learned Controller to take signed forms on the patent office records and waive the above objection.

(ii) Complete Address of the inventor "Suresh Chande" has not been provided.

The applicant submits that the complete address of "Suresh Chande" is as following

Address: Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India.

Therefore, Applicant humbly requests the Learned Controller to take the updated address on the patent office records and waive the above objection.

(iii) Proof of right has not been submitted within prescribed period (within 6 month of the provisional specification) as mentioned u/r 10 of The Patents Rule 2003 (as amended).

The applicant submits the petition to condone delay in filing proof or right. Therefore, Applicant humbly requests the Learned Controller to take proof of right on the patent office records and waive the above objection.

(iv) Form-5 has not been submitted within the prescribed time period.

The applicant submits that the Form 5 was submitted online within prescribed time on February 18, 2016 after filing complete specification dated January 28, 2016 which is also uploaded by IPO on the record.

Further, Applicant also submits the petition to condone delay in filing Form 5 physically after filing online.

Therefore, Applicant humbly requests the Learned Controller to take Form-5 on the patent office records and waive the above objection.

(v) Power of Authority has not been submitted in favour of signatories to various forms. Names of agents provided on various forms and submitted Power of Attorney are not in accordance with those provided in the Patent Agent Register. Patent agent registration number is not provided on submitted copy of Power of Attorney.

The applicant submits that the GPA is submitted in favour of patent agent with patent agent registration number signed by applicant. Therefore, Applicant humbly requests the Learned Controller to take signed GPA on the patent office records and waive the above objection.

(vi) Necessary figures should be provided with abstract as per rule 13(7) of The Patent Rules, 2003 (as amended).

The applicant submits that the necessary figure is provided with abstract as per rule 13(7) of The Patent Rules, 2003 (as amended). Therefore, applicant humbly requests the Learned Controller to waive the above objection.

In view of the above submissions, Applicant believes that the entire objections have been met and requests the Learned Controller to allow the application to proceed for grant. In case you require any clarifications or documents we would be pleased to provide the same on behalf of the Applicant.

Any communication in connection with the above applications may be sent to us directly as the agent for the Applicants. Applicant respectfully states that any decision adverse to the Applicant in this regard should not be taken without taking the Applicant or their representative a personal hearing on this issue.

PRAYER

It is therefore prayed that:

- (a) the objections may be dropped;
- (b) the application may be favorably considered for early grant; and
- (c) a personal hearing may be granted in the event of any outstanding issue.

Dated this 13th day of September 2020

Rashmi Tyagi

RASHMI TYAGI

IN/PA-1594

AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

Enclosures:

- 1. Claims-Clean**
- 2. Abstract-Clean**
- 3. Complete Specification-Clean**

- 4. Annexure 1 (Complete Specification-track, Claims-track, Drawings-track & Abstract-track)**
- 5. Annexure 2 (Form-3 duly signed by agent, Form-5 duly signed by agent)**
- 6. Petition to condone delay in filing Form-3**
- 7. Petition to condone delay in filing Form-5**
- 8. Petition to condone delay in filing Proof of Right**
- 9. GPA duly signed by applicant in favour of Agent**

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(Section 10 & Rule 13)

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**“A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND
HARDWARE INTERFACES OF SMARTPHONE”**

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

INDIAN

Kashmere Gate, New Delhi-110006, India

The following specification describes the invention and the manner in which it is to be performed.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of smartphone development. More particularly, the invention relates to a method and system for enabling a unified platform capable of customizing hardware and operating system for building smartphone.

10

BACKGROUND OF THE INVENTION

There exists today a wide variety of small, typically handheld, electronic appliances known generally as mobile internet devices or smartphones. In the current state of the art, all such devices are designed by their
15 manufacturers to include a variety of hardware capabilities to address as many potential end users as possible. Similarly, manufacturers determine the form factor, that is, the size, shape, weight, color, and other physical attributes, of each product, with the goal to satisfy the greatest possible number of users with the fewest specific combinations. Finally,
20 manufacturers configure the operating software of their devices to provide a variety of functions such that a particular function or related group of functions is performed in exactly the same way on as many device models as possible.

25

The practice of limiting the number of hardware and software combinations benefits the device manufacturers by reducing the complexity of the various systems and procedures they use for product development, manufacturing, sales, and customer support. However, current and emerging mobile devices provide a great deal of programmability through
30 the provision of software applications, or “apps”. These apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device.

5 Further, add-on software apps inherently cannot offer any ability to change
the specific hardware built into a mobile device. While most mobile devices
provide connectors and slots for adding or connecting hardware modules
that provide optional capabilities, and coupled with software apps these
hardware add-ons can be quite sophisticated, here too this practice is
10 limited to adding modules that aren't in the base device.

Finally, neither add-on software apps nor plug-in hardware modules offer
any ability to change the form factor of a device completely. End users
with a variety of special needs are generally left unsatisfied by the
15 available options.

Further, other development kits available allows to customize, create
and/or modify either software or hardware so as to make the device
compatible for any new feature or to develop an improved product. What is
20 needed, then, is system where end users or others acting on behalf of a
group of end users may create personal or custom configurations of
mobile devices or modify an existing one.

Accordingly, it would be advantageous to have an improved development
25 system for experimenting with every concept of mobile computing so as to
build and innovate new products.

Thus, considering all these facts the present invention provides an
integrated development system having improved flexibility, reduced cost,
30 and reduced associated workload that facilitates the user or others for
improved optimization, greater configurability and customization of both
hardware and software components.

5 **SUMMARY**

An object of the present invention provides a system for creating customizable mobile device for learning and development comprising, a memory database, a processing unit coupled to the memory database storing therein one or more instructions to be executed by the processing
10 unit, an interfacing unit operatively coupled to processing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database, the interface unit comprising plurality of multi-input/output interface different from each other, wherein the interface unit further comprises an application program interface, an
15 external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface.

Another object of the present invention provides a system for creating
20 customizable mobile device for learning and development comprising, a memory database, a processing unit operatively coupled to memory database for executing one or more instruction stored therein and a multi-input/output interface for providing communication with one or more smartphone operating system, network communication technology,
25 sensors and I/O devices.

A further object of the present invention provides a system which allows the user to create any application or choose the already created experiments from the provided list to run and test the concepts for
30 necessary understanding and analysis specific to the mobile computing, embedded systems, sensor interfacing and wired/wireless communication protocols.

Another object of the present invention provides a system for performing
35 several experiments to demonstrate the concepts in real environment

5 related to such as but not limited to language C & Python programming,
socket & shell programming, sensor networks, mobile communication,
databases, embedded systems, etc. and manual or in book or CD form
“How to create the experiments with step by step procedure” as an unified
integrated solution. A web based add-on complimentary material or
10 projects are also provided online free of cost to users.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be
apparent from the following description when read with reference to the
15 accompanying drawings.

FIG. 1 illustrates basic architecture and various components of
development system according to a preferred embodiment of the present
invention;

20

FIG. 2 illustrates primary components layout of development system
according to a preferred embodiment of the present invention;

FIG. 3 illustrates flow diagram of development system according to a
25 preferred embodiment of the present invention;

FIG. 4 illustrates booting process sequence diagram of development
system according to a preferred embodiment of the present invention.

30

5 **DESCRIPTION**

 The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only
10 provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

 The present invention provides a mobile device, smartphone development
15 system for real-time designing, interfacing & programming of the various components of smartphone. The system of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating
20 software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof.

 The development system of present invention includes real hardware, software, sensing and communicating components to build a smartphone.
25 Thus it provides three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

30 Accordingly, the system of present invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera, Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only
35 provides the freedom to modify, customize and create operating system,

5 hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART, USB, SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

10 FIG. 1 illustrates architecture block diagram of system according to a preferred embodiment of the present invention. The system (100) includes a processing unit (101), a memory database (102) and interface unit (not shown) of processing unit which couples the processor with and/or to the various communication interface such as I/O interface (104), memory
15 interface (105), sensory interface (106), communication interface (107) and Application/OS interface (103).

According to an embodiment of present invention the processing unit (101) is a computing platform to perform all customized operation, which
20 comprises a processor and an interface unit for communication with plurality of application specific communication interface. The processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and
25 Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

30 The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as
35 SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106)

5 provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

10

In an embodiment of present invention a customized mobile device or smartphone is provided in which one or more hardware element and/or software element can be selected according to user need to create a new smartphone device, application software and testing environment for

15 further development.

FIG. 2 illustrates layout of primary components of development system according to a preferred embodiment of the present invention. Here the figure illustrates different hardware component used in the development of

20 platform of present invention. However, the scope of present invention is not limited to these only. The detailed description of each component and its functioning is explained later in the specification.

FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention. The system of present invention runs on a highly customizable operating system (MyOS) allowing integration of multiple hardware component and software component into a single platform. The system (300) consists of hardware element (301), which runs on MyOS operating system. The MyOS operating system is specifically designed for a unified platform capable of customizing

25 hardware and operating system for building smartphone. When system is switched ON, hardware (301) memory is booted with operating system (MyOS) and input/output (303) interface with one or more user selected sensors (304) and communication technology (305) creates a customized

30

5 phone environment for user applications (306) development and execution.

The development system of the present invention is low cost and open source solution for users, students, faculty and developers to experiment
10 and innovate new designs, products and solutions for education, entertainment, agriculture and health application and offers following advantages:

- 15 • Provides unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS and Application software.
- Allows operating system customization for the kernel porting and specific requirement.
- 20 • Uses Python as a preferred programming environment to integrate both hardware, operating system, and the application.
- Acts as an integrated solution for sensor interfacing, programming and mobile application development through open source tools and technologies.
- 25 • Provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

According to an embodiment of present invention the mobile device or smartphone development system of the present invention comprises
30 primarily of following components:

The one or more hardware components used in the system are described herein:

- 35 a) Computing Platform: Raspberry Pi(R-Pi) is being used as a preferred computing platform. It uses the Broadcom SoC with ARM11 processor and operates at 700 MHz. It is widely used low

5 cost platform for various product design and developments presently.

10 b) Camera Module: This module can be used to take high definition video, as well as stills photographs with options like time-lapse, slow motion and video cleverness. It is a five mega pixel fixed focus camera that supports 1080p30, 720p60 and VGA90 video modes as well as still captures.

15 c) Touch Screen: It features a 2.8" display with 320x240, 16-bit color pixels and a resistive touch overlay. The plate uses the high speed SPI interface and can use the mini display as a console for displaying text, images or video etc.

20 d) Sensors: Various sensors such as temperature, humidity, accelerometer, smoke & pulse sensor are integrated with R-Pi.

The communication technology supported by present system may comprise following network communication modules:

25 a) GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots.

30 b) Bluetooth: Class-2 Bluetooth module with Serial Port Profile, which can be configured as either Master or Slave, a drop-in replacement for wired serial connections.

35

- 5 c) GPS: It provides the real time position information in NMEA format. This data includes the complete PVT (position, velocity, time) solution computed by the GPS receiver.
- 10 d) ZigBee: ZigBee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios based on an IEEE 802.15.4 standard.
- 15 e) Wi-Fi: It is wireless LAN based on IEEE 802.11 standard that allows an electronic device to inter networking using 2.4 GHz UHF and 5 GHz SHF ISM radio bands.

The application software component supported by present mobile device development platform comprises:

- 20 a) MyOS: To meet the user requirements standard embedded Linux kernel is optimized and configured for the intended hardware and software, to get new functionalities and to test new features as per application specific requirements. The MyOS is configured for platform application however it can be recompiled, customized and
- 25 ported into the platform for a specific requirement.
- b) Set of application programs and projects are created to experiment the concepts of various subjects as mentioned earlier.

30 The present invention accordingly provides a universal development system for experimenting the concepts of mobile computing, embedded systems, communication protocols and networks, sensors, interfacing peripherals as an integrated solution.

35 The system architecture of the present invention primarily consists of:

5 (a) OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size.

(b) Hardware interfacing as per user requirement that include application specific sensors, actuators, MIC, speaker, buzzer,
10 camera, display, user interface, communication module, vibrators, I/O memory or SD card extension etc.

(c) Programming for mobile system design or for mobile application programming (app development) using python.

15

According to an embodiment of the present invention on power-on development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors,
20 communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

25 FIG. 4 illustrates a booting process sequence diagram of development system according to a preferred embodiment of the present invention. The process starts at step (401), when system is switched ON, at the time of initialization, customized operating system (MyOS) gets loaded from card memory into RAM at step (402). This enables loading of the kernel of customized operating system (MyOS) in to the memory that consists of
30 integrated development environment (IDE) for application development.

In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A
35 single element or other unit may fulfill the functions of several items recited

5 in the claims. The mere fact that certain measures are recited in mutually
different dependent claims does not indicate that a combination of these
measures cannot be used to advantage.

10 The present invention can be implemented in any convenient form, for
example using dedicated hardware, or a mixture of dedicated hardware
and software. The present invention may be implemented as computer
software implemented by one or more networked processing apparatuses.
The network can comprise any conventional terrestrial or wireless
15 communications network, such as the Internet. The processing
apparatuses can comprise any suitably programmed apparatuses such
as a general purpose computer, personal digital assistant, mobile
telephone (such as a Wireless Application Protocol (WAP) or 3G-
compliant phone) and so on. Since the present invention can be
implemented as software, each and every aspect of the present invention
20 thus encompasses computer software implementable on a programmable
device.

The computer software can be provided to the programmable device using
any storage medium or carrier medium for storing processor readable
25 code such as a flexible disk, a compact disk read only memory (CD-ROM),
a digital versatile disk read only memory (DVD-ROM), DVD recording
only/rewritable (DVD-R/RW), electrically erasable and programmable read
only memory (EEPROM), erasable programmable read only memory
(EPROM), a memory card or stick such as USB memory, a memory chip,
30 a mini disk (MD), a magneto optical disc (MO), magnetic tape, a hard disk
in a server, a solid state memory device or the like, but not limited to
these.

The hardware platform includes any desired kind of hardware resources
35 including, for example, a central processing unit (CPU), a random access

5 memory (RAM), and a hard disk drive (HDD). The CPU may be implemented by any desired kind of any desired number of processor. The RAM may be implemented by any desired kind of volatile or non-volatile memory. The HDD may be implemented by any desired kind of non-volatile memory capable of storing a large amount of data. The hardware
10 resources may additionally include an input device, an output device, or a network device, depending on the type of the apparatus. Alternatively, the HDD may be provided outside of the apparatus as long as the HDD is accessible. In this example, the CPU, such as a cache memory of the CPU, and the RAM may function as a physical memory or a primary
15 memory of the apparatus, while the HDD may function as a secondary memory of the apparatus.

In the above-described example embodiment, a computing environment can be created using a computer used with a computer-readable program, described by object-oriented programming languages such as C++, Java
20 (registered trademark), JavaScript (registered trademark), Perl, Ruby, Python or legacy programming languages such as machine language, assembler language to control functional units used for the apparatus or system. For example, a particular computer (e.g., personal computer, work station) may control information processing apparatus or an image
25 processing apparatus using a computer-readable program, which can execute the above-described processes or steps. In the above described embodiments, at least one or more of the units of apparatus can be implemented in hardware or as a combination of hardware/software combination. In example embodiment, processing units, computing units,
30 or controllers can be configured using various types of processors, circuits, processing devices, processing circuits or the like such as a programmed processor, a circuit, an application specific integrated circuit (ASIC), used singly or in combination. A circuit is a structural assemblage of electronic
35 components including conventional circuit elements, integrated circuits

5 including application specific integrated circuits, standard integrated
circuits, application specific standard products, and field programmable
gate arrays. Further, a circuit includes central processing units, graphics
processing units, and microprocessors, which are programmed or
configured according to software code. A circuit does not include pure
10 software, although a circuit does include the above-described hardware
executing software.

In the present invention all references related to mobile device may be
assumed as mobile phone, smartphone, phone device, tablets, portable
15 device and computing device and may be used interchangeably. Further,
terms like "system" and "platform" are used interchangeably and
synonymously throughout this document.

Numerous additional modifications and variations are possible in light of
20 the above teachings. It is therefore to be understood that within the scope
of the appended claims, the disclosure of the present invention may be
practiced otherwise than as specifically described herein. For example,
elements and/or features of different examples and illustrative
embodiments may be combined each other and/or substituted for each
25 other within the scope of this disclosure and appended claims.

5 **We Claim:**

1. A system (100) for creating customizable mobile device for learning and development comprising:

a memory database (102);

10 a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101);

15 an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102); ~~the interface unit comprises consisting~~ plurality of multi-input/output interface different from each other, wherein the interface unit comprises

-an application program interface (103);

-an external memory communication interface (105);

20 -a multiple sensors communication interface (106);

-a network communication interface (107); and

-a universal communication interface (104).

25 2. The system (100) as claimed in claim 1, wherein the application program interface (103) is customizable to select one or more application specific operating system environments.

30 3. The system (100) as claimed in claim 1, wherein memory interface (105) provides communication to high speed memory devices.

4. The system (100) as claimed in claim 1, wherein sensors communication interface (106) provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity sensor,

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5 accelerometer sensor, gyroscope, light sensor, GPS, and fingerprint sensors.

10 5. The system (100) as claimed in claim 1, wherein the universal communication interface (104) provides communication to plurality of input/output devices selected from the group consisting of touch screen, display, keyboard, speaker, microphone and camera.

15 6. The system (100) as claimed in claim 1, wherein the network communication interface (107) provides communication with one or more communication technology selected from the group consisting of Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

20 ~~7. A system for creating customizable mobile device for learning and development comprising;~~
~~a memory database;~~
~~a processing unit operatively coupled to memory database for executing one or more instruction stored therein; and~~
~~a multi input/output interface for providing communication with one or more smartphone operating system, network~~
25 ~~communication technology, sensors and I/O devices.~~

Dated this 28th day of January, 2016



RASHMI TYAGI
IN/PA-1594
AGENT FOR APPLICANT

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ABSTRACT

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMARTPHONE

The present invention relates to a system [\(100\)](#) and method providing a unified platform for real time programming, designing and customizing smartphone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform [\(100\)](#) includes a processing unit [\(101\)](#) for controlling and managing the operation of one or more interface controllers. The one or more interface controller comprise memory interface [\(105\)](#), communication interface [\(107\)](#), input/output interface [\(104\)](#), sensor interface [\(106\)](#), application programming interface [\(103\)](#) for application programming and operating system customization.



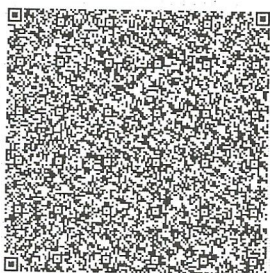
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THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi, (IN/PA-1594) Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007**, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and

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We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi



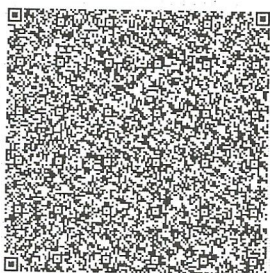
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Rashmi Tyagi

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Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
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FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

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COMPLETE SPECIFICATION

(Section 10 & Rule 13)

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**“A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND
HARDWARE INTERFACES OF SMARTPHONE”**

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

INDIAN

Kashmere Gate, New Delhi-110006, India

The following specification describes the invention and the manner in which it is to be performed.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of smartphone development. More particularly, the invention relates to a method and system for enabling a unified platform capable of customizing hardware and operating system for building smartphone.

10

BACKGROUND OF THE INVENTION

There exists today a wide variety of small, typically handheld, electronic appliances known generally as mobile internet devices or smartphones. In the current state of the art, all such devices are designed by their
15 manufacturers to include a variety of hardware capabilities to address as many potential end users as possible. Similarly, manufacturers determine the form factor, that is, the size, shape, weight, color, and other physical attributes, of each product, with the goal to satisfy the greatest possible number of users with the fewest specific combinations. Finally,
20 manufacturers configure the operating software of their devices to provide a variety of functions such that a particular function or related group of functions is performed in exactly the same way on as many device models as possible.

25

The practice of limiting the number of hardware and software combinations benefits the device manufacturers by reducing the complexity of the various systems and procedures they use for product development, manufacturing, sales, and customer support. However, current and emerging mobile devices provide a great deal of programmability through
30 the provision of software applications, or “apps”. These apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device.

5 Further, add-on software apps inherently cannot offer any ability to change
the specific hardware built into a mobile device. While most mobile devices
provide connectors and slots for adding or connecting hardware modules
that provide optional capabilities, and coupled with software apps these
hardware add-ons can be quite sophisticated, here too this practice is
10 limited to adding modules that aren't in the base device.

Finally, neither add-on software apps nor plug-in hardware modules offer
any ability to change the form factor of a device completely. End users
with a variety of special needs are generally left unsatisfied by the
15 available options.

Further, other development kits available allows to customize, create
and/or modify either software or hardware so as to make the device
compatible for any new feature or to develop an improved product. What is
20 needed, then, is system where end users or others acting on behalf of a
group of end users may create personal or custom configurations of
mobile devices or modify an existing one.

Accordingly, it would be advantageous to have an improved development
25 system for experimenting with every concept of mobile computing so as to
build and innovate new products.

Thus, considering all these facts the present invention provides an
integrated development system having improved flexibility, reduced cost,
30 and reduced associated workload that facilitates the user or others for
improved optimization, greater configurability and customization of both
hardware and software components.

5 **SUMMARY**

An object of the present invention provides a system for creating customizable mobile device for learning and development comprising, a memory database, a processing unit coupled to the memory database storing therein one or more instructions to be executed by the processing
10 unit, an interfacing unit operatively coupled to processing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database, the interface unit comprising plurality of multi-input/output interface different from each other, wherein the interface unit further comprises an application program interface, an
15 external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface.

Another object of the present invention provides a system for creating
20 customizable mobile device for learning and development comprising, a memory database, a processing unit operatively coupled to memory database for executing one or more instruction stored therein and a multi-input/output interface for providing communication with one or more smartphone operating system, network communication technology,
25 sensors and I/O devices.

A further object of the present invention provides a system which allows the user to create any application or choose the already created experiments from the provided list to run and test the concepts for
30 necessary understanding and analysis specific to the mobile computing, embedded systems, sensor interfacing and wired/wireless communication protocols.

Another object of the present invention provides a system for performing
35 several experiments to demonstrate the concepts in real environment

5 related to such as but not limited to language C & Python programming,
socket & shell programming, sensor networks, mobile communication,
databases, embedded systems, etc. and manual or in book or CD form
"How to create the experiments with step by step procedure" as an unified
integrated solution. A web based add-on complimentary material or
10 projects are also provided online free of cost to users.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be
apparent from the following description when read with reference to the
15 accompanying drawings.

FIG. 1 illustrates basic architecture and various components of
development system according to a preferred embodiment of the present
invention;

20

FIG. 2 illustrates primary components layout of development system
according to a preferred embodiment of the present invention;

FIG. 3 illustrates flow diagram of development system according to a
25 preferred embodiment of the present invention;

FIG. 4 illustrates booting process sequence diagram of development
system according to a preferred embodiment of the present invention.

30

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a mobile device, smartphone development system for real-time designing, interfacing & programming of the various components of smartphone. The system of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof.

The development system of present invention includes real hardware, software, sensing and communicating components to build a smartphone. Thus it provides three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

Accordingly, the system of present invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera, Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only provides the freedom to modify, customize and create operating system,

5 hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART, USB, SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

10 FIG. 1 illustrates architecture block diagram of system according to a preferred embodiment of the present invention. The system (100) includes a processing unit (101), a memory database (102) and interface unit (not shown) of processing unit which couples the processor with and/or to the various communication interface such as I/O interface (104), memory
15 interface (105), sensory interface (106), communication interface (107) and Application/OS interface (103).

According to an embodiment of present invention the processing unit (101) is a computing platform to perform all customized operation, which
20 comprises a processor and an interface unit for communication with plurality of application specific communication interface. The processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and
25 Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

30 The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as
35 SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106)

5 provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

10

In an embodiment of present invention a customized mobile device or smartphone is provided in which one or more hardware element and/or software element can be selected according to user need to create a new smartphone device, application software and testing environment for

15 further development.

FIG. 2 illustrates layout of primary components of development system according to a preferred embodiment of the present invention. Here the figure illustrates different hardware component used in the development of

20 platform of present invention. However, the scope of present invention is not limited to these only. The detailed description of each component and its functioning is explained later in the specification.

FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention. The system of present invention runs on a highly customizable operating system (MyOS) allowing integration of multiple hardware component and software component into a single platform. The system (300) consists of hardware element (301), which runs on MyOS operating system. The MyOS operating system is specifically designed for a unified platform capable of customizing

25 hardware and operating system for building smartphone. When system is switched ON, hardware (301) memory is booted with operating system (MyOS) and input/output (303) interface with one or more user selected sensors (304) and communication technology (305) creates a customized

30

5 phone environment for user applications (306) development and execution.

The development system of the present invention is low cost and open source solution for users, students, faculty and developers to experiment
10 and innovate new designs, products and solutions for education, entertainment, agriculture and health application and offers following advantages:

- 15 • Provides unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS and Application software.
- Allows operating system customization for the kernel porting and specific requirement.
- 20 • Uses Python as a preferred programming environment to integrate both hardware, operating system, and the application.
- Acts as an integrated solution for sensor interfacing, programming and mobile application development through open source tools and technologies.
- 25 • Provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

According to an embodiment of present invention the mobile device or smartphone development system of the present invention comprises
30 primarily of following components:

The one or more hardware components used in the system are described herein:

- 35 a) Computing Platform: Raspberry Pi(R-Pi) is being used as a preferred computing platform. It uses the Broadcom SoC with ARM11 processor and operates at 700 MHz. It is widely used low

5 cost platform for various product design and developments presently.

10 b) Camera Module: This module can be used to take high definition video, as well as stills photographs with options like time-lapse, slow motion and video cleverness. It is a five mega pixel fixed focus camera that supports 1080p30, 720p60 and VGA90 video modes as well as still captures.

15 c) Touch Screen: It features a 2.8" display with 320x240, 16-bit color pixels and a resistive touch overlay. The plate uses the high speed SPI interface and can use the mini display as a console for displaying text, images or video etc.

20 d) Sensors: Various sensors such as temperature, humidity, accelerometer, smoke & pulse sensor are integrated with R-Pi.

The communication technology supported by present system may comprise following network communication modules:

25 a) GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots.

30 b) Bluetooth: Class-2 Bluetooth module with Serial Port Profile, which can be configured as either Master or Slave, a drop-in replacement for wired serial connections.

35

- 5 c) GPS: It provides the real time position information in NMEA format.
This data includes the complete PVT (position, velocity, time)
solution computed by the GPS receiver.
- 10 d) ZigBee: ZigBee is a specification for a suite of high-level
communication protocols used to create personal area networks
built from small, low-power digital radios based on an IEEE
802.15.4 standard.
- 15 e) Wi-Fi: It is wireless LAN based on IEEE 802.11 standard that
allows an electronic device to inter networking using 2.4 GHz UHF
and 5 GHz SHF ISM radio bands.

The application software component supported by present mobile device
development platform comprises:

- 20 a) MyOS: To meet the user requirements standard embedded Linux
kernel is optimized and configured for the intended hardware and
software, to get new functionalities and to test new features as per
application specific requirements. The MyOS is configured for
platform application however it can be recompiled, customized and
25 ported into the platform for a specific requirement.
- b) Set of application programs and projects are created to experiment
the concepts of various subjects as mentioned earlier.

30 The present invention accordingly provides a universal development
system for experimenting the concepts of mobile computing, embedded
systems, communication protocols and networks, sensors, interfacing
peripherals as an integrated solution.

35 The system architecture of the present invention primarily consists of:

5 (a) OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size.

(b) Hardware interfacing as per user requirement that include application specific sensors, actuators, MIC, speaker, buzzer,
10 camera, display, user interface, communication module, vibrators, I/O memory or SD card extension etc.

(c) Programming for mobile system design or for mobile application programming (app development) using python.

15

According to an embodiment of the present invention on power-on development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors,
20 communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

25 FIG. 4 illustrates a booting process sequence diagram of development system according to a preferred embodiment of the present invention. The process starts at step (401), when system is switched ON, at the time of initialization, customized operating system (MyOS) gets loaded from card memory into RAM at step (402). This enables loading of the kernel of customized operating system (MyOS) in to the memory that consists of
30 integrated development environment (IDE) for application development.

In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A
35 single element or other unit may fulfill the functions of several items recited

5 in the claims. The mere fact that certain measures are recited in mutually
different dependent claims does not indicate that a combination of these
measures cannot be used to advantage.

10 The present invention can be implemented in any convenient form, for
example using dedicated hardware, or a mixture of dedicated hardware
and software. The present invention may be implemented as computer
software implemented by one or more networked processing apparatuses.
The network can comprise any conventional terrestrial or wireless
15 communications network, such as the Internet. The processing
apparatuses can comprise any suitably programmed apparatuses such
as a general purpose computer, personal digital assistant, mobile
telephone (such as a Wireless Application Protocol (WAP) or 3G-
compliant phone) and so on. Since the present invention can be
implemented as software, each and every aspect of the present invention
20 thus encompasses computer software implementable on a programmable
device.

The computer software can be provided to the programmable device using
any storage medium or carrier medium for storing processor readable
25 code such as a flexible disk, a compact disk read only memory (CD-ROM),
a digital versatile disk read only memory (DVD-ROM), DVD recording
only/rewritable (DVD-R/RW), electrically erasable and programmable read
only memory (EEPROM), erasable programmable read only memory
(EPROM), a memory card or stick such as USB memory, a memory chip,
30 a mini disk (MD), a magneto optical disc (MO), magnetic tape, a hard disk
in a server, a solid state memory device or the like, but not limited to
these.

The hardware platform includes any desired kind of hardware resources
35 including, for example, a central processing unit (CPU), a random access

5 memory (RAM), and a hard disk drive (HDD). The CPU may be implemented by any desired kind of any desired number of processor. The RAM may be implemented by any desired kind of volatile or non-volatile memory. The HDD may be implemented by any desired kind of non-volatile memory capable of storing a large amount of data. The hardware
10 resources may additionally include an input device, an output device, or a network device, depending on the type of the apparatus. Alternatively, the HDD may be provided outside of the apparatus as long as the HDD is accessible. In this example, the CPU, such as a cache memory of the CPU, and the RAM may function as a physical memory or a primary
15 memory of the apparatus, while the HDD may function as a secondary memory of the apparatus.

In the above-described example embodiment, a computing environment can be created using a computer used with a computer-readable program, described by object-oriented programming languages such as C++, Java
20 (registered trademark), JavaScript (registered trademark), Perl, Ruby, Python or legacy programming languages such as machine language, assembler language to control functional units used for the apparatus or system. For example, a particular computer (e.g., personal computer, work station) may control information processing apparatus or an image
25 processing apparatus using a computer-readable program, which can execute the above-described processes or steps. In the above described embodiments, at least one or more of the units of apparatus can be implemented in hardware or as a combination of hardware/software combination. In example embodiment, processing units, computing units,
30 or controllers can be configured using various types of processors, circuits, processing devices, processing circuits or the like such as a programmed processor, a circuit, an application specific integrated circuit (ASIC), used singly or in combination. A circuit is a structural assemblage of electronic
35 components including conventional circuit elements, integrated circuits

5 including application specific integrated circuits, standard integrated
circuits, application specific standard products, and field programmable
gate arrays. Further, a circuit includes central processing units, graphics
processing units, and microprocessors, which are programmed or
configured according to software code. A circuit does not include pure
10 software, although a circuit does include the above-described hardware
executing software.

In the present invention all references related to mobile device may be
assumed as mobile phone, smartphone, phone device, tablets, portable
15 device and computing device and may be used interchangeably. Further,
terms like "system" and "platform" are used interchangeably and
synonymously throughout this document.

Numerous additional modifications and variations are possible in light of
20 the above teachings. It is therefore to be understood that within the scope
of the appended claims, the disclosure of the present invention may be
practiced otherwise than as specifically described herein. For example,
elements and/or features of different examples and illustrative
embodiments may be combined each other and/or substituted for each
25 other within the scope of this disclosure and appended claims.

5 **We Claim:**

1. A system (100) for creating customizable mobile device for learning and development comprising:

a memory database (102);

10 a processing unit (101) coupled to the memory database (102) storing therein one or more instructions to be executed by the processing unit (101);

an interfacing unit operatively coupled to processing unit (101) to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database (102); ~~the interface unit comprises consisting~~ plurality of multi-input/output interface different from each other, wherein the interface unit comprises

-an application program interface (103);

-an external memory communication interface (105);

20 -a multiple sensors communication interface (106);

-a network communication interface (107); and

-a universal communication interface (104).

25 2. The system (100) as claimed in claim 1, wherein the application program interface (103) is customizable to select one or more application specific operating system environments.

3. The system (100) as claimed in claim 1, wherein memory interface (105) provides communication to high speed memory devices.

30 4. The system (100) as claimed in claim 1, wherein sensors communication interface (106) provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity sensor,

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5 accelerometer sensor, gyroscope, light sensor, GPS, and fingerprint sensors.

10 5. The system (100) as claimed in claim 1, wherein the universal communication interface (104) provides communication to plurality of input/output devices selected from the group consisting of touch screen, display, keyboard, speaker, microphone and camera.

15 6. The system (100) as claimed in claim 1, wherein the network communication interface (107) provides communication with one or more communication technology selected from the group consisting of Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

20 ~~7. A system for creating customizable mobile device for learning and development comprising;~~
~~a memory database;~~
~~a processing unit operatively coupled to memory database for executing one or more instruction stored therein; and~~
~~a multi input/output interface for providing communication with one or more smartphone operating system, network~~
25 ~~communication technology, sensors and I/O devices.~~

Dated this 28th day of January, 2016



RASHMI TYAGI
IN/PA-1594
AGENT FOR APPLICANT

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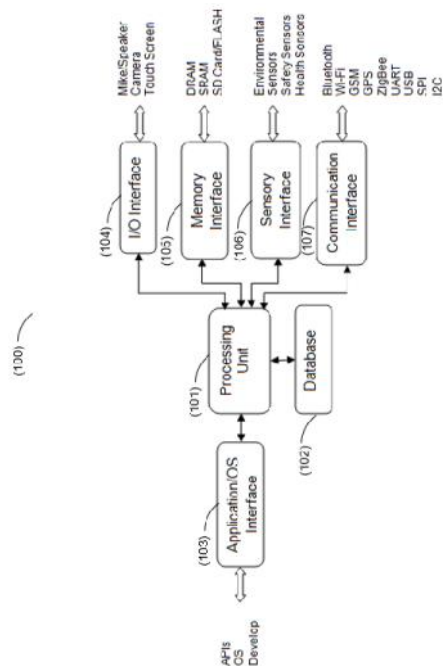
ABSTRACT

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A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMARTPHONE

The present invention relates to a system (100) and method providing a unified platform for real time programming, designing and customizing smartphone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform (100) includes a processing unit (101) for controlling and managing the operation of one or more interface controllers. The one or more interface controller comprise memory interface (105), communication interface (107), input/output interface (104), sensor interface (106), application programming interface (103) for application programming and operating system customization.

Fig. 1



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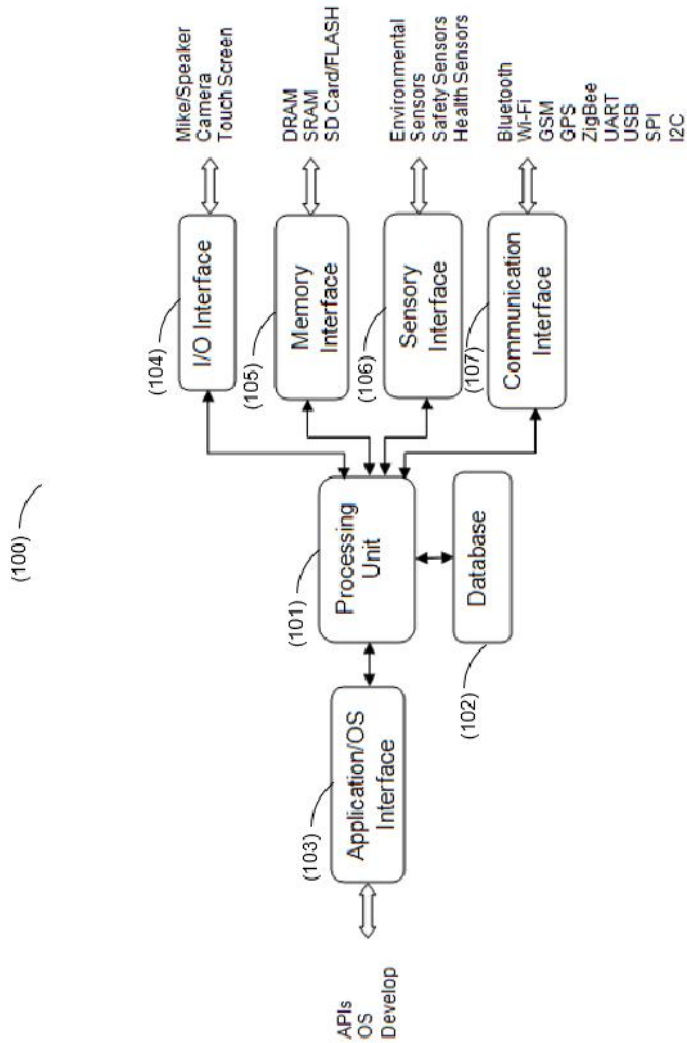


Fig. 1 **FIG.1**

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Rashmi Tyagi

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RASHMI TYAGI

(IN/PA-1594)

AGENT FOR APPLICANT

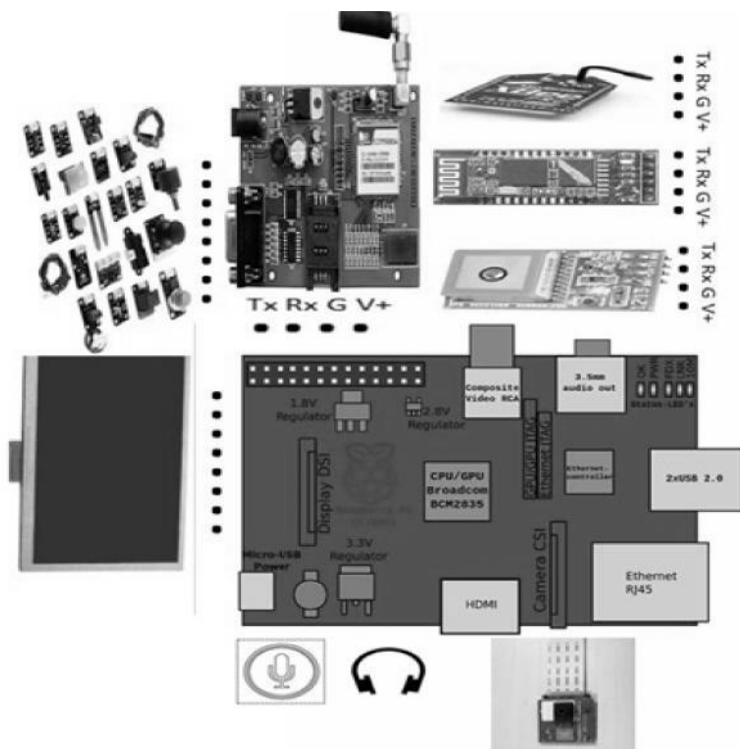


Fig. 2 **FIG. 2**

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Rashmi Tyagi

RASHMI TYAGI

(IN/PA-1594)

AGENT FOR APPLICANT

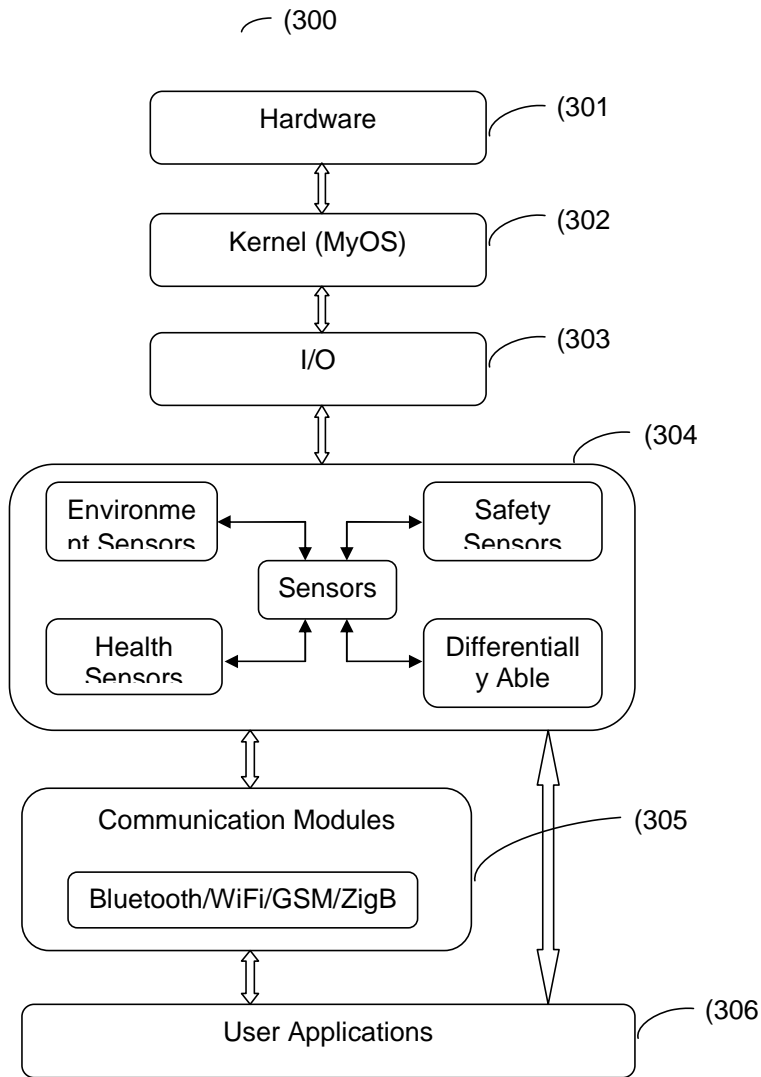


Fig. 3 FIG. 3

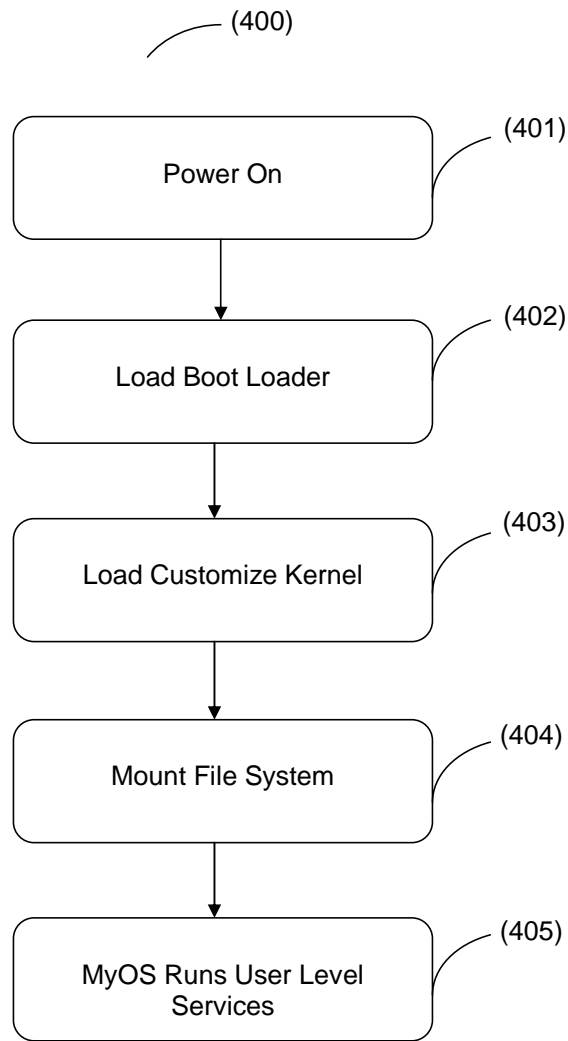
Rashmi Tyagi

RASHMI TYAGI
(IN/PA-1594)
AGENT FOR APPLICANT

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~~Fig. 4~~ FIG. 4

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AGENT FOR APPLICANT

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In the matter of the Patent Act, 1970
And
In the matter of The Patent Rules, 2003
And
In the matter of Indian Patent Application
No. 249/DEL/2015 filed on 28/01/2015

PETITION UNDER RULE 137

We, **Indira Gandhi Delhi Technical University for Women**, the applicants in the above application and petitioners herein beg to submit as follows:

- That we have filed an application at the Indian Patent Office, Delhi on 28/01/2015 as assignees of the true and first inventors.
- That there was a delay in submitting Form-3 physically at IPO.
- That rule 137 allows the Applicant to rectify the irregularity occasioned by filing a Petition U/R 137.
- That the Applicant has rectified the irregularity occasioned by filing Form-3 (to overcome objection in FER) on 13/09/2020 along with this Petition.

We, therefore, humbly request that irregularity with regard to filing Form-3 may be condoned.

For this act of kindness, your petitioner shall ever be grateful.

Dated this 13th day of September 2020

Rashmi Tyagi

Rashmi Tyagi

IN/PA-1594

Agent for Applicant

To
The Controller of Patents,
The Patent Office, at New Delhi

In the matter of the Patent Act, 1970
And
In the matter of The Patent Rules, 2003
And
In the matter of Indian Patent Application
No. 249/DEL/2015 filed on 28/01/2015

PETITION UNDER RULE 137

We, **Indira Gandhi Delhi Technical University for Women**, the applicants in the above application and petitioners herein beg to submit as follows:

- That we have filed an application at the Indian Patent Office, Delhi on 28/01/2015 as assignees of the true and first inventors.
- That there was a delay in submitting Form 5 physically at IPO.
- That rule 137 allows the Applicant to rectify the irregularity occasioned by filing a Petition U/R 137.
- That the Applicant has rectified the irregularity occasioned by filing Form 5 (to overcome objection in FER) on 13/09/2020 along with this Petition.

We, therefore, humbly request that irregularity with regard to filing Form 5 may be condoned.

For this act of kindness, your petitioner shall ever be grateful.

Dated this 13th day of September 2020

Rashmi Tyagi

Rashmi Tyagi

IN/PA-1594

Agent for Applicant

To
The Controller of Patents,
The Patent Office, at New Delhi

In the matter of the Patent Act, 1970
And
In the matter of The Patent Rules, 2003
And
In the matter of Indian Patent Application
No. 249/DEL/2015 filed on 28/01/2015

PETITION UNDER RULE 137

We, **Indira Gandhi Delhi Technical University for Women**, the applicants in the above application and petitioners herein beg to submit as follows:

- That we have filed an application at the Indian Patent Office, Delhi on 28/01/2015 as assignees of the true and first inventors.
- That there was a delay in submitting Form-1 towards Proof of Right.
- That rule 137 allows the Applicant to rectify the irregularity occasioned by filing a Petition U/R 137.
- That the Applicant has rectified the irregularity occasioned by filing Form-1 (to overcome objection in FER) on 13/09/2020 along with this Petition.

We, therefore, humbly request that irregularity with regard to filing Form-1 may be condoned.

For this act of kindness, your petitioner shall ever be grateful.

Dated this 13th day of September 2020

Rashmi Tyagi

Rashmi Tyagi

IN/PA-1594

Agent for Applicant

To
The Controller of Patents,
The Patent Office, at New Delhi



**INTELLECTUAL
PROPERTY INDIA**

एकस्व/PATENTS|अभिकल्प/DESIGNS|
व्यापार चिह्न/TRADE MARKS|भौगोलिक
उपदर्शन/GEOGRAPHICAL INDICATIONS



सत्यमेव जयते

भारत सरकार

GOVERNMENT OF INDIA

एकस्व कार्यालय /THE PATENT OFFICE
बौद्धिक सम्पदा भवन / I.P.O. BUILDING
प्लॉट नं. 32/ PLOT NO. 32
सेक्टर -14/ SECTOR 14, द्वारका/ DWARKA
नई दिल्ली/NEW DELHI -110078
दूरभाष /Tel. No. : 011-25300200
फ़ैक्स /Fax : 011-28034301/02/15
ई मेल /Email : delhi-patent@nic.in
वेबसाइट /Website:<http://ipindia.nic.in>

सं.संख्या/Ref.No /आवेदन संख्या/Application No/ 249/DEL/2015

दिनांक/Date of Dispatch/Email: 13/03/2020

सेवा में,/To

RASHMI TYAGI,

#250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India

Email : rashmi@elpisinnovation.com,rashmi.tyagi@hotmail.com

विषय: एकस्व अधिनियम, 1970 की धारा 12 व 13 तथा एकस्व नियम, 2003 के अधीन परीक्षण रिपोर्ट

Subject: Examination report under sections 12 & 13 of the Patents Act, 1970 and the Patents Rules, 2003.

1. उपर्युक्त आवेदन के संदर्भ में परीक्षण रिपोर्ट (अर्थात, एकस्व नियम, 2003 (यथा संशोधित) के नियम 24-ख(3) में विनिर्दिष्ट आपत्तियों का प्रथम कथन) इसके साथ संलग्न है। यह रिपोर्ट परीक्षण हेतु अनुरोध दिनांक 27/09/2016 के उत्तर में जारी की गयी है। परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि (अर्थात, इस रिपोर्ट में लगाई गयी सभी आवश्यकताओं के अनुपालन की अवधि) आवेदक को आपत्तियों का प्रथम कथन जारी होने की तिथि से छः माह है।

Please find enclosed herewith an Examination Report (i.e. a first statement of objections as specified in Rule 24-B(3) of The Patents Rules, 2003 (as amended)) in respect of above-mentioned application. This report is issued with reference to a request for examination dated 27/09/2016. The last date for filing a response to the Examination Report (i.e. a period to comply with all the requirements raised in this examination report) is six months from the date on which the first statement of objections is issued to the Applicant.

2. यदि रिपोर्ट के अंतर्गत लगाई गयी आवश्यकताओं का अनुपालन एकस्व नियम, 2003 (यथा संशोधित) के नियम 24 ख(5) में विनिर्दिष्ट अवधि के भीतर अंदर अनुपालन नहीं किया गया तो एकस्व अधिनियम 1970 की धारा 21(1) के अधीन वर्तमान आवेदन को परित्यक्त माना जाएगा।
The instant application shall be deemed to have been abandoned under Section 21(1) of The Patents Act, 1970, unless all the requirements raised in this report are complied with in the period as specified in Rule 24-B (5) of The Patents Rules, 2003 (as amended).

3. आपका ध्यान एकस्व नियम, 2003 के नियम 24 ख(6) के प्रावधानों की ओर भी आमंत्रित किया जाता है।
Your attention is also invited to the provisions of Rule 24-B (6) of the Patents Rules 2003.

4. आपको सलाह दी जाती है कि शीघ्र निपटान हेतु अपना उत्तर शीघ्र प्रस्तुत करें।
You are advised to file the reply at the earliest for early disposal.

Anjali
नियंत्रक पेटेंट/ Controller of Patents

संलग्न/Enclosed: अपरोक्त अनुसार/As above

टिप्पणी: यह इलेक्ट्रॉनिक रूप से उत्पन्न रिपोर्ट है।

NOTE: This is an electronically generated report.

सभी पत्राचार नियंत्रक एकस्व को उपरोक्त पते पर भेजा जाये।

All communications should be sent to the Controller of Patents at the above mentioned address.

परीक्षण रिपोर्ट / Examination Report

आवेदन संख्या /Application Number	249/DEL/2015
दाखिल करने की तिथि /Date of Filing	28/01/2015
पूर्विका दिनांक /Date of Priority	--
पीसीटी अंतर्राष्ट्रीय आवेदन की संख्या व दिनांक / PCT International Application No. & Date	--
आवेदक /Applicant	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
परीक्षण हेतु अनुरोध की संख्या व दिनांक /Request for Examination No. & Date	R20161027738 27/09/2016
प्रकाशन की तिथि /Date of Publication	19/08/2016

इस परीक्षण रिपोर्ट के चार भाग हैं, अर्थात रिपोर्ट का सारांश, विस्तृत तकनीकी रिपोर्ट, औपचारिक आवश्यकताएँ तथा रिकॉर्ड में दस्तावेज़ / This examination report consists of four parts, namely summary of the report, detailed technical report, formal requirements and documents on record.

भाग -1: रिपोर्ट का सारांश

PART-I: SUMMARY OF THE REPORT

क्र. सं. /Sl. No.	अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियां /Requirements under the Act	दावों की संख्या /Claim Numbers	टिप्पणी /Remarks	
1.	धारा 2(1)(ग) के तहत आविष्कार /Invention u/s 2(1)(j)	नवीनता /Novelty	दावे /Claims: दावे /Claims: 1-7	हाँ /Yes नहीं /No
		आविष्कारी कदम / Inventive step	दावे /Claims: दावे /Claims: 1-7	हाँ /Yes नहीं /No
		औद्योगिक उपयोगिता /Industrial Applicability	दावे /Claims: 1-7	हाँ /Yes
			दावे /Claims:	नहीं /No
2.	धारा 3 के अधीन पेटेंट-अयोग्यता (यदि हाँ, खंड 3(क-त) /Non-patentability u/s 3 (if yes, specify section3(a-p))	दावे /Claims: 1-7	हाँ /Yes k	
		दावे /Claims:	नहीं /No	
3.	धारा 10 (5) के अधीन आविष्कार की एकलता /Unity of invention u/s 10 (5)	दावे /Claims:	हाँ /Yes	
		दावे /Claims: 1-7	नहीं /No	
4.	धारा 10(4) के अधीन प्रकटन की दक्षता (हाँ/नहीं निर्दिष्ट करें)/Sufficiency of disclosure u/s 10 (4) (Specify Yes/No)	1-7		
5.	[धारा 10(5) व 10(4) (ग)] के अधीन दावे /Claims [u/s 10(5) & 10(4) (c)]	क्षेत्र /Scope	दावे /Claims: दावे /Claims: 1-7	हाँ /Yes नहीं /No

भाग -II विस्तृत तकनीकी रिपोर्ट

PART-II: DETAILED TECHNICAL REPORT

क. उद्धरित दस्तावेजों की सूची /A.List of documents cited:

(क) पेटेंट साहित्य / (a). Patent Literature :

क्र. सं.	दस्तावेजों का विवरण	प्रकाशन	उद्धरित दस्तावेज का प्रसंगिक विवरण (पृष्ठ व अनुच्छेद संख्या)	उद्धरित दस्तावेज के प्रासंगिक दावे /	अभिकथित आविष्कार के
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/ Sl.no	/Details of documents	तिथि(दिन/माह/वर्ष) / Publication date	/ Relevant description (page and paragraph no.) of cited document	प्रासंगिक दावा / Relevant claims of cited document	दावे /Claims of alleged invention
1	D1: US8875095B2	28/10/2014	Abstract ; Figure 1 ; Description paragraphs 2-18	1-19	1-7
2	D2: US8719781B2	06/05/2014	Abstract ; Figure 1 ; Description paragraphs 2-15	1-19	1-7
3	D3: US8694968B2	08/04/2014	Abstract ; Figure 1 ; Description paragraphs 2-14	1-36	1-7

(ख) गैर-पेटेंट साहित्य / (b). Non-patent literature

कोई दस्तावेज़ उद्धृत नहीं है / No Document Cited

ख. अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ / B. Detailed observations on the requirements under the Act:

(1). नवीनता / NOVELTY:

(I) ऊपर उद्धरित दस्तावेज़ के संदर्भ (1-7) में दिये गए प्रकटन के पूर्वानुमान को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-7) में नवीनता की कमी है /

Claim(s) (1-7) lack(s) novelty, being anticipated in view of disclosure in the document cited above under reference for the following reasons:

D1 discloses a systems and methods for developing, customizing, and deploying mobile device applications through a mobile application development and deployment platform. Preferably, these systems and methods are implemented in an Internet based environment that allows non-technical users to build sophisticated, highly-customizable cross-platform mobile applications. The platform allows users to select, input, create, customize, and combine various content, design characteristics, and application components, such as modules, some of which utilize features and functionality associated with various mobile devices and mobile operating systems. In certain embodiments, the platform allows users to compile, and generate a configuration file for, the mobile application that can be distributed to end users for execution on various mobile devices and mobile operating systems. When the mobile application is installed on, or executed by the mobile device, the configuration file may enable the retrieval of various data associated with the mobile application.

In view of the cited document D1, the claims are not novel u/s 2(1)(j) of The Patent Act 1970 (as amended).

(2). आविष्कारी कदम / INVENTIVE STEP:

(I) ऊपर उद्धरित दस्तावेज़(जों) के संदर्भ में स्पष्ट अध्यापन(जों) को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-7) में आविष्कारी कदम की कमी है

Claim(s) (1-7) lack(s) inventive step, being obvious in view of teaching (s) of cited document(s) above under reference for the following reasons:

D2 discloses a method of developing a software application configured to run on a computing device in an

adaptive fashion and independent of operating system, database system, and presentation medium, comprising the steps of: using an operating system-independent computer programming language to create the software application comprised of one or more modules; using a persistence layer in the software application abstracting access to a database residing on a physical storage medium wherein the persistence layer abstracting access to data records at runtime without hardcoding specific information about each record type; using a record management layer in the software application collecting and manipulating data record information in the persistence layer through both an application programming interface and one or more user interfaces and providing management functionality at runtime for a given record type; using an adaptive presentation layer in the software application generating a plurality of views from a single set of data models that display on a plurality of presentation media and wherein the presentation layer auto-generating views at runtime based on the structure of the data models such that the views reflect changes in the database; and releasing the software application for use on one or more computing devices. D3 discloses a computer-implemented method for creating, managing and distributing a mobile device operating software package, the method comprising: receiving a selection of at least one of a logic and data element from at least one of a shape, component, connections, color, and label palette to add to a data and logic canvas and a user interaction element from at least one of a graphic, widget, audio/video, or haptic palette to add to a multimedia user interaction canvas to form a mobile device operating software package; testing the mobile device operating software package using a generic device model testing module; submitting the mobile device operating software package to a distribution center; and distributing the mobile device operating software package to a mobile device.

In view of the cited documents D2 and D3, the claims do not contain inventive step u/s 2(1)(ja) of The Patent Act 1970 (as amended).

(3).पेटेंट अयोग्यता /NON PATENTABILITY:

(I) निम्नलिखित कारणों से धारा 3 के खंड (k) के प्रावधान के तहत दावा(वे) (1-7) सांविधिक रूप से पेटेंट योग्य नहीं हैं / Claim(s) (1-7) are statutorily non-patentable under the provision of clause (k) of Section 3 for the following reasons:

Without prejudice to objection U/S 2(1)(j), the subject matter of the claims as filed in the instant application falls within scope of clause (k) of section (3) of the Patents Act, 1970 (as amended). Therefore the invention claimed in the said claims is not patentable. In the method claims, steps are algorithmic steps. These can be implemented by software means only which works based on algorithms. Also system claims do not contribute in the constructional or structural aspects of the alleged invention and the alleged contribution lies only in algorithmic steps which make the system functional.

(4).आविष्कार की एकलता /UNITY OF INVENTION:

(I) दावा(वों) 1-7 में आविष्कार की एकलता की कमी है क्योंकि दावे किसी एक आविष्कार या आविष्कारों का समूह जो मिलकर एक आविष्कारी संकल्पना की संरचना करें उससे संबन्धित नहीं हैं। Claim(s) 1-7 lack(s) unity of invention as the claims do not relate to a single invention or to a group of inventions linked so as to form a single inventive concept:

Claims 1-7 do not form a single inventive concept. Claims 1-6 and 7 form different set of inventive concepts hence not allowable as a single application u/s 10(5) of the Patents Act, 1970 (as amended).

(II) इस आवेदन का दावा (के दावे) सह-लंबित आवेदन संख्या के दावे के परस्पर विरोध में है। Claim(s) of the instant application conflict(s) with claim(s) of co-pending application no.

(6).प्रकटन की दक्षता /SUFFICIENCY OF DISCLOSURE:

(I) विनिर्देश पूर्णतया: व विशेषकर आविष्कार तथा इसके संचालन तथा विधि के निष्पादन के संबंध में विवरण नहीं देते हैं। The complete specification does not fully and particularly describe the invention and its operation and the method

by which it is to be performed in respect of:

The complete specification does not fully and particularly describe the invention and its operation or use and the method by which it is to be performed. Also the complete specification does not disclose the best method of performing the invention which is known to the applicant and for which he is entitled to claim protection.

(7).क्षेत्र /SCOPE:

(I) दावा(ते) 1-7 आविष्कार के उस क्षेत्र जिस के लिए संरक्षण का दावा किया गया है उसे निम्नलिखित कारणों से परिभाषित नहीं करता(ते) है।
Claim(s) 1-7 does/do not define the scope of invention for which the protection is claimed for the following reasons:

1. Words and phrases like "according to", "as recited in", "characterized in that" or "further comprising" should not be used in claims. These words and phrases make the scope of invention indefinite.
2. The technical features of the claims are not referenced with numerals in parenthesis to enhance the intelligibility of the claims.

भाग – III: औपचारिक आवश्यकताएँ /PART-III: FORMAL REQUIREMENTS

आपत्तियाँ /Objections	टिप्पणी /Remarks
Statement & Under Taking (Form 3 Details)	The period within which the applicant shall file the statement and undertaking under sub-section (1) of section 8 is six months from the date of filing the application. Annexure to form 3 has not been filed in accordance to rule 12 (1A) of The Patents Rule 2003 (as amended).
Format of Specification (rule 13)	<ol style="list-style-type: none"> 1. Complete specification has not been prepared following font, margin and line numbering requirements of rule 9 of The Patent Rules, 2003 (as amended). 2. Irrelevant content, like reference of foreign applications, white spaces and other information from header and footer of the pages, has not been deleted from the Complete Specification.
Format of Drawings	Name of applicant, number of sheets of drawings, consecutive number of sheets and signature of applicant or his agent should be on drawings as per rule 15 of The Patent Rules, 2003 (as amended). Drawings are not submitted as per rule 15 of The Patent Rules, 2003 (as amended).
Other Deficiencies	<ol style="list-style-type: none"> 1. Form-5, Form-3, drawings and claims are not signed by the authorised patent agent. 2. Complete Address of the inventor "Suresh Chande" has not been provided. 3. Proof of right has not been submitted within prescribed period (within 6 month of the provisional specification) as mentioned u/r 10 of The Patents Rule 2003 (as amended). 4. Form-5 has not been submitted within the prescribed time period. 5. Power of Authority has not been submitted in favour of signatories to various forms. Names of agents provided on various forms and submitted Power of Attorney are not in accordance with those provided in the Patent Agent Register. Patent agent registration number is not provided on submitted copy of Power of Attorney.

6. Necessary figures should be provided with abstract as per rule 13(7) of The Patent Rules, 2003 (as amended).

भाग-IV: रिकॉर्ड में दस्तावेज़ /PART-IV: DOCUMENTS ON RECORD

निम्नलिखित दस्तावेज़ों के आधार पर यह परीक्षण रिपोर्ट तैयार की गयी है

The examination report has been prepared based on the following documents:

कार्यसूची तिथि / Docket Date	कार्यसूची संख्या /Docket Number	प्रविष्टि संख्या विवरण /Entry Number Description
28 Jan 2015	2951	1-New Application For Patent With Provisional /Complete Specification
02 Dec 2015	38892	OTHERS(NON CASH)
02 Dec 2015	38892	OTHERS(NON CASH)
28 Jan 2016	3080	2-Complete After Provisional Specification - Form 2 Check For No. OF Pages & Claims
18 Feb 2016	6171	5-Declaration As To Inventorship - Form 5
05 Apr 2016	12817	OTHERS(NON CASH)
05 Apr 2016	12817	OTHERS(NON CASH)
05 Apr 2016	12817	OTHERS(NON CASH)
27 Sep 2016	45286	28(i)-Request For Examination After 18 months Publication - Form 18

नियंत्रक का नाम /Name of the Controller: [Anjali](#)

नियंत्रक स्थान /Controller Location: [Delhi](#)

टिप्पणी: परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि / Note: Last date for filing response to the Examination Report:
13/09/2020

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. Applicant: Indira Gandhi Delhi Technical University for Women

Nationality: Indian

Address: Kashmere Gate, New Delhi-110006, India

2. Statement in case of request for examination made by the applicants

We hereby request that our application for patent no. **249/DEL/2015** filed on **28th January, 2015** for the invention titled "**A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMART PHONE**" shall be examined under sections 12 and 13 of the Act.

3. Address for Service:

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh – 201007, India

Mobile No.:+91-9968284766

E-mail: rashmi.tyagi@hotmail.com

Dated 26th day of September, 2016

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANT)

To,
The Controller of Patents
The Patent Office, at New Delhi



314418

EI: RT: 249/DEL/2015

April 05, 2016

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF FORM-1 & FORM-5 IN ORIGINAL

Dear Sir,

Re: Indira Gandhi Delhi Technical University for Women**Indian Patent Application No. 249/DEL/2015****e-Filed: January 28, 2015****Title: A System for Building, Customizing Software & Hardware Interfaces of
Smart Phone**

We are submitting herewith original Form-1 & Form-5 for application **249/DEL/2015** titled
"**A System for Building, Customizing Software & Hardware Interfaces of Smart
Phone**" e-filed on January 28, 2015 for grant of patent.

Enclosures:

1. Form-1 (in original)
2. Form-5 (in original)
3. Form-5 E-filing Receipt (copy)

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi

Rashmi Tyagi (IN/PA 1594)

#250, Street No. 06, New Colony Kerhera,

Mohan Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 91 9968284766**Email:** rashmi@elpisinnovation.com

IPO DELHI 05-04-2016 16:05



314418

EI: RT: 249/DEL/2015

April 05, 2016

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The Controller of Patents
The Patent Office, at New Delhi

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Rashmi Tyagi

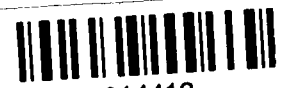
Rashmi Tyagi (IN/PA 1594)

#250, Street No. 06, New Colony Kerhera,

Mohan Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 91 9968284766**Email:** rashmi@elpisinnovation.com

IPO DELHI 05-04-2016 16:05



314412

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7, 54 & 135 and rule 20(1)]		(FOR OFFICE USE ONLY) Application No: Filing Date: Amount of Fee Paid: CBR No: Signature:	
1. APPLICANT(S)			
Name		Nationality	Address
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN		Indian	Kashmere Gate, New Delhi-110006, India
2. INVENTOR(S)			
Name		Nationality	Address
REDDY, S. Ramanarayana		Indian	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
CHANDE, Suresh		Indian	Finland
AGARWAL, Nidhi		Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
KUMAR, Sanjay		Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
MISHRA, Narendra		Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
KUMAR, Pardeep		Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
KAUR, Jasleen		Indian	Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

IPO DELHI 05-04-2016 16:05

3. TITLE OF THE INVENTION

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMART PHONE

4. ADDRESS FOR CORRESPONDENCE OF AUTHORISED PATENT AGENT IN INDIA

#250, Street No. 06, New Colony Kerhara,
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Mobile No.: +91 9968284766

E-mail: rashmi@elpisinnovation.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
N.A.	N.A.	N.A.	---	---

6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International application number	International filing date as allotted by the receiving office
N.A.	N.A.

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) application number	Date of filing Original (first) application
N.A.	N.A.

8. PARTICULARS FOR FILING PATENT OF ADDITION

Main application/Patent Number	Date of filing of main application
N.A.	N.A.

9. DECLARATIONS:**(i) Declaration by the inventor(s)**

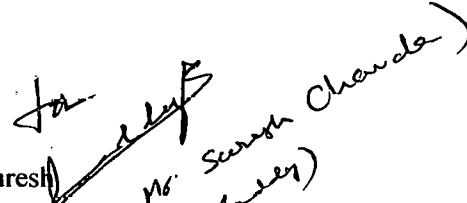
I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: REDDY, S. Ramanarayana

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: CHANDE, Suresh

(d) Date: 28.01.2015

(e) Signature: 

(f) Name: AGARWAL, Nidhi

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KUMAR, Sanjay

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: MISHRA, Narendra

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KUMAR, Pardeep

(a) Date: 28.01.2015

(b) Signature: 

(c) Name: KAUR, Jasleen

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:

(b) Signature

(c) Name

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I/we, the applicant(s) hereby declare(s) that:-

- ✓ I am/We are in possession of the above-mentioned invention.
- ✓ The provisional specification relating to the invention is filed with this application.
- ✗ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ✓ There is no lawful ground of objection to the grant of patent to me/us.
- ✓ I am/We are the assignee or legal representative or true & first inventors.
- ✗ The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention.
- ✗ I/We claim the priority from the above mentioned application(s) file in the convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- ✗ My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para – 6.
- ✗ The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed onunder section 16 of the Act.
- ✗ The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

- (a) Form 2 (Provisional Specification) [Total No. of pages: 15; Specification: 10, Drawings: 05]
- (b) General Power of Authority (Copy, for original refer to 156/DEL/2015)

Fee Rs. 8,000/- through **(Credit Card)** online payment gateway on 28.01.2015.

I/We hereby declare that to best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/we request that a patent may be granted to me/us for the said invention.

Dated this 28th day of **January 2015**

Signature: *Rashmi Tyagi*

Name: **RASHMI TYAGI**

(IN/PA-1594)

AGENT FOR THE APPLICANT

To,

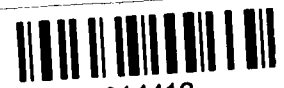
The Controller of Patents

The Patent Office,

Intellectual Property Office Building,

Plot No. 32, Sector 14, Dwarka,

New Delhi-110075



314412

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		Signature:																																	
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IPO DELHI 05-04-2016 16:05

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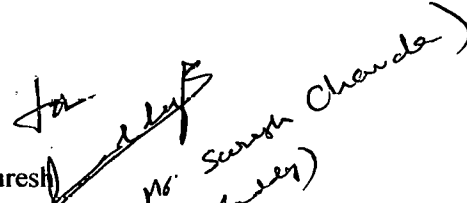
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- ✗ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
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I/We hereby declare that to best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/we request that a patent may be granted to me/us for the said invention.

Dated this 28th day of **January 2015**

Signature: *Rashmi Tyagi*

Name: **RASHMI TYAGI**

(IN/PA-1594)

AGENT FOR THE APPLICANT

To,

The Controller of Patents

The Patent Office,

Intellectual Property Office Building,

Plot No. 32, Sector 14, Dwarka,

New Delhi-110075



314418

EI: RT: 249/DEL/2015

April 05, 2016

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF FORM-1 & FORM-5 IN ORIGINAL

Dear Sir,

**Re: Indira Gandhi Delhi Technical University for Women
 Indian Patent Application No. 249/DEL/2015
 e-Filed: January 28, 2015**

**Title: A System for Building, Customizing Software & Hardware Interfaces of
 Smart Phone**

We are submitting herewith original Form-1 & Form-5 for application **249/DEL/2015** titled
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It is respectfully requested to accept and take the aforesaid document on record.

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Contact: 91 9968284766**Email:** rashmi@elpisinnovation.com

IPO DELHI 05-04-2016 16:05

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)



&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP

[See Section 10 (6) and rule 13 (6)]

1. NAME OF APPLICANT(S): INDIRA GANDHI DELHI TECHNICAL UNIVERSITY
FOR WOMEN of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 249/DEL/2015 dated 28.01.2015 are:-

2. INVENTORS(S)

(a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **CHANDE Suresh**
(b) NATIONALITY : Indian
(c) ADDRESS : Finland

(a) NAME : **AGARWAL Nidhi**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **KUMAR Sanjay**
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(a) NAME : **KAUR Jasleen**
(b) NATIONALITY : Indian
(c) ADDRESS : Department of CSE, Indira Gandhi Delhi Technical University
for Women, Kashmere Gate, New Delhi-110006, India

Dated this 18th day of February, 2016

Rashmi Tyagi

Name: **RASHMI TYAGI (IN/PA-1594)**

AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

IPO DELHI 05-04-2016 16:05

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

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Dated this **18th** day of **February, 2016**

Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND
HARDWARE INTERFACES OF SMARTPHONE”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
Kashmere Gate, New Delhi-110006, India**

The following specification describes the invention and the manner in which it is to be performed.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of smartphone development. More particularly, the invention relates to a method and system for enabling a unified platform capable of customizing hardware and operating system for building smartphone.

10

BACKGROUND OF THE INVENTION

There exists today a wide variety of small, typically handheld, electronic appliances known generally as mobile internet devices or smartphones. In the current state of the art, all such devices are designed by their manufacturers to include a variety of hardware capabilities to address as many potential end users as possible. Similarly, manufacturers determine the form factor, that is, the size, shape, weight, color, and other physical attributes, of each product, with the goal to satisfy the greatest possible number of users with the fewest specific combinations. Finally, manufacturers configure the operating software of their devices to provide a variety of functions such that a particular function or related group of functions is performed in exactly the same way on as many device models as possible.

25 The practice of limiting the number of hardware and software combinations benefits the device manufacturers by reducing the complexity of the various systems and procedures they use for product development, manufacturing, sales, and customer support. However, current and emerging mobile devices provide a great deal of programmability through the provision of software applications, or “apps”. These apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device.

5 Further, add-on software apps inherently cannot offer any ability to change
the specific hardware built into a mobile device. While most mobile
devices provide connectors and slots for adding or connecting hardware
modules that provide optional capabilities, and coupled with software apps
these hardware add-ons can be quite sophisticated, here too this practice
10 is limited to adding modules that aren't in the base device.

Finally, neither add-on software apps nor plug-in hardware modules offer
any ability to change the form factor of a device completely. End users
with a variety of special needs are generally left unsatisfied by the
15 available options.

Further, other development kits available allows to customize, create
and/or modify either software or hardware so as to make the device
compatible for any new feature or to develop an improved product. What is
20 needed, then, is system where end users or others acting on behalf of a
group of end users may create personal or custom configurations of
mobile devices or modify an existing one.

Accordingly, it would be advantageous to have an improved development
25 system for experimenting with every concept of mobile computing so as to
build and innovate new products.

Thus, considering all these facts the present invention provides an
integrated development system having improved flexibility, reduced cost,
30 and reduced associated workload that facilitates the user or others for
improved optimization, greater configurability and customization of both
hardware and software components.

5 **SUMMARY**

An object of the present invention provides a system for creating customizable mobile device for learning and development comprising, a memory database, a processing unit coupled to the memory database storing therein one or more instructions to be executed by the processing
10 unit, an interfacing unit operatively coupled to processing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database, the interface unit comprising plurality of multi-input/output interface different from each other, wherein the interface unit further comprises an application program interface, an
15 external memory communication interface, a multiple sensors communication interface, a network communication interface and a universal communication interface.

Another object of the present invention provides a system for creating
20 customizable mobile device for learning and development comprising, a memory database, a processing unit operatively coupled to memory database for executing one or more instruction stored therein and a multi-input/output interface for providing communication with one or more smartphone operating system, network communication technology,
25 sensors and I/O devices.

A further object of the present invention provides a system which allows the user to create any application or choose the already created experiments from the provided list to run and test the concepts for
30 necessary understanding and analysis specific to the mobile computing, embedded systems, sensor interfacing and wired/wireless communication protocols.

Another object of the present invention provides a system for performing
35 several experiments to demonstrate the concepts in real environment

5 related to such as but not limited to language C & Python programming,
socket & shell programming, sensor networks, mobile communication,
databases, embedded systems, etc. and manual or in book or CD form
“How to create the experiments with step by step procedure” as an unified
integrated solution. A web based add-on complimentary material or
10 projects are also provided online free of cost to users.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be
apparent from the following description when read with reference to the
15 accompanying drawings.

FIG. 1 illustrates basic architecture and various components of
development system according to a preferred embodiment of the present
invention;

20

FIG. 2 illustrates primary components layout of development system
according to a preferred embodiment of the present invention;

FIG. 3 illustrates flow diagram of development system according to a
25 preferred embodiment of the present invention;

FIG. 4 illustrates booting process sequence diagram of development
system according to a preferred embodiment of the present invention.

30

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only
10 provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a mobile device, smartphone development
15 system for real-time designing, interfacing & programming of the various components of smartphone. The system of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating
20 software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof.

The development system of present invention includes real hardware, software, sensing and communicating components to build a smartphone.
25 Thus it provides three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

30 Accordingly, the system of present invention integrates the real mobile components such as TFT, LCD, LED, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi, Multimedia, Camera, Sensors, Buzzers, MyOS, Graphical User Interface (GUI), software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only
35 provides the freedom to modify, customize and create operating system,

5 hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART, USB, SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

10 FIG. 1 illustrates architecture block diagram of system according to a preferred embodiment of the present invention. The system (100) includes a processing unit (101), a memory database (102) and interface unit (not shown) of processing unit which couples the processor with and/or to the various communication interface such as I/O interface (104), memory
15 interface (105), sensory interface (106), communication interface (107) and Application/OS interface (103).

According to an embodiment of present invention the processing unit (101) is a computing platform to perform all customized operation, which
20 comprises a processor and an interface unit for communication with plurality of application specific communication interface. The processing unit (101) communicates with various interfaces that can be selected from one or more group, for example, an application interface which provides access to Android OS environment, Linux OS environment, Windows and
25 Mac OS environment and other application operating system environments to create a customized operating system and to learn the effect of newly created OS environment on a mobile device or smartphone operation.

30 The I/O interface (104) allows connection to such as but not limited to the speaker, microphone, buzzer, camera, touch screen, display, user interface, keyboard and other input/output devices. The memory interface (105) provides connection with one or more high speed memory RAM required to be used in the customized smartphone platform such as
35 SDRAM, DRMA and SD CARD/FLASH. The sensor interface (106)

5 provides communication to application specific sensors such as health sensors, environment sensors, safety sensors and device activity sensors, etc. The communication interface (107) provides connection to one or more network communication technology but not limited to Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

10

In an embodiment of present invention a customized mobile device or smartphone is provided in which one or more hardware element and/or software element can be selected according to user need to create a new smartphone device, application software and testing environment for further development.

15

FIG. 2 illustrates layout of primary components of development system according to a preferred embodiment of the present invention. Here the figure illustrates different hardware component used in the development of platform of present invention. However, the scope of present invention is not limited to these only. The detailed description of each component and its functioning is explained later in the specification.

20

FIG. 3 illustrates flow diagram of development system according to a preferred embodiment of the present invention. The system of present invention runs on a highly customizable operating system (MyOS) allowing integration of multiple hardware component and software component into a single platform. The system (300) consists of hardware element (301), which runs on MyOS operating system. The MyOS operating system is specifically designed for a unified platform capable of customizing hardware and operating system for building smartphone. When system is switched ON, hardware (301) memory is booted with operating system (MyOS) and input/output (303) interface with one or more user selected sensors (304) and communication technology (305) creates a customized

25

30

5 phone environment for user applications (306) development and execution.

The development system of the present invention is low cost and open source solution for users, students, faculty and developers to experiment
10 and innovate new designs, products and solutions for education, entertainment, agriculture and health application and offers following advantages:

- 15 • Provides unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth, ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS and Application software.
- Allows operating system customization for the kernel porting and specific requirement.
- 20 • Uses Python as a preferred programming environment to integrate both hardware, operating system, and the application.
- Acts as an integrated solution for sensor interfacing, programming and mobile application development through open source tools and technologies.
- 25 • Provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

According to an embodiment of present invention the mobile device or smartphone development system of the present invention comprises
30 primarily of following components:

The one or more hardware components used in the system are described herein:

- 35 a) Computing Platform: Raspberry Pi(R-Pi) is being used as a preferred computing platform. It uses the Broadcom SoC with ARM11 processor and operates at 700 MHz. It is widely used low

5 cost platform for various product design and developments presently.

b) Camera Module: This module can be used to take high definition video, as well as stills photographs with options like time-lapse, slow motion and video cleverness. It is a five mega pixel fixed focus camera that supports 1080p30, 720p60 and VGA90 video modes as well as still captures.

c) Touch Screen: It features a 2.8" display with 320x240, 16-bit color pixels and a resistive touch overlay. The plate uses the high speed SPI interface and can use the mini display as a console for displaying text, images or video etc.

d) Sensors: Various sensors such as temperature, humidity, accelerometer, smoke & pulse sensor are integrated with R-Pi.

The communication technology supported by present system may comprise following network communication modules:

a) GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots.

b) Bluetooth: Class-2 Bluetooth module with Serial Port Profile, which can be configured as either Master or Slave, a drop-in replacement for wired serial connections.

35

- 5 c) GPS: It provides the real time position information in NMEA format. This data includes the complete PVT (position, velocity, time) solution computed by the GPS receiver.
- 10 d) ZigBee: ZigBee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios based on an IEEE 802.15.4 standard.
- 15 e) Wi-Fi: It is wireless LAN based on IEEE 802.11 standard that allows an electronic device to inter networking using 2.4 GHz UHF and 5 GHz SHF ISM radio bands.

The application software component supported by present mobile device development platform comprises:

- 20 a) MyOS: To meet the user requirements standard embedded Linux kernel is optimized and configured for the intended hardware and software, to get new functionalities and to test new features as per application specific requirements. The MyOS is configured for platform application however it can be recompiled, customized and
- 25 ported into the platform for a specific requirement.
- b) Set of application programs and projects are created to experiment the concepts of various subjects as mentioned earlier.

30 The present invention accordingly provides a universal development system for experimenting the concepts of mobile computing, embedded systems, communication protocols and networks, sensors, interfacing peripherals as an integrated solution.

35 The system architecture of the present invention primarily consists of:

5 (a) OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size.

(b) Hardware interfacing as per user requirement that include application specific sensors, actuators, MIC, speaker, buzzer,
10 camera, display, user interface, communication module, vibrators, I/O memory or SD card extension etc.

(c) Programming for mobile system design or for mobile application programming (app development) using python.

15

According to an embodiment of the present invention on power-on development system is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the system is also integrated with health, environment and safety sensors,
20 communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

25 FIG. 4 illustrates a booting process sequence diagram of development system according to a preferred embodiment of the present invention. The process starts at step (401), when system is switched ON, at the time of initialization, customized operating system (MyOS) gets loaded from card memory into RAM at step (402). This enables loading of the kernel of customized operating system (MyOS) in to the memory that consists of
30 integrated development environment (IDE) for application development.

In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A
35 single element or other unit may fulfill the functions of several items recited

5 in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

The present invention can be implemented in any convenient form, for
10 example using dedicated hardware, or a mixture of dedicated hardware and software. The present invention may be implemented as computer software implemented by one or more networked processing apparatuses. The network can comprise any conventional terrestrial or wireless communications network, such as the Internet. The processing
15 apparatuses can comprise any suitably programmed apparatuses such as a general purpose computer, personal digital assistant, mobile telephone (such as a Wireless Application Protocol (WAP) or 3G-compliant phone) and so on. Since the present invention can be implemented as software, each and every aspect of the present invention
20 thus encompasses computer software implementable on a programmable device.

The computer software can be provided to the programmable device using any storage medium or carrier medium for storing processor readable
25 code such as a flexible disk, a compact disk read only memory (CD-ROM), a digital versatile disk read only memory (DVD-ROM), DVD recording only/rewritable (DVD-R/RW), electrically erasable and programmable read only memory (EEPROM), erasable programmable read only memory (EPROM), a memory card or stick such as USB memory, a memory chip,
30 a mini disk (MD), a magneto optical disc (MO), magnetic tape, a hard disk in a server, a solid state memory device or the like, but not limited to these.

The hardware platform includes any desired kind of hardware resources
35 including, for example, a central processing unit (CPU), a random access

5 memory (RAM), and a hard disk drive (HDD). The CPU may be implemented by any desired kind of any desired number of processor. The RAM may be implemented by any desired kind of volatile or non-volatile memory. The HDD may be implemented by any desired kind of non-volatile memory capable of storing a large amount of data. The hardware
10 resources may additionally include an input device, an output device, or a network device, depending on the type of the apparatus. Alternatively, the HDD may be provided outside of the apparatus as long as the HDD is accessible. In this example, the CPU, such as a cache memory of the CPU, and the RAM may function as a physical memory or a primary
15 memory of the apparatus, while the HDD may function as a secondary memory of the apparatus.

In the above-described example embodiment, a computing environment can be created using a computer used with a computer-readable program,
20 described by object-oriented programming languages such as C++, Java (registered trademark), JavaScript (registered trademark), Perl, Ruby, Python or legacy programming languages such as machine language, assembler language to control functional units used for the apparatus or system. For example, a particular computer (e.g., personal computer, work
25 station) may control information processing apparatus or an image processing apparatus using a computer-readable program, which can execute the above-described processes or steps. In the above described embodiments, at least one or more of the units of apparatus can be implemented in hardware or as a combination of hardware/software
30 combination. In example embodiment, processing units, computing units, or controllers can be configured using various types of processors, circuits, processing devices, processing circuits or the like such as a programmed processor, a circuit, an application specific integrated circuit (ASIC), used singly or in combination. A circuit is a structural assemblage
35 of electronic components including conventional circuit elements,

5 integrated circuits including application specific integrated circuits,
standard integrated circuits, application specific standard products, and
field programmable gate arrays. Further, a circuit includes central
processing units, graphics processing units, and microprocessors, which
are programmed or configured according to software code. A circuit does
10 not include pure software, although a circuit does include the above-
described hardware executing software.

In the present invention all references related to mobile device may be
assumed as mobile phone, smartphone, phone device, tablets, portable
15 device and computing device and may be used interchangeably. Further,
terms like “system” and “platform” are used interchangeably and
synonymously throughout this document.

Numerous additional modifications and variations are possible in light of
20 the above teachings. It is therefore to be understood that within the scope
of the appended claims, the disclosure of the present invention may be
practiced otherwise than as specifically described herein. For example,
elements and/or features of different examples and illustrative
embodiments may be combined each other and/or substituted for each
25 other within the scope of this disclosure and appended claims.

5 **We Claim:**

1. A system for creating customizable mobile device for learning and development comprising:

a memory database;

10 a processing unit coupled to the memory database storing therein one or more instructions to be executed by the processing unit;

15 an interfacing unit operatively coupled to processing unit to perform plurality of input/output functions simultaneously based on one or more instructions stored in the memory database, the interface unit comprises plurality of multi-input/output interface different from each other, wherein the interface unit comprises

an application program interface;

an external memory communication interface;

20 a multiple sensors communication interface;

a network communication interface; and

a universal communication interface.

25 2. The system as claimed in claim 1, wherein the application program interface is customizable to select one or more application specific operating system environments.

30 3. The system as claimed in claim 1, wherein memory interface provides communication to high speed memory devices.

4. The system as claimed in claim 1, wherein sensors communication interface provides communication with one or more sensors selected from the group consisting of health sensor, environment sensors, safety sensors and activity sensors such as proximity

5 sensor, accelerometer sensor, gyroscope, light sensor, GPS, and
fingerprint sensors.

5. The system as claimed in claim 1, wherein the universal
communication interface provides communication to plurality of
10 input/output devices selected from the group consisting of touch
screen, display, keyboard, speaker, microphone and camera.

6. The system as claimed in claim 1, wherein the network
communication interface provides communication with one or more
15 communication technology selected from the group consisting of
Bluetooth, Wi-Fi, GSM, ZigBee, UART, USB, SPI and I2C.

7. A system for creating customizable mobile device for learning and
development comprising;
20 a memory database;
a processing unit operatively coupled to memory database
for executing one or more instruction stored therein; and
a multi-input/output interface for providing communication
with one or more smartphone operating system, network
25 communication technology, sensors and I/O devices.

Dated this 28th day of January, 2016

RASHMI TYAGI
AGENT FOR APPLICANT

ABSTRACT

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMARTPHONE

The present invention relates to a system and method providing a unified platform for real time programming, designing and customizing smartphone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform includes a processing unit for controlling and managing the operation of one or more interface controllers. The one or more interface controller comprise memory interface, communication interface, input/output interface, sensor interface, application programming interface for application programming and operating system customization.

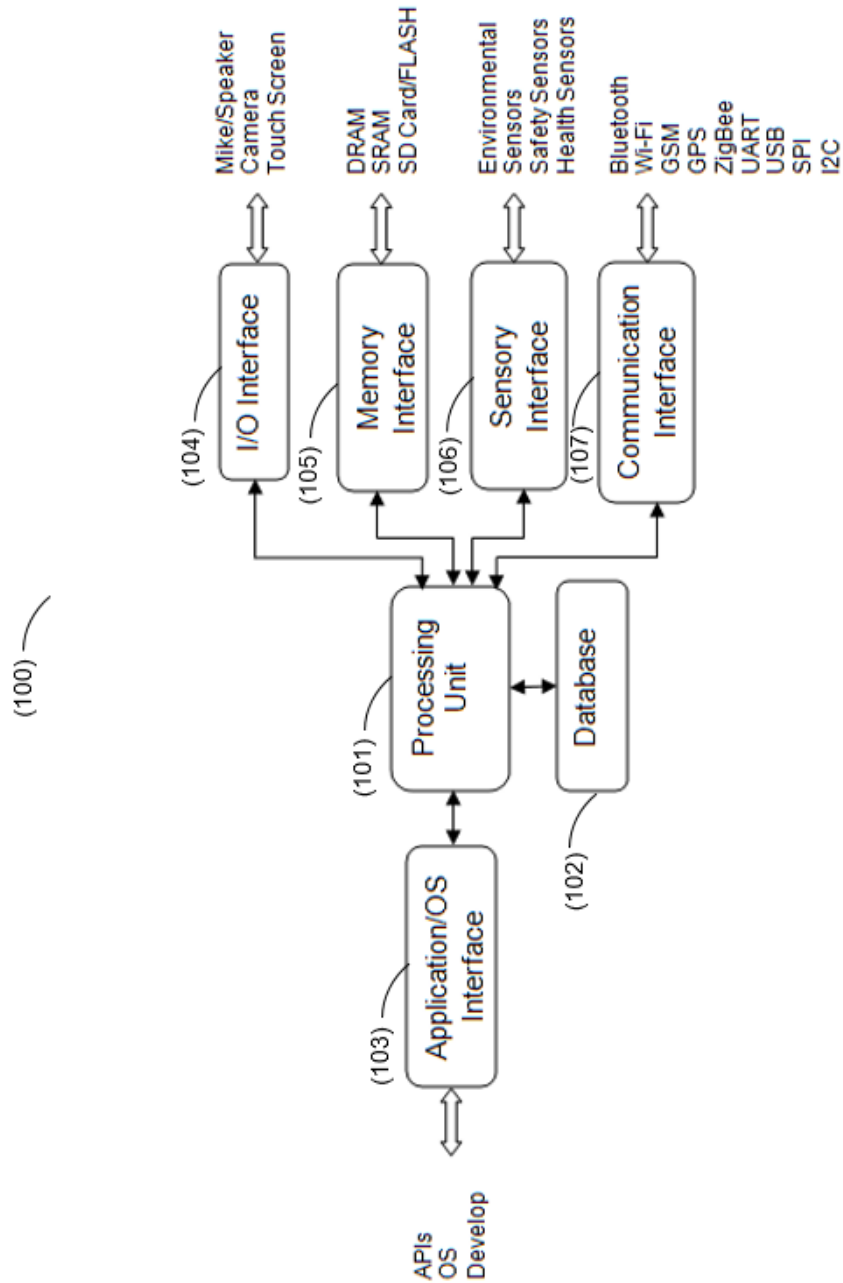


Fig. 1

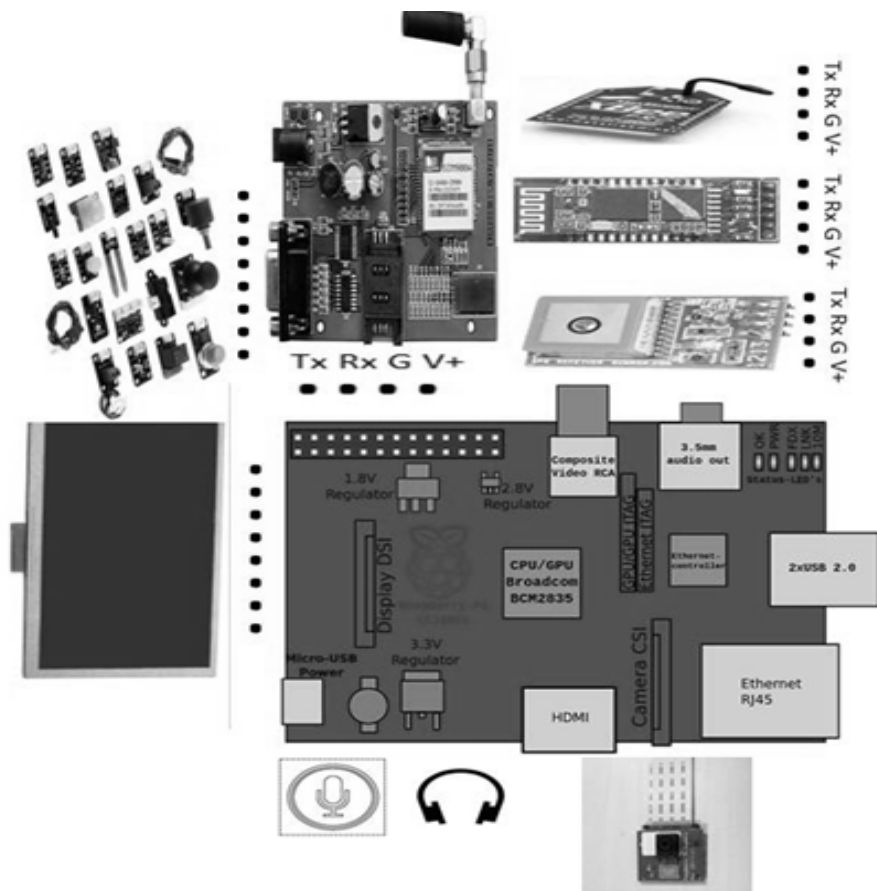


Fig. 2

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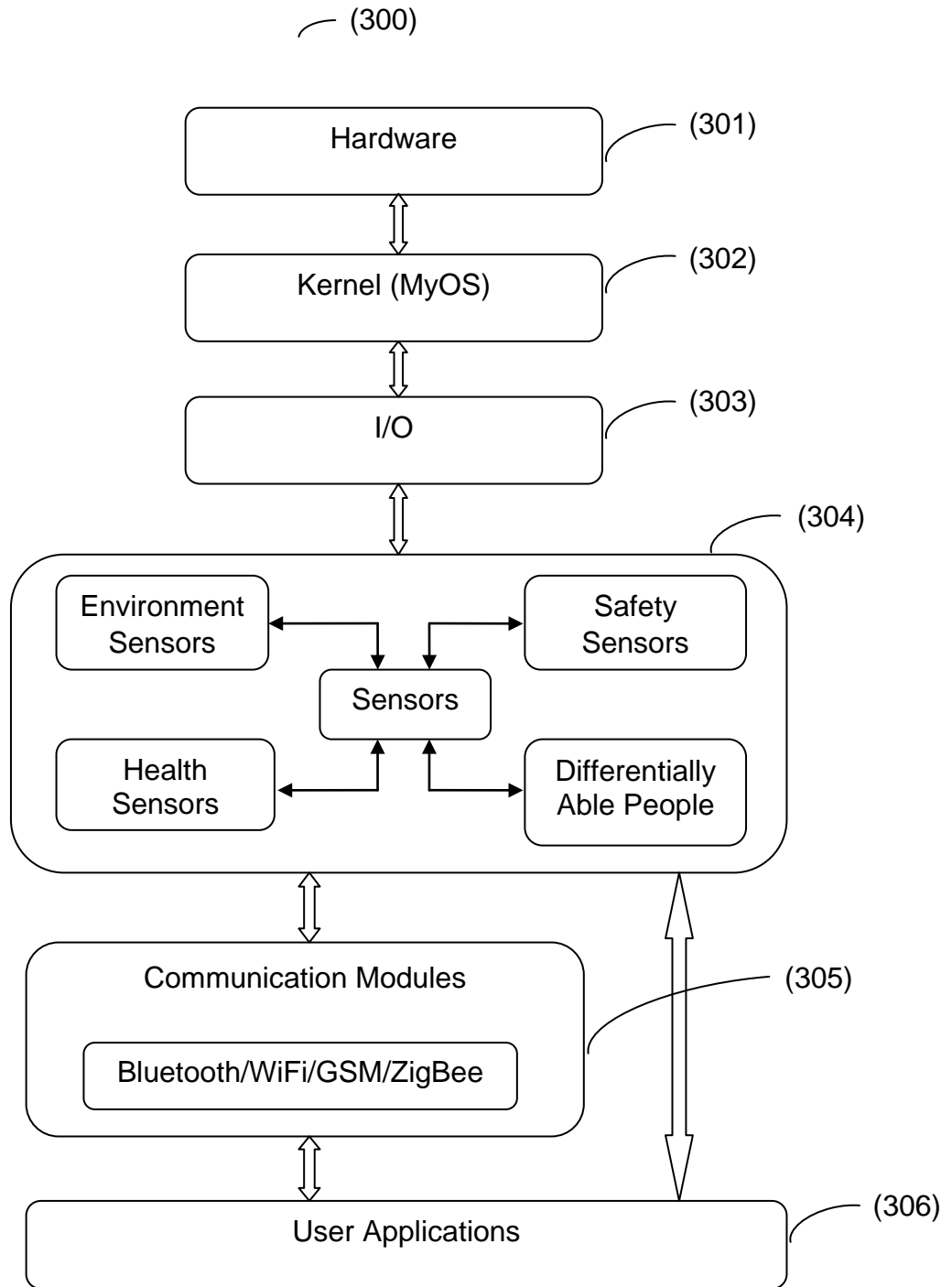


Fig. 3

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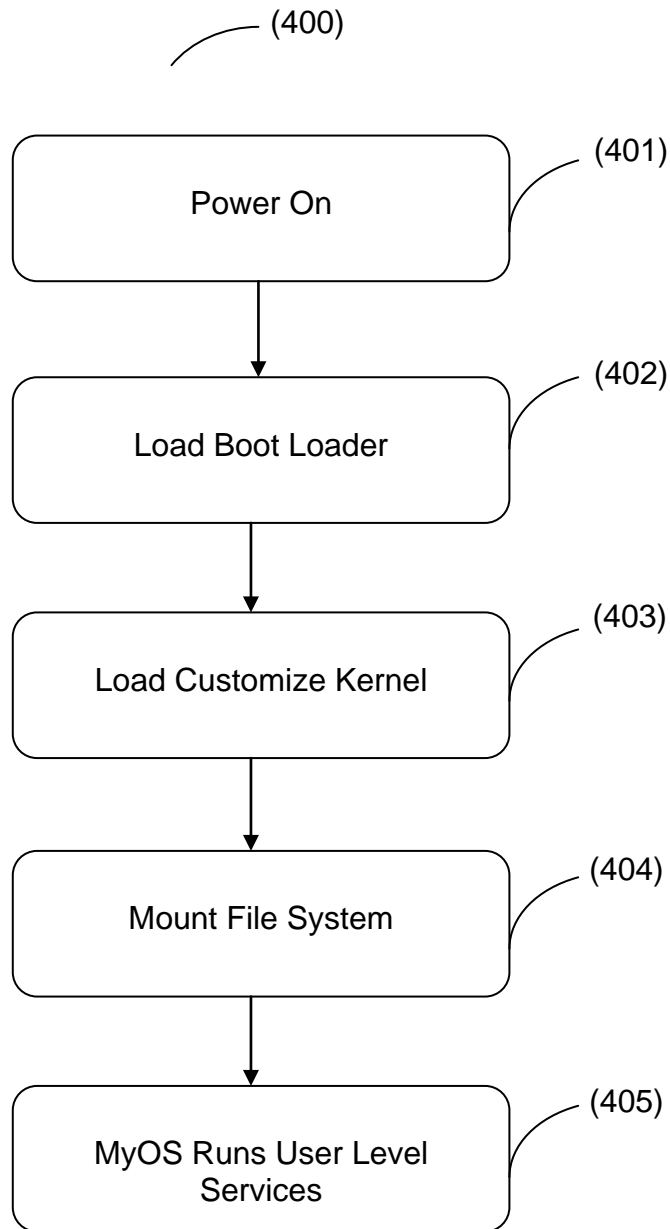


Fig. 4

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240315

EI: RT: 249/DEL/2015

December 02, 2015

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION GENERAL POWER OF AUTHORITY (GPA) COPY

Dear Sir,

Re: Indira Gandhi Delhi Technical University for Women**Indian Patent Application No. 249/DEL/2015****e-Filed: January 28, 2015****Title: A System for Building, Customizing Software & Hardware Interfaces of
Smart Phone**

We are submitting herewith copy of General Power or Authority for provisional Patent application **249/DEL/2015** titled "**A System for Building, Customizing Software & Hardware Interfaces of Smart Phone**" e-filed on January 28, 2015 for grant of patent.

Enclosures:

1. General Power of Authority (copy) [for original refer to our letter EI: RT: 156/DEL/2015 dated Dec 02, 2015]

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi

Rashmi Tyagi

IN/PA 1594

#250, Street No. 06, New Colony Kerhera,

Mohan Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 91 9968284766**Email:** rashmi@elpisinnovation.com

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INDIA NON JUDICIAL

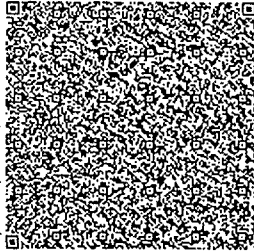


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THE PATENTS ACT, 1970

GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint Rashmi Tyagi, Indian, of Elpis Innovation of the address of correspondence #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India, jointly and severally, to act on our

Statutory Alert: 02-12-2015 16:34

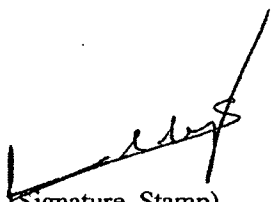
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2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and we request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**


(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

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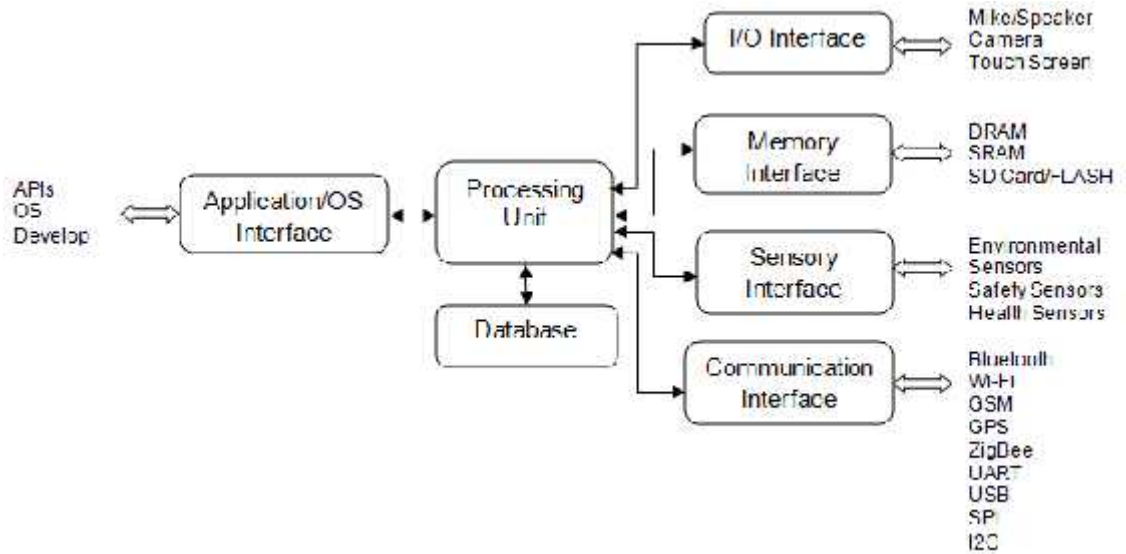


FIG. 1

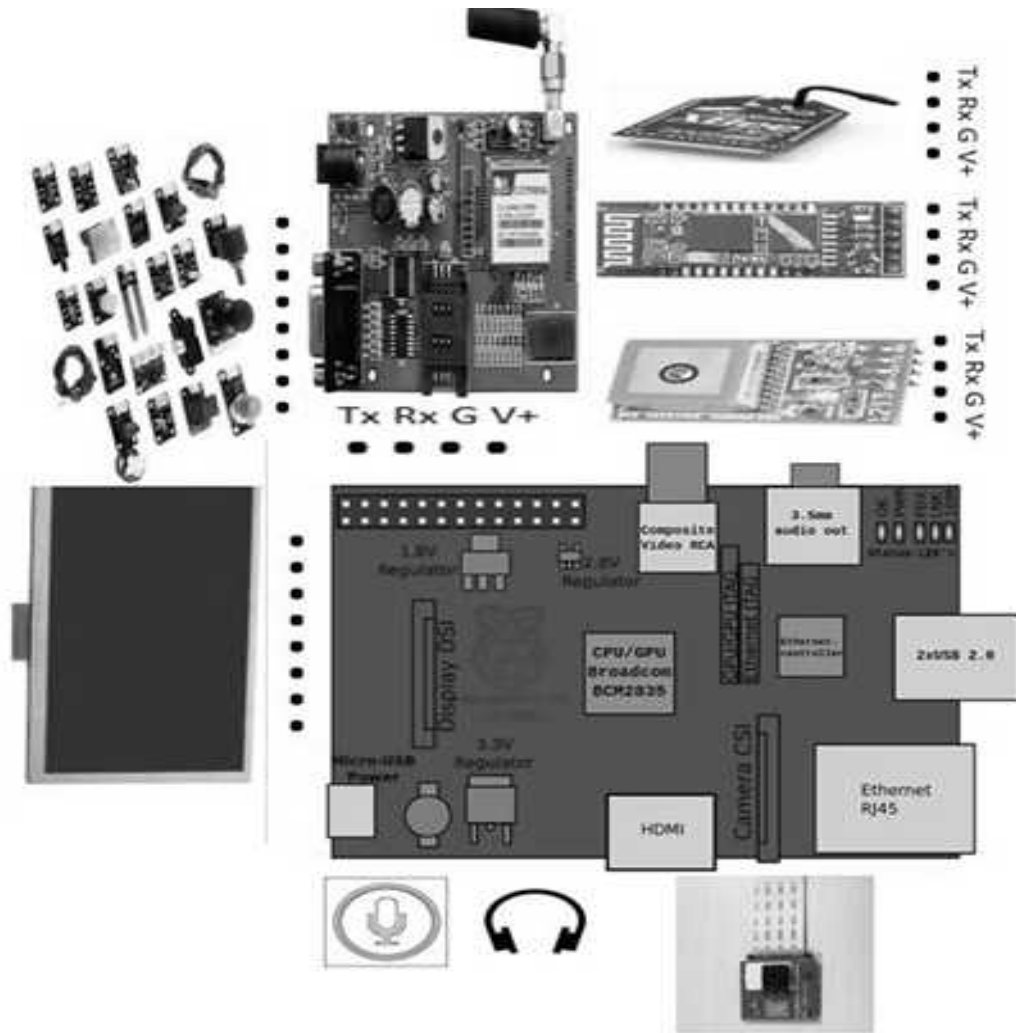


FIG. 2

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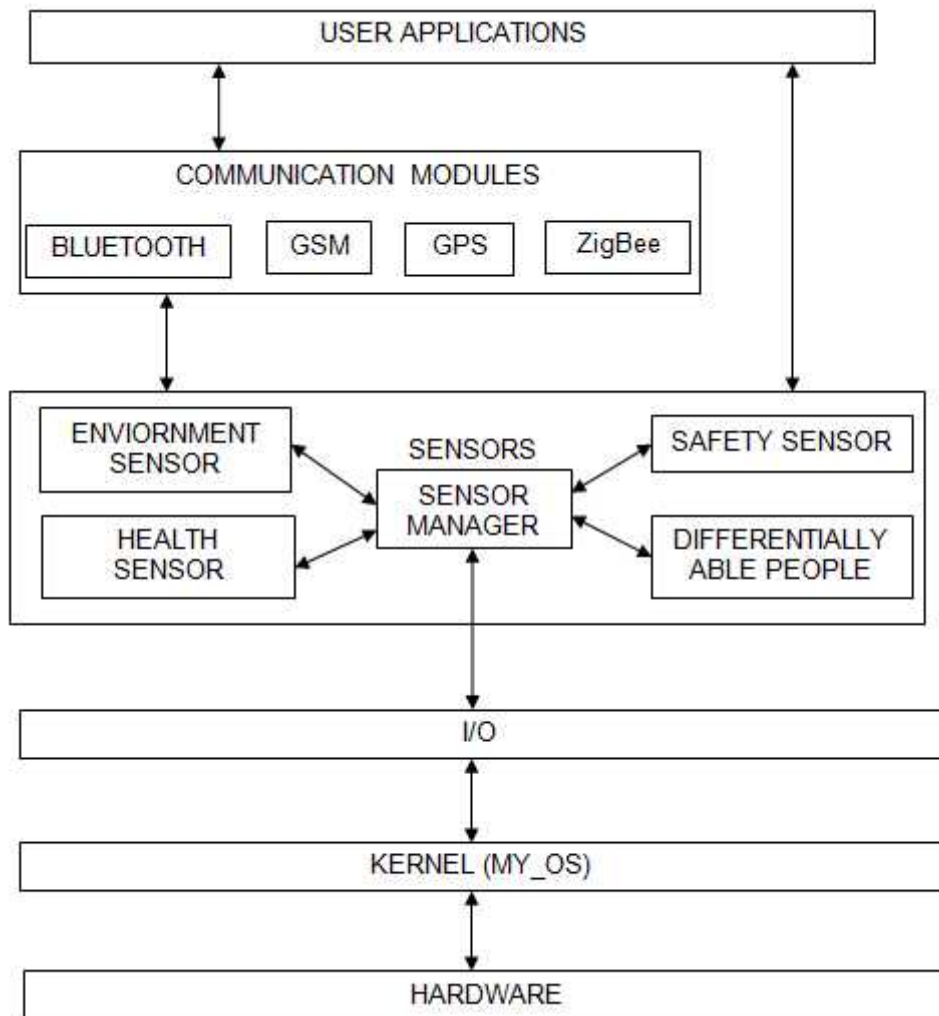


FIG.3

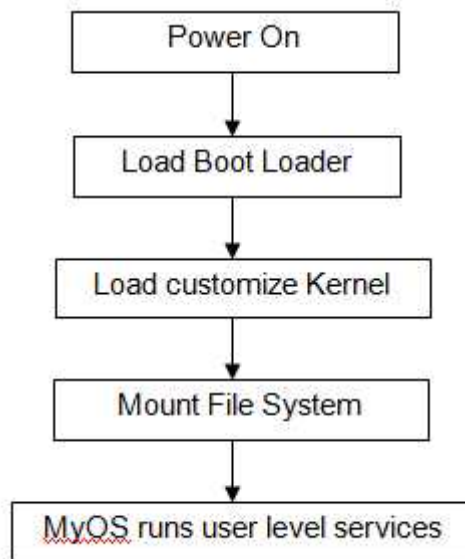


FIG.4

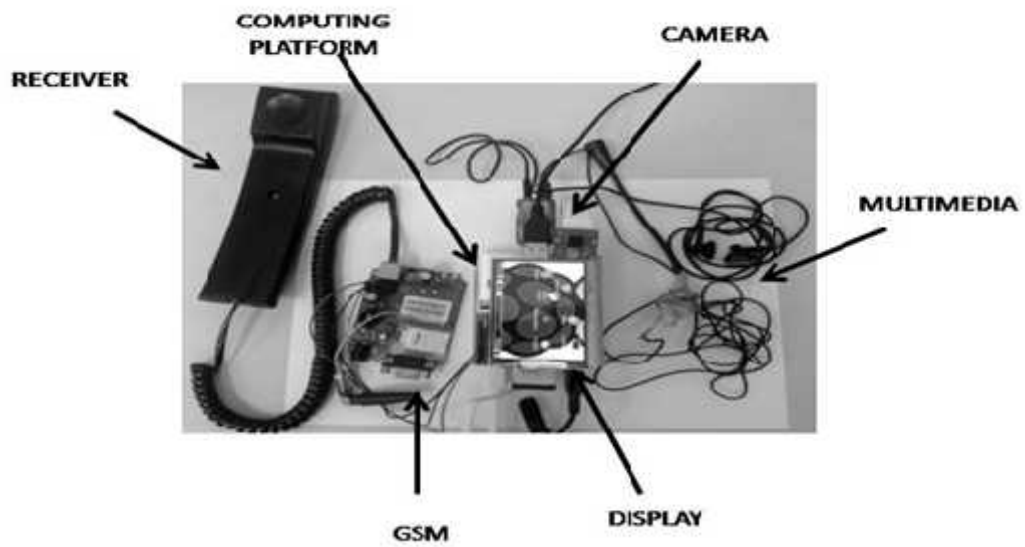


FIG.5

FORM 3
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See section 8; rule 12)

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of Kashmere Gate, New Delhi-110006, India, hereby declare:

- (i) that we have not made any application for the same/substantially the same invention outside India.

- (ii) that the rights in the application(s) has/have been assigned to none.

that we undertake that up to the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within three months from the dates of filing of such applications.

Dated this **28th** day of **January 2015**

Name: **RASHMI TYAGI**
(IN/PA-1594)
AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office,
Intellectual Property Office Building,
Plot No. 32, Sector 14, Dwarka,
New Delhi-110075

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION
(Section 10 & Rule 13)

**“A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE
INTERFACES OF SMART PHONE”
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
Kashmere Gate, New Delhi-110006, India**

The following specification describes the invention.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of smart phone development. More particularly, the invention relates to a method and system for enabling a unified platform capable of customizing hardware and operating system for building smart phone.

10

BACKGROUND OF THE INVENTION

There exists today a wide variety of small, typically handheld, electronic appliances known generally as mobile internet devices or smart phones. In the current state of the art, all such devices are designed by their manufacturers to include a variety of hardware capabilities to address as many potential end users as possible. Similarly, manufacturers determine the form factor, that is, the size, shape, weight, color, and other physical attributes, of each product, with the goal to satisfy the greatest possible number of users with the fewest specific combinations. Finally, manufacturers configure the operating software of their devices to provide a variety of functions such that a particular function or related group of functions is performed in exactly the same way on as many device models as possible.

The practice of limiting the number of hardware and software combinations benefits the device manufacturers by reducing the complexity of the various systems and procedures they use for product development, manufacturing, sales, and customer support. However, current and emerging mobile devices provide a great deal of programmability through the provision of software applications, or “apps”. These apps allow people to add a wide variety of software functionality to their mobile devices but do not in general provide the ability to tune the base operating software of a particular class of mobile device.

Further, add-on software apps inherently cannot offer any ability to change the specific hardware built into a mobile device. While most mobile devices provide connectors and slots for adding or connecting hardware modules that provide optional capabilities, and coupled with software apps these hardware add-ons can be quite sophisticated, here too this practice is limited to adding modules that aren't in the base device.

5 Finally, neither add-on software apps nor plug-in hardware modules offer any ability to change the form factor of a device completely. End users with a variety of special needs are generally left unsatisfied by the available options.

10 Further, other development kits available allow to customize, create and/or modify either software or hardware so as to make the device compatible for any new feature or to develop an improved product. What is needed, then, is system where end users or others acting on behalf of a group of end users may create personal or custom configurations of mobile devices or modify an existing one.

15 Accordingly, it would be advantageous to have an improved development system or kit for experimenting with every concept of mobile computing so as to build and innovate new products.

20 Thus, considering all these facts the present invention provides an integrated development system or kit having improved flexibility, reduced cost, and reduced associated workload that facilitates the user or others for improved optimization, greater configurability and customization of both hardware and software components.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

10 FIG. 1 illustrates basic architecture and various components of development system or Kit (MySmartPhone Kit) according to a preferred embodiment of the present invention;

FIG. 2 illustrates primary components layout of development system or Kit
15 (MySmartPhone Kit) according to a preferred embodiment of the present invention;

FIG. 3 illustrates flow diagram of development system or Kit (MySmartPhone Kit) according to a preferred embodiment of the present invention;

20 FIG. 4 illustrates booting process sequence diagram of development system or Kit (MySmartPhone Kit) according to a preferred embodiment of the present invention.

25 FIG. 5 illustrates sample demonstration of development system or Kit (MySmartPhone Kit) according to a preferred embodiment of the present invention.

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain
10 more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a mobile device, smart phone development
15 system or kit (MySmartPhone Kit) for real-time designing, interfacing & programming of the various components of smart phone. The kit of present invention can be used as an experimental kit for experimenting each and every concept of mobile computing, embedded systems, sensors and communication networks as an integrated approach such that creation of new devices, operating
20 software packages, and applications can be accelerated by incorporation or customization of existing items or components thereof.

The development kit of present invention includes real hardware, software, sensing and communicating components to build a smart phone. Thus it provide
25 three dimensional freedom to end users and others, such as branding organizations, support personnel, students & developers to modify or interface any hardware, build or customize the operating system and to develop the applications specific to their needs.

Accordingly, the kit of present invention integrates the real mobile components
30 such as TFT, MPU, GPS, GSM, Bluetooth (BT), ZigBee,Wi-Fi Multimedia, Camera, Sensors, MyOS, software and learning material in book form both in hard as well soft copy as a complete integrated solution. Thus, it not only provides the freedom to modify, customize and create operating system,
35 hardware and the application development as per requirement but also acts as a demonstration or experimental platform for various wired (UART,USB,SPI and I2C) and wireless (BT, ZigBee, GSM, Wi-Fi and GPS) communication protocols.

5 The development system or kit of the present invention is low cost and open source solution for users, students, faculty and developers to experiment and innovate new designs, products and solutions for education, entertainment, agriculture and health application and offers following advantages:

- 10
- Provides unique platform for integration of real mobile components such as TFT, MPU, GPS, GSM, Bluetooth (BT), ZigBee, Wi-Fi Multimedia, Camera, Sensors, MyOS, Application software.
 - Allows operating System customization for the kernel porting and specific requirement.
- 15
- Uses Python as a programming environment to integrate both hardware, operating system, and the application.
 - Acts as an integrated solution for sensor Interfacing, programming and mobile application development through open source tools and technologies.
- 20
- Provides a practical integrated real platform for experimenting the concepts of various subjects such as mobile computing, embedded systems, sensors and communication networks.

25 **The development system or Kit of the present invention comprises primarily of following components:**

Hardware components:

- 30
- a) Computing Platform: Raspberry Pi(R-Pi) is being used as a computing platform. It uses the Broadcom SoC with ARM11 processor and operates 700 MHz. It is widely used low cost platform for various product design and developments in recent times.
- 35
- b) Camera Module: This module can be used to take high definition video, as well as stills photographs with options like time-lapse, slow motion and video cleverness. It is a five mega pixel fixed focus camera that supports 1080p30, 720p60 and vga90 video modes as well as still captures.

- 5 c) Touch Screen: It features a 2.8" display with 320x240 16-bit color pixels and a resistive touch overlay. The plate uses the high speed SPI interface and can use the mini display as a console for displaying text, images or video etc.
- 10 d) Sensors: Various sensors such as temperature, humidity, accelerometer, smoke & pulse sensor are integrated with R-Pi.

Communication Modules:

- 15 a) GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots.
- 20 b) Bluetooth: Class-2 Bluetooth (BT) module with Serial Port Profile, which can be configured as either Master or Slave, a drop-in replacement for wired serial connections.
- 25 c) GPS: It provides the real time position information in NMEA format. This data includes the complete PVT (position, velocity, time) solution computed by the GPS receiver.
- 30 d) ZigBee: ZigBee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios based on an IEEE 802.15.4 standard.
- 35 e) Wi-Fi: It is wireless LAN based on IEEE 802.11 standard that allows an electronic device to inter networking using 2.4 GHz UHF and 5 GHz SHF ISM radio bands.

5 **Software component:**

a) MyOS: To meet the user requirements standard embedded Linux kernel is optimized and configured for the intended hardware and software, to get new functionalities and to test new features as per application specific requirements. The MyOS is configured for MySmartPhone application however it can be recompiled, customize and ported into the MySmartPhone for a specific requirement.

b) Set of application programs and projects are created to experiment the concepts of various subjects as mentioned earlier.

15

The present invention accordingly provides a universal development system or kit for experimenting the concepts of mobile computing, embedded systems, communication protocols and networks, sensors, interfacing peripherals as an integrated solution.

20

The Kit architecture of the present invention primarily consists of:

(a) OS for customizing existing Linux, Yocto, Android OS, for creating new OS, reducing kernel size.

25

(b) Hardware interfacing as per user requirement that include application specific sensors, actuators, mic, speaker, camera, display, communication module, vibrators, I/O memory or SD card extension etc.

30

(c) Programming for mobile system design or for mobile application programming (app development) using python.

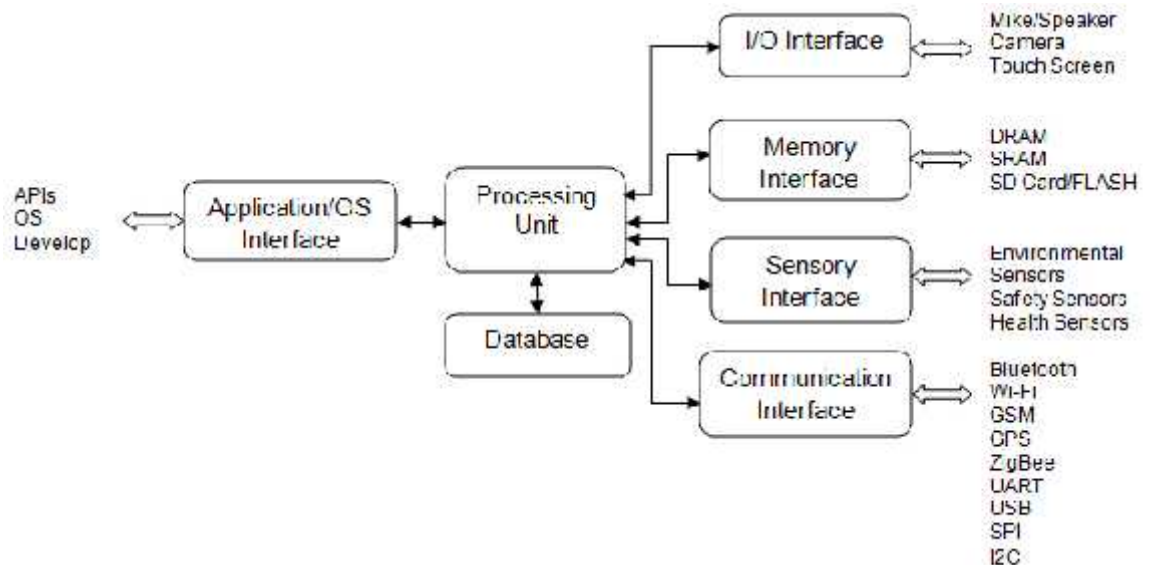
In present invention on power-on development system or Kit (MySmartPhone) is booted with selected OS for the particular field specific applications and related software and target codes. Additionally, the kit is also integrated with health, environment and safety sensors, communication modules, camera, TFT display and touch keypad with power adaptor status LEDs, signal outputs pins, status pins, SIM tray, USB, VGA, HDMI, USB to UART, audio & video, camera, SPI and I2C ports for connecting peripherals for further enhancing applications.

5 Further, according to present invention when MySmartPhone kit is switched on;
at the time of initialization, MyOS boot loader gets loaded from card memory into
RAM and thereby loads the kernel of MyOS that consists of IDE for application
development. The user can create any application or chose the already created
experiments from the list to run and test the concepts for necessary
10 understanding and analysis specific to the mobile computing, embedded
systems, sensor interfacing and wired/wireless communication protocols. The kit
of the present invention comprises several experiments to demonstrate the
concepts in real environment related to the above mentioned subjects and
manual or in book form “How to create the experiments with step by step
15 procedure” as an integrated solution. A web based add on complimentary
material/projects are also made available online free of cost for users.

ABSTRACT

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMART PHONE

- 10 The present invention relates to a system and method providing a unified platform for real time programming, designing and customizing smart phone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform includes a processing unit for controlling and managing the operation of
- 15 one or more interface controllers. The one or more interface controller comprise memory interface, communication interface, input/output interface, sensor interface, application programming interface for application programming and operating system customization.

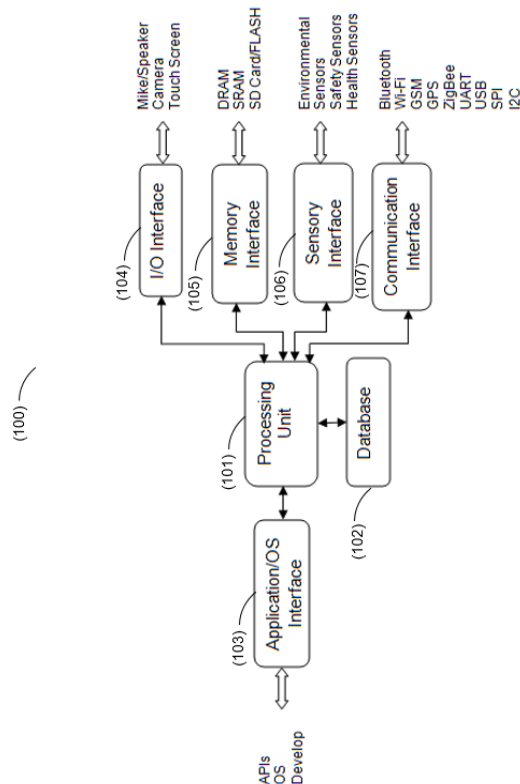


ABSTRACT

A SYSTEM FOR BUILDING, CUSTOMIZING SOFTWARE AND HARDWARE INTERFACES OF SMARTPHONE

The present invention relates to a system (100) and method providing a unified platform for real time programming, designing and customizing smartphone hardware and software (OS) component for the purpose of experimenting, developing and learning various concept of mobile computing environment. The platform (100) includes a processing unit (101) for controlling and managing the operation of one or more interface controllers. The one or more interface controller comprise memory interface (105), communication interface (107), input/output interface (104), sensor interface (106), application programming interface (103) for application programming and operating system customization.

Fig. 1





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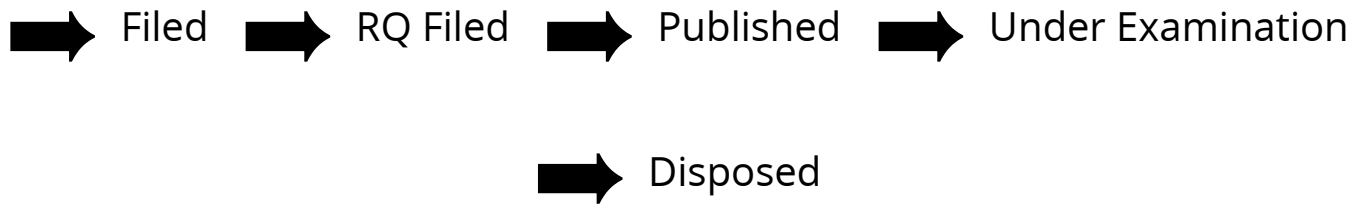
Application Details

APPLICATION NUMBER	201611016353
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	10/05/2016
APPLICANT NAME	1 . ANKITA GULATI 2 . INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
TITLE OF INVENTION	"MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED"
FIELD OF INVENTION	PHYSICS
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E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	15/07/2017
PUBLICATION DATE (U/S 11A)	09/02/2018
REPLY TO FER DATE	26/08/2020

Application Status

APPLICATION STATUS	Reply Filed. Application in amended examination
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ABSTRACT
MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED

The present invention relates to a system (100) for providing a tactual and
5 a synchronized auditory stimulus in real time to a visually impaired for
reading a tactile image, braille, tactile text, and printed text on an
accessible page (10). The system comprises of a computing device (110)
for capturing the image and computer vision techniques for processing
and filtering the captured image, extracting relevant features from the
10 image and linking to a pre-stored audio file for generating an audio
stimulus corresponding to the processed tactile image to the visually
impaired. The computing device (110) is held by a portable stand (101)
during use which comprises a frame body (103) for securing the
computing device (110) at an appropriate angle and distance for capturing
15 image, a clamp support (105) for securing accessible page (10) under the
camera field view, and a support (104) for balancing the computing device
(110).

We Claim

1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page comprising of:

a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instructions stored in the memory for:

-capturing the tactile image by camera;
-filtering the image to extract coordinate position and shape of the tactile image

-identifying tactile graphics, tactile text and/or printed text in the filtered image;

-identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;

-generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;

a portable stand (101) for holding the computing device (110) during use comprising:

-a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10);

-LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);

-a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and

- a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

wherein the frame body (103) is adjustable in height by collapsing
5 towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110).

2. The system (100) for providing a tactual and a synchronized auditory
10 stimulus in real time to a visually impaired for reading a tactile image on an accessible page (10), wherein the tactile image is a 2D/3D embossed image optionally consisting of tactile data and/or printed text.

15 3. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of graphical objects, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

20 4. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of non visible codes and images placed for comparing the captured image with a set of reference images pre-stored in the memory of the computing device (110) for generating a synchronous
25 audio.

5. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the computing device (110) is a portable device preferably a mobile device or smartphone.

30

6. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the audio file can be generated in different languages through various formats including text.

5 **Dated this 10th day of May 2017**

Rashmi Tyagi

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IN/PA-1594

AGENT FOR APPLICANTS

10

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED”**

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The following specification describes the invention and the manner in which it is to be performed.

MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED

FIELD OF INVENTION

- 5 The present invention relates to the field of assistive technologies for visually impaired people. More particularly, the invention relates to multimodal interaction system for visually impaired which provides a synchronized audio stimulus in addition to a haptic stimulation to the user.

10 **BACKGROUND OF THE INVENTION**

- According to WHO, about 285 million people are estimated to be visually impaired worldwide, 90% of whom live in low income settings. Out of these 19 million are children under the age of 15 years. Children below the age of 10 years have limited resources in terms of learning material. Also, what options do they have in terms of recreational material? A solution to this problem could be the use of assistive technology. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not give similar enjoyment as the books available for sighted children.

- Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Due to these problems, children become vulnerable to developmental delays and other learning difficulties which hinder their inclusion into the society.

- 30 Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems

which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept
5 of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Therefore, such devices are not suitable for visually impaired children.

10 Thus, a solution is required which just doesn't only provide narration but also help visually impaired children in visualizing various characters, concepts & themes which can eventually help in cognition and perception development. In this way, not just only knowledge can be imparted
15 amongst children but they can also be made aware of many things like social scenarios so that they can adapt to different surroundings easily. Thus, in this way their inclusion into the society can be accelerated.

Therefore, to overcome the disadvantages of prior art present invention provides a multimodal interaction system for visually impaired or sighted
20 elderly as well as for people with learning disabilities which gives haptic stimuli in addition to audio stimulus. So, that integration of these two inputs can help the user in developing an understanding of the concept and thus can eventually help in perception and cognition development.

25 **SUMMARY OF THE INVENTION**

An object of the invention provides a multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory
30 storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or

tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

An another object of the invention provides a multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

An furthermore object of the invention provides a system enabling vision-impaired or people with low-vision to view objects or source material, including reading text (handwritten or printed), viewing pictures and physical object by feeling or touching and through audio speech signal.

An furthermore object of the invention provides a system for reading graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

- 5 FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system according to a preferred embodiment of the present invention;
FIG. 2 illustrates a tactile printed material according to a preferred embodiment of the present invention;
- 10 FIG. 3 illustrates work flowchart of the multimodal interaction system according to a preferred embodiment of the present invention; and
FIG. 4 illustrates a working configuration of the multimodal interaction system according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 The present invention provides a multimodal interaction system for visually impaired children, elderly as well as people with learning disabilities. The system of the present invention comprises primarily of a tactile printed material, a reading stand and a computing device that provides a
15 synchronized audio stimulus in addition to a haptic stimuli to the visually impaired.

FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system (100) according to a preferred embodiment of the present invention. The present invention provides a system (100)
20 enabling people with vision impairment or learning disabilities to view printed objects or source material, including reading text, graphics, shapes, handwritten or printed, viewing pictures and physical objects. The system (100) includes a computing device (110) preferably a mobile phone or smartphone, a foldable stand (101) and a page (10) with printed
25 3D/2D object, graphics, shapes or text. The foldable stand (101) includes a mobile phone sliding holder (102), over which mobile holder moves back and forth for a relevant position with respect to printed page preferably a tactile book (10) explained later in the specification, a height adjustable stand frame (103) and clamps (105) with back support (104).

30 According to a preferred embodiment of the present invention the printed material is a storybook having 3D embossed images and graphics so that

the user can actually feel the characters & concepts in the book. The graphics and text is identified by the software application running on computing device preferably a camera mobile phone or smartphone and a corresponding audio is generated to the user. The software application is configured to use the camera of the computing device for scanning and the computer vision techniques for processing and filtering the image and extracting relevant features from the image. The book as described comprises learning material made up of tactile sheets. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided to the user by the software application on the computing device. The software application is configured to perform image processing on each page separately & playing the corresponding audio file. Further, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a simple stand is provided in the system. The stand is a wooden or plastic stand with clips or clamps to position the storybook appropriately & grooves on the top are used to hold the computing device in proper position.

The prime components according to a preferred embodiment of the present invention are described in details herein:

- A. Tactile Printed Material
- B. Wooden/Plastic Stand
- C. Software Application

25

A. Tactile Printed Material

Images and diagrams that are normally used by sighted people for understanding concepts or conveying information are useless for visually impaired people. Visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. FIG. 2

illustrates a tactile printed material (200) according to a preferred embodiment of the present invention that includes 3D cut-outs (201) for proper shape estimation. These 3D cut-out tactile diagrams are produced using embossing or other technologies on physical medium like swell paper or PVC sheets. The printed material on page comprises high contrast embossed illustrations in which images or figures are embossed with different depth marking. It also provides audio land marking. Some Interesting question answers are provided at the end of material.

10 **B. Stand**

The stand (101) of the present invention is foldable, portable, light in weight, compact and easy to assemble & carry and adjustable in height to accommodate scanning of tactile sheets from A4 to upto A3 size. The stand supports multiple functionalities as explained herein:

15 I. Mobile Holder: Visually Impaired children while reading can't keep the computing device for example, mobile phone in hand all the time and also can't keep it in position for proper scanning. Thus, a sliding holder (102) of design but not limited to Dove-tail is provided. It possesses a variable sized mobile device holder, whose length and width could be adjusted depending upon the customer's computing device dimensions. To prevent the computing device such as a mobile phone from falling while working, the computing device is locked into the holder during the initial set up, i.e. before running the system. The design for the stand used in the embodiment described herein may include any other suitable design whether now known or hereafter described in the construction art to achieve the particular purpose.

25
30 II. Support at the back: Due to the height of stand there is a possibility that the stand as a whole might vibrate or fall due to shocks or weight of computing device kept at the mobile holder (As computing device weight would tend to form a couple which in turn would have

the tendency to rotate the stand as whole). Thus, the stand is provided with support (104) at the back to prevent vibration.

- 5 III. Book Holding Clamps/Frame: Clamps (105) are provided to prevent the relative motion between the printed matter for example a book and the stand to ensure that the book remains in a proper reading position.
- 10 IV. LED Light: Portable LED lights are placed on the top, on the backside of mobile holder to ensure proper lighting while scanning the documents/graphics.

C. Software Application

15 The software application in the present invention is configured to perform image processing on the specific images attached to each page of printed material and playing the corresponding audio file as illustrated in the work flowchart of FIG. 3 (explained later in specification). The camera of mobile phone captures the images of the printed subject matter which is processed by software application running on the computing device. The application first extracts feature of the images and identifies object after processing it. The identified regions of interest are linked to pre-stored audio data and a corresponding audio file is identified and generated. The audio file can be generated in different languages through various formats including text.

25

According to other embodiment of the present invention, an audio tactile storybook for visually impaired children is provided which offers a helping hand to visualize the concepts in the real world and also provides an imaginary view of the original character and happenings all around in the book. In the present invention different learning concepts are incorporated as a part of the book such as on the page depicting a party scenario, the

30

child is asked to count the number of balloons in the party. In this way, children learn new things in the flow of storybook reading only. It is also includes interactive Braille questions with audio answers at the end of the storybook to make the storybook more interesting for the visually impaired child who perceives as a fun Q & A game. The short puzzle provided at the end of the storybook also helps in improving the learning capacity of the child.

FIG. 3 illustrates work flowchart (300) of the multimodal interaction system according to a preferred embodiment of the present invention. The process starts at step (301) and (302) when storybook to be read is placed in the base of the stand and mobile phone is kept in the holder of the stand frame. At step (303) software application is launched in the mobile phone. Upon launch of the application camera first identifies the object or shape of graphics/image (at step 304). Once the image/graphic is identified it is further processed for the identification of text (if present) within it. Once the object/image is identified using feature extraction processes a corresponding audio/display file stored in the phone memory is retrieved (at step 306) and displayed/played to the user in an appropriate output format (at step 307). In a preferred embodiment output format, may be an audio file for a visual impaired user or may be a display form for the user with listening disability. If the application is unable to identify object/shape of image/graphics the system generates an error to the user in a suitable form.

According to preferred embodiment of present invention whenever a visually impaired child/adult or user wants to read the storybook (401), the parent/caretaker sets up the system as illustrated in FIG. 4. The parent then fixes the book (401) on clamps (404) & computing device (402) in proper position on the holder (405) of the reading stand (403) respectively. Now, the parents leave the visually impaired child alone after starting the

software application so that the child can enjoy the story. Thereafter, the image at the cover page is scanned & the central character of the story introduces itself & about the context of story. The image on the cover page also provides instructions to the child regarding the use the storybook so that the child can enjoy the story properly. After the introduction is complete, the child is asked to flip the cover. Now, on first page, there is a specific image (406) which is scanned by the camera of the computing device and software application performs image processing on the specific image for identification of page and region of interest for linkage and generation of audio in different languages through various formats including text. When the child feels the 3D embossed images on the page, the corresponding generated audio file is played via the software application. Likewise the story continues, and on the last page of the book Braille questions with audio answers are provided to make the child's experience more interactive.

In the present invention various embodiments have been explained in reference to visually impaired children however the system of present invention is not being limited to children only it can be used by other users such as all age groups of visually impaired, sighted elderly, as well as by people with learning disabilities.

The multimodal interaction system of the present invention has following advantages:

- I. It provides simultaneous tactile and audio stimulus for the user.
- II. The audio is provided via software application installed on the computing device.
- III. The multimodal interaction system of the present invention is provided in an affordable kit to the user.
- IV. The user requires minimum operational training to operate the multimodal interaction system of present invention.

- V. The multimodal interaction system of present invention helps user in perception and cognition development.
- VI. It can be used as one of the tools in early intervention programs for blind/visually impaired children for better understanding of real world objects.
- VII. The multimodal interaction system of the present invention provides edutainment that is education plus entertainment.
- VIII. The audio tactile books of the present invention help in auditory perception development and cognition development.
- IX. Special stuffed toys with audio feedback help in cognition development.

In the present invention tactile is sometimes referred to as haptic and mobile phone is sometimes referred to as smartphone or simply mobile or phone. These terms are used interchangeably in this specification.

In the present invention printed matter can refer to any of a wide variety of printed matter including, books, storybooks, learning material, hard cover bound books, paper back books, publications, newspapers, magazines, journals, periodicals, reading materials, literature, brochures, memos, notes, certificates, commercial paper, money, paper money, negotiable instruments, stock certificates, legal documents, legal papers, motions, discovery, interrogatories, decrees, judgments, wills, trusts, stamps, business cards, folders, files, packaging, boxes, letters, envelopes, labels, notebooks, papers checks, negotiable instruments, checks, money orders, credit cards, and any and all other types of conventional or new types of printed matter. Further, the term printed matter can specifically refer to marks, fonts, text, images, pictures, illustrations, texture, dots, bumps, bar codes, matrix, and even Braille.

30

A “computing device,” as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory capability. Examples of computing devices, these teachings not being limited to only these examples, mobile phones, smartphones, tablets, digital personal assistants, and laptops, etc.

The “software application” or “app” can be available for download or installation on a user computing device from the provider of multimodal interaction system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided in the Kit to download the app. In an embodiment, the software application can be initialized when a user first time uses the multimodal interaction system. After the “software application” has been downloaded, the application can be installed on the computing device in an executable format. The executable form of the application permits the user to access embodiments of the invention via an electronic resource, such as a mobile "app" or website.

20

We Claim

1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page (10) comprising of:
 - 5 a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instruction stored in the for:
 - 10 -capturing the tactile image by camera;
 - filtering the image to extract coordinate position and shape of the tactile image
 - identifying tactile graphics, tactile text and/or printed text in the filtered image;
 - 15 -identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;
 - generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;
 - 20 a portable stand (101) for holding the computing device (110) during use comprising:
 - a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10) ;,
 - 25 -LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);
 - a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and
 - 30

-a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

5 wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110)..

10 2. The system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image on an accessible page (10), wherein the tactile image is a 2D/3D embossed image optionally consisting of tactile data and/or printed text.

15 3. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

20 4. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of nonvisible codes and images placed for comparing the captured image with a set of reference images pre-stored in the memory of the computing device (110) for generating a synchronous audio.

25 5. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the computing device (110) is a portable device preferably a mobile device or
30 smartphone.

- 5 6. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the audio file can be generated in different languages through various formats including text.

Dated this 10th day of May 2017

Rashmi Tyagi

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IN/PA-1594
AGENT FOR APPLICANTS**

ABSTRACT
MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED

5 The present invention relates to a system (100) for providing a tactual and
a synchronized auditory stimulus in real time to a visually impaired for
reading a tactile image, braille, tactile text, and printed text on an
accessible page (10). The system comprises of a computing device (110)
for capturing the image and computer vision techniques for processing
and filtering the captured image, extracting relevant features from the
10 image and linking to a pre-stored audio file for generating an audio
stimulus corresponding to the processed tactile image to the visually
impaired. The computing device (110) is held by a portable stand (101)
during use which comprises a frame body (103) for securing the
computing device (110) at an appropriate angle and distance for capturing
15 image, a clamp support (105) for securing accessible page (10) under the
camera field view, and a support (104) for balancing the computing device
(110).

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED”**

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The following specification describes the invention and the manner in which it is to be performed.

MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED

FIELD OF INVENTION

5 The present invention relates to the field of assistive technologies for visually impaired people. More particularly, the invention relates to multimodal interaction system for visually impaired which provides a synchronized audio stimulus in addition to a haptic stimulation to the user.

10 **BACKGROUND OF THE INVENTION**

According to WHO, about 285 million people are estimated to be visually impaired worldwide, 90% of whom live in low income settings. Out of these 19 million are children under the age of 15 years. Children below the age of 10 years have limited resources in terms of learning material. Also, what options do they have in terms of recreational material? A solution to this problem could be the use of assistive technology. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not give similar enjoyment as the books available for sighted children.

Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Due to these problems, children become vulnerable to developmental delays and other learning difficulties which hinder their inclusion into the society.

30

Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Therefore, such devices are not suitable for visually impaired children.

Thus, a solution is required which just doesn't only provide narration but also help visually impaired children in visualizing various characters, concepts & themes which can eventually help in cognition and perception development. In this way, not just only knowledge can be imparted amongst children but they can also be made aware of many things like social scenarios so that they can adapt to different surroundings easily. Thus, in this way their inclusion into the society can be accelerated.

Therefore, to overcome the disadvantages of prior art present invention provides a multimodal interaction system for visually impaired or sighted elderly as well as for people with learning disabilities which gives haptic stimuli in addition to audio stimulus. So, that integration of these two inputs can help the user in developing an understanding of the concept and thus can eventually help in perception and cognition development.

SUMMARY OF THE INVENTION

An object of the invention provides a multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory

storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

10 An another object of the invention provides a multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

An furthermore object of the invention provides a system enabling vision-impaired or people with low-vision to view objects or source material, including reading text (handwritten or printed), viewing pictures and physical object by feeling or touching and through audio speech signal.

An furthermore object of the invention provides a system for reading graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

- 5 FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system according to a preferred embodiment of the present invention;
FIG. 2 illustrates a tactile printed material according to a preferred embodiment of the present invention;
- 10 FIG. 3 illustrates work flowchart of the multimodal interaction system according to a preferred embodiment of the present invention; and
FIG. 4 illustrates a working configuration of the multimodal interaction system according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 The present invention provides a multimodal interaction system for visually impaired children, elderly as well as people with learning disabilities. The system of the present invention comprises primarily of a tactile printed material, a reading stand and a computing device that provides a synchronized audio stimulus in addition to a haptic stimuli to the visually
15 impaired.

FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system (100) according to a preferred embodiment of the present invention. The present invention provides a system (100)
20 enabling people with vision impairment or learning disabilities to view printed objects or source material, including reading text, graphics, shapes, handwritten or printed, viewing pictures and physical objects. The system (100) includes a computing device (110) preferably a mobile phone or smartphone, a foldable stand (101) and a page (10) with printed
25 3D/2D object, graphics, shapes or text. The foldable stand (101) includes a mobile phone sliding holder (102), over which mobile holder moves back and forth for a relevant position with respect to printed page preferably a tactile book (10) explained later in the specification, a height adjustable
stand frame (103) and clamps (105) with back support (104).

30

According to a preferred embodiment of the present invention the printed material is a storybook having 3D embossed images and graphics so that the user can actually feel the characters & concepts in the book. The graphics and text is identified by the software application running on
5 computing device preferably a camera mobile phone or smartphone and a corresponding audio is generated to the user. The software application is configured to use the camera of the computing device for scanning and the computer vision techniques for processing and filtering the image and extracting relevant features from the image. The book as described
10 comprises learning material made up of tactile sheets. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided to the user by the software application on the computing device. The software application is configured to perform image processing on each page separately &
15 playing the corresponding audio file. Further, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a simple stand is provided in the system. The stand is a wooden or plastic stand with clips or clamps to position the storybook appropriately & grooves on the top are used to hold the computing device
20 in proper position.

The prime components according to a preferred embodiment of the present invention are described in details herein:

- A. Tactile Printed Material
- 25 B. Wooden/Plastic Stand
- C. Software Application

A. Tactile Printed Material

Images and diagrams that are normally used by sighted people for
30 understanding concepts or conveying information are useless for visually impaired people. Visually impaired children below the age of ten years

explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. FIG. 2 illustrates a tactile printed material (200) according to a preferred embodiment of the present invention that includes 3D cut-outs (201) for proper shape estimation. These 3D cut-out tactile diagrams are produced using embossing or other technologies on physical medium like swell paper or PVC sheets. The printed material on page comprises high contrast embossed illustrations in which images or figures are embossed with different depth marking. It also provides audio land marking. Some Interesting question answers are provided at the end of material.

B. Stand

The stand (101) of the present invention is foldable, portable, light in weight, compact and easy to assemble & carry and adjustable in height to accommodate scanning of tactile sheets from A4 to upto A3 size. The stand supports multiple functionalities as explained herein:

- I. Mobile Holder: Visually Impaired children while reading can't keep the computing device for example, mobile phone in hand all the time and also can't keep it in position for proper scanning. Thus, a sliding holder (102) of design but not limited to Dove-tail is provided. It possesses a variable sized mobile device holder, whose length and width could be adjusted depending upon the customer's computing device dimensions. To prevent the computing device such as a mobile phone from falling while working, the computing device is locked into the holder during the initial set up, i.e. before running the system. The design for the stand used in the embodiment described herein may include any other suitable design whether now known or hereafter described in the construction art to achieve the particular purpose.

30 |

5 II. Support at the back: Due to the height of stand there is a possibility that the stand as a whole might vibrate or fall due to shocks or weight of computing device kept at the mobile holder (As computing device weight would tend to form a couple which in turn would have the tendency to rotate the stand as whole). Thus, the stand is provided with support (104) at the back to prevent vibration.

10 III. Book Holding Clamps/Frame: Clamps (105) are provided to prevent the relative motion between the printed matter for example a book and the stand to ensure that the book remains in a proper reading position.

15 IV. LED Light: Portable LED lights are placed on the top, on the backside of mobile holder to ensure proper lighting while scanning the documents/graphics.

C. Software Application

20 The software application in the present invention is configured to perform image processing on the specific images attached to each page of printed material and playing the corresponding audio file as illustrated in the work flowchart of FIG. 3 (explained later in specification). The camera of mobile phone captures the images of the printed subject matter which is processed by software application running on the computing device. The application first extracts feature of the images and identifies object after processing it. The identified regions of interest are linked to pre-stored audio data and a corresponding audio file is identified and generated. The audio file can be generated in different languages through various formats including text.

30 According to other embodiment of the present invention, an audio tactile storybook for visually impaired children is provided which offers a helping

hand to visualize the concepts in the real world and also provides an imaginary view of the original character and happenings all around in the book. In the present invention different learning concepts are incorporated as a part of the book such as on the page depicting a party scenario, the child is asked to count the number of balloons in the party. In this way, children learn new things in the flow of storybook reading only. It is also includes interactive Braille questions with audio answers at the end of the storybook to make the storybook more interesting for the visually impaired child who perceives as a fun Q & A game. The short puzzle provided at the end of the storybook also helps in improving the learning capacity of the child.

FIG. 3 illustrates work flowchart (300) of the multimodal interaction system according to a preferred embodiment of the present invention. The process starts at step (301) and (302) when storybook to be read is placed in the base of the stand and mobile phone is kept in the holder of the stand frame. At step (303) software application is launched in the mobile phone. Upon launch of the application camera first identifies the object or shape of graphics/image (at step 304). Once the image/graphic is identified it is further processed for the identification of text (if present) within it. Once the object/image is identified using feature extraction processes a corresponding audio/display file stored in the phone memory is retrieved (at step 306) and displayed/played to the user in an appropriate output format (at step 307). In a preferred embodiment output format, may be an audio file for a visual impaired user or may be a display form for the user with listening disability. If the application is unable to identify object/shape of image/graphics the system generates an error to the user in a suitable form.

According to preferred embodiment of present invention whenever a visually impaired child/adult or user wants to read the storybook (401), the

parent/caretaker sets up the system as illustrated in FIG. 4. The parent then fixes the book (401) on clamps (404) & computing device (402) in proper position on the holder (405) of the reading stand (403) respectively. Now, the parents leave the visually impaired child alone after starting the software application so that the child can enjoy the story. Thereafter, the image at the cover page is scanned & the central character of the story introduces itself & about the context of story. The image on the cover page also provides instructions to the child regarding the use the storybook so that the child can enjoy the story properly. After the introduction is complete, the child is asked to flip the cover. Now, on first page, there is a specific image (406) which is scanned by the camera of the computing device and software application performs image processing on the specific image for identification of page and region of interest for linkage and generation of audio in different languages through various formats including text. When the child feels the 3D embossed images on the page, the corresponding generated audio file is played via the software application. Likewise the story continues, and on the last page of the book Braille questions with audio answers are provided to make the child's experience more interactive.

20

In the present invention various embodiments have been explained in reference to visually impaired children however the system of present invention is not being limited to children only it can be used by other users such as all age groups of visually impaired, sighted elderly, as well as by people with learning disabilities.

25

The multimodal interaction system of the present invention has following advantages:

- I. It provides simultaneous tactile and audio stimulus for the user.
- II. The audio is provided via software application installed on the computing device.

30

- III. The multimodal interaction system of the present invention is provided in an affordable kit to the user.
- IV. The user requires minimum operational training to operate the multimodal interaction system of present invention.
- 5 V. The multimodal interaction system of present invention helps user in perception and cognition development.
- VI. It can be used as one of the tools in early intervention programs for blind/visually impaired children for better understanding of real world objects.
- 10 VII. The multimodal interaction system of the present invention provides edutainment that is education plus entertainment.
- VIII. The audio tactile books of the present invention help in auditory perception development and cognition development.
- IX. Special stuffed toys with audio feedback help in cognition development.
- 15

In the present invention tactile is sometimes referred to as haptic and mobile phone is sometimes referred to as smartphone or simply mobile or phone. These terms are used interchangeably in this specification.

20

In the present invention printed matter can refer to any of a wide variety of printed matter including, books, storybooks, learning material, hard cover bound books, paper back books, publications, newspapers, magazines, journals, periodicals, reading materials, literature, brochures, memos, notes, certificates, commercial paper, money, paper money, negotiable instruments, stock certificates, legal documents, legal papers, motions, discovery, interrogatories, decrees, judgments, wills, trusts, stamps, business cards, folders, files, packaging, boxes, letters, envelopes, labels, notebooks, papers checks, negotiable instruments, checks, money orders, credit cards, and any and all other types of conventional or new types of printed matter. Further, the term printed matter can specifically refer to

30

marks, fonts, text, images, pictures, illustrations, texture, dots, bumps, bar codes, matrix, and even Braille.

5 A “computing device,” as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory capability. Examples of computing devices, these teachings not being limited to only these examples, mobile phones, smartphones, tablets, digital personal assistants, and laptops, etc.

10

The “software application” or “app” can be available for download or installation on a user computing device from the provider of multimodal interaction system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided in the Kit to download the app. In an embodiment, the software application can be initialized when a user first time uses the multimodal interaction system. After the “software application” has been downloaded, the application can be installed on the computing device in an executable format. The executable form of the application permits the user to access 15 embodiments of the invention via an electronic resource, such as a mobile “app” or website. 20

~~WE CLAIM~~We Claim

- 5 1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text ~~A multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a~~ on an accessible page (10) comprising of:
- 10 a ~~mobile-computing~~ device (110) comprising a camera, a microphone, a speaker ~~and~~, a memory storing a set of instructions and, ~~coupled to~~ a processor coupled to the memory, wherein the processor is configured to execute instruction stored in the for: memory-storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format
- 15 -capturing the tactile image by camera;
-filtering the image to extract coordinate position and shape of the tactile image
-identifying tactile graphics, tactile text and/or printed text in the filtered image;
- 20 -identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;
-generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;;
- 25 a portable stand (101) for holding the computing device (110) during use comprising:
- 30 -a ~~stand~~-frame body (101-103) consisting on top comprising a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10) for holding the mobile device on top of the stand frame;

-LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);

5 a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; ~~for keeping printed page (10) below the mobile camera field view~~ and

10 ~~a~~ ~~back~~-support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

15 wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110).~~the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.~~

20 2. The system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image on an accessible page (10), wherein the tactile image is a 2D/3D embossed image optionally consisting of tactile data and/or printed text.

25 ~~2. The multimodal interaction system of claim 1, wherein the output format is a Braille display, or a text display corresponding to printed image/tactile data.~~

30 ~~3. The multimodal interaction system of claim 1, wherein the output format is an audible signal corresponding to printed image/tactile data.~~

5

~~4. The multimodal interaction system of claim 1, comprising a light source capable of illuminating the printed object from which at least one image is to be captured.~~

~~5. The multimodal interaction system of claim 1, wherein the stand (101) when folded is portable.~~

~~6. The multimodal interaction system of claim 1, wherein the adjustable stand frame body (103) height collapse towards the clamp support for storage.~~

10

7.3. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of~~The multimodal interaction system of claim 1, wherein printed page includes~~ graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

15

8.4. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein accessible page (10) optionally consists of~~The multimodal interaction system of claim 1, wherein printed page includes~~ nonvisible codes and images placed for comparing the captured image with a set of reference images pre-stored in the memory of the computing device (110) for generating a synchronous audio.

20

~~9. A multimodal interaction system (100) for reading 2D/3D-embossed image and/or tactile data printed on a page (10) comprising:~~

25

~~a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format;~~

30

~~a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand (101), a clamp support~~

5

~~(105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (101) are attached through the stand frame body (103) with adjustable height.~~

5. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the computing device (110) is a portable device preferably a mobile device or smartphone.

10

6. The system (100) for providing a tactual and a synchronized auditory stimulus as claimed in claim 1, wherein the audio file can be generated in different languages through various formats including text.

Dated this 10th day of May 2017

Rashmi Tyagi

RASHMI TYAGI

IN/PA-1594

AGENT FOR APPLICANTS

ABSTRACT
MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED

5 The present invention relates to a system (100) for providing a tactual and
a synchronized auditory stimulus in real time to a visually impaired for
reading a tactile image, braille, tactile text, and printed text on an
accessible page (10). The system comprises of a computing device (110)
for capturing the image and computer vision techniques for processing
and filtering the captured image, extracting relevant features from the
10 image and linking to a pre-stored audio file for generating an audio
stimulus corresponding to the processed tactile image to the visually
impaired. The computing device (110) is held by a portable stand (101)
during use which comprises a frame body (103) for securing the
computing device (110) at an appropriate angle and distance for capturing
15 image, a clamp support (105) for securing accessible page (10) under the
camera field view, and a support (104) for balancing the computing device
(110).~~The present invention relates to a multimodal interaction system for~~
~~visually impaired. The system of the present invention provides~~
~~synchronized audio stimuli in addition to haptic stimulus to the visually~~
20 ~~impaired and comprises of a tactile printed material, an application on a~~
~~computing device for providing audio and a stand to hold the computing~~
~~device at a specific angle. The application is configured to use the camera~~
~~of the computing device for scanning the printed material and computer~~
~~vision techniques for processing and filtering the scanned image and~~
25 ~~extracting relevant features from the image.~~

Date: 26 August 2020

Our reference: 201611016353

To

The Controller of Patents

The Patent Office, at New Delhi

Kind attention of: Shri Rakesh Kumar Kushwaha

Controller of Patents

Last Date: 26 August 2020

Dear Sir,

Re:

Applicant : Indira Gandhi Delhi Technical University for Women
Application No. : 201611016353
Filed on : 10 May 2016
Title : Multimodal Interaction System & Method for Visually Impaired

This is further to the First Examination Report (FER) issued on 26 February 2020 in respect of the above-mentioned patent application. The Applicant, herein, submits response to all the objections raised in the FER. The last date to put the patent application in order for grant is 26 August 2020.

RESPONSE TO THE FER

Part 1: Summary of Amendments

Applicant humbly submits amended claims 1-6 are pending for examination. The original claims 1-9 are amended to more clearly articulate the subject matter and also to overcome the objections raised in the FER. No new matter has been introduced through these amendments. Applicant submits that the amended claims 1-9 are within the scope of the invention disclosed in the original filed complete specification and the amended claims 1-9

are in accordance with Section 59 (1) of the Patents Act, 1970. A marked up copy of the amended claims indicating basis for the claim amendment from description or illustration of as filed complete specification is submitted herewith.

The amendment and renumbering of the claims is as following:

Amended Claims	Deleted Claims	New Added Claims
Claim 1 amended to Claim 1 Claim 7 amended to Claim 3, Claim 8 amended to Claim 4	Original Claim 2, Original Claim 3, Original Claim 4, Original Claim 5, and Original Claim 6	Claim 2, Claim 5, and Claim 6,

The support and basis for amended claims are given below:

Proposed Claims	Specification Support
Claim 1	Page 06, Lines 17-29; Page 07, Lines 1-20; Page 08, Lines 12-29; Page 09, Lines 1-15
Claim 2	Page 07, Lines 1-20
Claim 3	Page 04, Lines 29-31
Claim 4	Page 10, Lines 13-28
Claim 5	Page 06, Lines 17-29
Claim 6	Page 09, Lines 17-28s

The applicant, therefore, respectfully requests the Learned Controller for reconsideration of the present application in view of the forgoing amendments and following remarks.

Part-II: Detailed Technical Report

Objection 1: Novelty

The Learned controller has objected the novelty of originally filed claims 1-9 in view of document:

1. D1: WO 2014014175A1

D1 discloses the image region and the character region extraction step in the general education material to extract the text area and the image area for each information mixed in the general education material, by analyzing the extracted image area. The image information tactile step of each complex classifying the low complexity image and the high complexity image and processing each image into the tactile information and recognizing the character information in the tactile text area and the character information in the video area, respectively It is a haptic display-based visual information display method for the visually impaired, including a character recognition and braille conversion step to convert to braille information and the image area and the text area extracting step in the general education data are classified into text areas other than the video area, text areas in the video area, and video areas and the image area and the text area extraction step in the general education material, for the brightness (brightness) image and label for the characteristic analysis of the text and visual material for the general education material General education data input step for generating the base information, image area

extraction step for classifying the text area and the image area based on the characteristics of the text and visual data appearing in the generated brightness image, and extracting the video area, and the classified image And a character extraction step in the image region for detecting the character region in the region.

Applicant submits the following submissions with regard to novelty of the claimed invention in view of cited document D1:

i. D1 discloses a method of converting printed information (images and text) into haptic information using a novel algorithm and displaying the haptic information on a haptic display-based visual information display system. According to D1 a method is disclosed for converting educational material including a visual material into tactile information together with a character and providing a special educational material having a similar level to a general educational material whereas the proposed invention provides a system to make text, diagrams, embossed image and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides simultaneous multilingual audio narration with an existing tactile image and/or text in real time using a mobile device. The mobile device scans the tactile image which may additionally consist an embossed image, braille text and normal text (if any) and renders simultaneous audio of scanned image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a stand. This arrangement facilitates a multimodal (tactual and auditory) interaction for visually impaired persons for understanding graphical information in an affordable manner.

ii. D1 discloses a method for displaying visual information based on a haptic display for a visually impaired person comprises the steps of extracting an image region and a text region in a general education material for extracting a text region and an image region for each information mixed in a general educational material; classifying a low complexity image and a high complexity image by analyzing the extracted image region; processing each image according to the complexity to convert each image into tactile information; and recognizing character information in the tactile character region and character information in the image region, respectively, and converting the recognized character information into braille information whereas in the proposed invention the tactile sheets having embossed images,

graphics and text which user can actually feel as well as general text is identified by the software application running on computing device preferably a camera mobile phone or smartphone, processed for feature extraction and a corresponding audio is generated to the user. The software application is configured to use the camera of the computing device for scanning and the computer vision techniques for processing and filtering the image and extracting relevant features from the image of tactile sheets. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided to the user by the software application on the computing device of the proposed invention. Further, the software application is configured to perform image processing on each page separately & playing the corresponding audio file. Additionally, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a stand is provided in the system. The stand is a wooden or plastic stand with clips or clamps to position the printed material appropriately & grooves on the top are used to hold the computing device in proper position. Thus the entire setup of the system of the present invention enable a visually impaired to read tactile images through tactual and synchronizing auditory stimulus. Hence the proposed invention stands novel in view of teaching of cited document.

iii. According to D1 a method is disclosed for converting and displaying visual information in general educational materials through a multimedia device into tactile information. More specifically it discloses a method for extracting an image region and a text region in the general education material for extracting a character region and an image region for each information mixed in the general education material followed by analyzing the extracted image region, a low-complexity image including figures and graphs and a high-complexity image including illustrations and photos are classified, and each of the separated images is tactile or hapticized through different processing processes according to the

complexity whereas proposed invention provides a system is for rendering tactile embossed images and graphics readable to the user (visually impaired). Being tactile embossed images the user can actually feel the characters & concepts in the images and by the method of proposed invention the graphics and text in tactile matter is identified by the software application running on computing device preferably a camera mobile phone or smartphone and a corresponding audio is generated to the user. Thus, provides a system for enabling a vision-impaired or people with low-vision to view objects or source material, including reading text (handwritten or printed), viewing pictures and physical object by feeling or touching and through audio speech signal simultaneously.

Accordingly, it is respectfully stated that the cited prior art does not teaches a system for identifying and processing embossed tactile image, text and graphics to simultaneous audio output and thus does not applies identification and image processing technique of proposed invention the hence the system of proposed in view of cited document D1 stands novel.

2. D1: WO 2012169810A2

D2 discloses a haptic electronic board-based system and a method for providing learning information for visually impaired persons is disclosed. The system for providing learning information for visually impaired persons comprises a learning information server, which is linked to a lecture and a writing program; a first information output device (PC) for receiving from the learning information server learning information for persons with poor vision via a wired and wireless network (LAN, WLAN), and on which a viewer program of the persons with poor vision for providing screen magnification and reduction functions is installed; and a second information output device (haptic electronic board) for connecting to the learning information server through a short distance wireless network (ZigBee or Bluetooth) using a unique device ID, and converting learning information for completely

blind persons, which is received from the learning information server by the haptic electronic board, into tactile information and transferring the tactile information to the completely blind persons. The learning information server transfers the lecture and the learning information that is written by the writing program to visually impaired persons having various degrees of visual impairment using a tactile information automatic conversion technology.

Applicant submits the following submissions with regard to novelty of the claimed invention in view of cited document D2:

i. D2 discloses a system for inputting learning information including formulas, symbols, pictures, figures, graphs, and video information as well as characters written by lectures and authoring programs to the learning information server. After receiving, the video information is reconstructed for low vision people so that people with low vision can easily recognize it, and automatically converted into tactile information that can be easily recognized by all blind people. The learning information stored in the learning information server is saved in real time through a wired or wireless network. The system further comprises haptic that provides learning information suitable for both low vision and blind people by transmitting to first information output devices (PC) for low vision people with a viewer program installed, and second information output devices (haptic electronic board) for all blind people. It provides an electronic board-based learning information provision system for the visually impaired whereas the proposed invention aims to make tactile images, diagrams, text and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides a simultaneous multilingual audio narration with an existing tactile image in real time using a mobile device. The mobile device scans the tactile image and renders simultaneous audio of particular image regions using off the shelf image processing algorithms. Further, the system of proposed invention offers the portability to the user in comparison to cited document by providing a portable stand for holding the

computing device. This portable stands also allows for accurate scanning of subject image by adjusting the height and angle of the computing device being held. Hence the cited document fail to teach a similar system comprising a computing device and a portable stand for rendering tactile image readable by a visually impaired through tactual and a synchronized audio in real-time. Thus, the proposed invention stands novel.

3. D3: IN 201611011175A

D3 discloses a device, systems, and methods for assisting a visually impaired user in gripping an object and the aspects are further described below in the detailed description. This summary is not intended to identify essential features of the claimed subject matter nor is it intended for use in determining or limiting the scope of the claimed subject matter and a system for assisting a visually impaired user to grip objects is illustrated. The system comprises a memory and a processor coupled to the memory. The processor is configured to execute program instructions stored in the memory. The processor may execute programmed instructions stored in the memory to receive an image of an object in real-time and identify a reference image corresponding to the image by comparing the image with reference images present in a database. Further, the processor may execute programmed instructions stored in the memory to identify a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. Further, the processor may execute programmed instructions stored in the memory to generate the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. Further, the processor may execute programmed instructions stored in the memory to receive a tactile image from a tactile glove put on by the visually impaired user. Further, the processor may execute programmed instructions stored in the memory to

compare the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image.

Furthermore, the processor may execute programmed instructions stored in the memory to generate a second set of audio instructions for guiding the visually impaired user to grip the object base on a second set of audio instructions, wherein the second set of audio instructions are generated based on the pressure variation data and a device for assisting a visually impaired user to grip an object is illustrated. The device comprises a camera mounted over a wearable device and a central processing unit coupled to the camera and tactile gloves. The central processing unit comprises a memory and a processor coupled to the memory. The processor is configured to execute program instructions stored in the memory. The processor may execute programmed instructions stored in the memory to receive an image of an object in real-time from the camera and identify a reference image corresponding to the image by comparing the image with reference images present in a database. Further, the processor may execute programmed instructions stored in the memory to identify a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. Further, the processor may execute programmed instructions stored in the memory to generate the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. Further, the processor may execute programmed instructions stored in the memory to receive a tactile image from a tactile glove put on by the visually impaired user. Further, the processor may execute programmed instructions stored in the memory to compare the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image. Furthermore, the processor may execute programmed instructions stored in the memory to generate a second set of audio instructions for guiding the visually impaired user to grip the object base on a second set of audio instructions,

wherein the second set of audio instructions are generated based on the pressure variation data and a non-transitory computer-readable medium embodying a program executable in a computing device for assisting a visually impaired user to grip an object is disclosed. The program comprises program code for receiving an image of an object in real-time from the camera and identifying a reference image corresponding to the image by comparing the image with reference images present in a database. The program comprises program code for identifying a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. The program comprises program code for generating the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. The program comprises program code for receiving a tactile image from a tactile glove put on by the visually impaired user. The program comprises program code for comparing the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image. The program comprises program code for generating a second set of audio instructions for guiding the visually impaired user to grip the object based on a second set of audio instructions, wherein the second set of audio instructions are generated based on the pressure variation data.

Applicant submits the following submissions with regard to novelty of the claimed invention in view of cited document D3:

i. D3 relates to the field of navigation and discloses system and method for assisting a visually impaired user to grip an object. The system may receive an image of an object in real-time and identify a reference image corresponding to the image by comparing the image with reference images. Further, the system may identify a reference tactile image corresponding to the reference image and generate a first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image.

Further, the system may receive a tactile image from a tactile glove of the visually impaired user and compare the tactile image with the reference tactile image to identify pressure variation data. Furthermore, the system may generate a second set of audio instructions for guiding the visually impaired user to grip the object generated using the pressure variation data. Thus the invention relates to the field of navigation and employment in assembly lines or similar fields where gripping an object is an essential part of work whereas the proposed invention discloses a system to make diagrams and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides simultaneous multilingual audio narration with an existing tactile image in real time using a mobile device. The mobile device scans the tactile image and renders simultaneous audio of particular image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a portable stand. This arrangement facilitates multimodal (tactual and auditory) interaction for visually imapired persons for understanding graphical information in an affordable manner.

ii. In D3 the smart glass worn by the users receives an image in real time and provides auditory instructions for properly gripping an object by comparing the received image with the reference images. The tactile glove receives tactile image and provides a second set of audio instructions by comparing with the reference tactile images. Thus the system of D3 does not narrate any information about the 3D object. It is rather related to properly gripping the object and no tactile information is provided.

iii. Further, in D3 the auditory instructions are provided to guide the user to properly grip an object and no corresponding/simultaneous audio is provided about the object.

iv. In D3 the system receives images of 3D objects in real time for the purpose of guiding users to properly grip the object by means of auditory instruction and it does not utilise the

haptic information for providing any details about the object to the user as in the proposed invention. Thus, the proposed invention stands novel.

Objection 2: Inventive Step

The Learned controller has objected the inventive merit of originally filed claims 1-9 in view of document:

1. D1: WO 2014014175A1
2. D2: WO 2012169810A2
3. D3: IN 201611011175A

Applicant submits the following submissions with regard to inventiveness of the claimed invention:

The claim 1 is amended to more clearly articulate the subject matter and also to overcome the objections raised in the FER. The amendments are fully supported in the specification on record. It is well settled that in determining the differences between the prior art and the claims, the question under is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. To this end, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.

[Emphasis Added] To establish a prima facie case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation to modify the reference or to combine reference teachings; (2) there must be reasonable expectation of success; and (3) the prior art reference must teach or suggest all the claim limitations.

Thus, Applicant respectfully traverses the rejection because the approach disclosed in **D1, D2 and D3** and approach claimed in the proposed invention is not only different, but

portions of **D1, D2 and D3** upon which the Learned Controller relied do not render the claimed invention render obvious.

Claim 1 has been amended to recite:

1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page comprising of:

a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instructions stored in the memory for:

- capturing the tactile image by camera;
- filtering the image to extract coordinate position and shape of the tactile image
- identifying tactile graphics, tactile text and/or printed text in the filtered image;
- identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;
- generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;

a portable stand (101) for holding the computing device (110) during use comprising:

- a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10);
- LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);
- a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and
- a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110).

Applicant claimed features	D1 claimed features
1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time	D1 discloses method of converting printed information (images and text) of general

to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page comprising of:

a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instructions stored in the memory for:

-capturing the tactile image by camera;

-filtering the image to extract coordinate position and shape of the tactile image;

-identifying tactile graphics, tactile text and/or printed text in the filtered image;

-identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;

-generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;

a portable stand (101) for holding the computing device (110) during use comprising:

-a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10);

-LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);

-a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and

education material into haptic information using a novel algorithm and displaying the haptic information on a haptic display-based visual information display system.

whereas proposed invention provides a system to make tactile diagrams and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides simultaneous multilingual audio narration with an existing tactile image in real time using a mobile device. The mobile device scans the tactile image and renders simultaneous audio of particular image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a portable stand. This arrangement facilitates multimodal (tactual and auditory) interaction for visually imapired persons for understanding graphical information in an affordable manner.

The system of D1 discloses a method for displaying visual information based on a haptic display for a visually impaired person comprises the steps of extracting an image region and a text region in a general education material for extracting a text region and an image region for each information mixed in a general educational material; classifying a low complexity image and a high complexity image by analyzing the extracted image region; processing each image according to the complexity to convert each image into tactile information; and recognizing character information in the tactile character region and character information in the image region, respectively, and converting the recognized character information into braille information

whereas proposed invention doesn't convert visual information/diagrams into tactile equivalents in real time. The output format is tactile image comprising of Braille labels for text and tactile/raised regions for the

- a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110).

image/diagram areas converted into tactile equivalent prior to be read using simultaneous audio narration. The technical advancement lies in using both output modalities that is tactual and auditory in a simultaneous manner to understand the image/diagram by a visually impaired.

In D1 there is no mention of audio narration of tactile images and data.

whereas in proposed invention an audible signal in multilingual format is generated in coherence with the tactile objects being experienced by the visually impaired person.

In D1 no light source is mentioned instead it comprises a step of generating a brightness image in its image processing algorithm for analyzing the characteristics of the text and visual data for the general education material.

whereas the proposed invention comprises a light source configured to portable stand capable of illuminating the tactile printed object to assist the mobile device in accurately capturing the image in real time for generating the associated auditory signal. At least one image is to be captured by the mobile device for generating associated audio.

D1 comprises of converting printed information (images and text) of general education material into haptic information using a novel algorithm and displaying the haptic information on a haptic display-based visual information display system and as such it is a standalone output device.

whereas the proposed invention comprises multiple components, namely the computational device being the mobile / smartphone, the tactile image and the portable stand for aligning both the diagram / tactile image and mobile device in the desired way for properly capturing the tactile image from mobile device to generate a corresponding audio. The mobile device is

	<i>the preferred computational device due to low cost and portability. In order to ensure the portability of the entire arrangement, the stand is portable when folded and not in use.</i>
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Applicant respectfully submits that the system of proposed invention is for user with all degrees of vision and comprises of a portable computing device secured to a portable stand when compared to stationary system of D1. The document D1 fails to disclose a system for providing a tactual and a synchronized auditory stimulus (multimodal interaction) in real time to a visually impaired for reading a tactile image, braille, tactile text, and printed text on an accessible page by using a portable device secured to a portable stand for ease of access and appropriate conversion of tactile image and data on the accessible sheet through various image processing steps into an synchronized auditory stimulus rendering a visually impaired to read tactile images, graphics and diagrams.

Applicant claimed features	D2 claimed features
<p>1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page comprising of:</p> <p style="padding-left: 40px;">a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instructions stored in the memory for:</p> <ul style="list-style-type: none"> -capturing the tactile image by camera; -filtering the image to extract coordinate position and shape of the tactile image; -identifying tactile graphics, tactile text and/or printed text in the filtered image; -identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text; 	<p>D2 discloses a system and method for providing learning information for the visually impaired based on a haptic electronic board. The system for providing learning information for visually impaired persons comprises a learning information server, which is linked to a lecture and a writing program; a first information output device (PC) for receiving from the learning information server learning information for persons with poor vision via a wired and wireless network (LAN, WLAN), and on which a viewer program of the persons with poor vision for providing screen magnification and reduction functions is installed; and a second information output device (haptic electronic board) for connecting to the learning information server through a short distance wireless network (ZigBee or Bluetooth) using a unique device ID, and converting learning information for completely blind persons, which is received from the learning information server by the haptic electronic board, into tactile information and transferring the tactile information to the completely blind</p>

-generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;

a portable stand (101) for holding the computing device (110) during use comprising:

-a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10);

-LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);

-a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and

- a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by computing device (110).

persons. The system comprises of different output devices for catering to different degree of vision loss, namely PC for low vision users and ultrasonic motors based tactile display for blind users.

whereas system of proposed invention make diagrams and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides simultaneous multilingual audio narration with an existing tactile image in real time using a mobile device. The mobile device scans the tactile image for processing and generating simultaneous audio of particular image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a portable stand. This arrangement facilitates multimodal (tactual and auditory) interaction for visually impaired persons for understanding graphical information in an affordable manner.

D2 comprises a concept of delivering video information to low vision users through PC connected through a wired/wireless connection by using a low vision citation viewer program. For blind users, tactile information is conveyed through ultrasonic motors based tactile display connected through wireless medium. The content needs to be previously stored on a learning information server. Depending on the degree of vision loss, the user connects with the server using the appropriate wired/wireless connection.

whereas the proposed invention uses simultaneous tactile and auditory inputs for providing information to users with all degrees of vision loss (low vision and blind). The information for image recognition and audio generation is stored locally in the memory of the mobile device. No other dedicated device is required for storing and accessing information.

	<p>In D2 the output format is reconstructed video accessed using a PC for low vision users and tactile information accessed through actuator pins for blind users.</p> <p><i>whereas in the proposed invention both output modalities, tactual and auditory are utilized in a simultaneous manner to understand the image/diagram and as such the audible signal is provided in coherence with the tactile object being experienced by the visually impaired person.</i></p> <p>In D2 the graphical and text information received from the learning information server is converted in real time either into reconstructed video/tactile information delivered through PC/haptic electronic board depending on the degree of vision loss.</p> <p><i>whereas the proposed invention consists of a tactile image comprising Braille labels for text and tactile/raised regions for the image/diagram areas converted into tactile equivalent prior to be read using simultaneous audio narration using off the shelf print to tactile conversion algorithms. The proposed invention has been developed for visually impaired and can also be used for users with learning disabilities as it offers multimodal interaction.</i></p>
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Applicant respectfully submits that D2 fail to disclose the teaching of proposed invention.

Applicant claimed features	D3 claimed features
<p>1. A system (100) for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image optionally consisting of braille, tactile text, and printed text on an accessible page comprising of:</p> <p>a computing device (110) comprising a camera, a microphone, a speaker, a memory storing a set of instructions and, a processor coupled to the memory, wherein the processor is configured to execute instructions stored in the memory for:</p>	<p>D3 relates to the field of navigation and discloses system and method for assisting a visually impaired user to grip an object. The system may receive an image of an object in real-time and identify a reference image corresponding to the image by comparing the image with reference images.</p> <p>Further, the system may identify a reference tactile image corresponding to the reference image and generate a first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image.</p>

-capturing the tactile image by camera;

-filtering the image to extract coordinate position and shape of the tactile image;

-identifying tactile graphics, tactile text and/or printed text in the filtered image;

-identifying a pre-stored audio file corresponding to captured image for linking to the tactile graphics, tactile text and/or printed text;

-generating an auditory stimulus synchronized to linked tactile graphics, tactile text and/or printed text to the visually impaired;

a portable stand (101) for holding the computing device (110) during use comprising:

-a frame body (103) consisting on top a sliding holder (102) movable back and forth for securing an appropriate angle and distance of camera of the computing device (110) with respect to the accessible page (10);

-LED lights secured to the top on the backside of the frame body (103) to provide sufficient light on accessible page (10) for capturing of the tactile image by the computing device (110);

-a clamp support (105) at bottom of the frame body (103) for securing accessible page (10) under the computing device camera field view; and

- a support (104) at the back of the frame body (103) for balancing the stand (101) by preventing vibration due to weight of the device (110) and stand (101) itself;

wherein the frame body (103) is adjustable in height by collapsing towards the clamp support (105) for appropriate capturing of accessible pages (10) of different size preferably from A4 to upto A3 size by

Further, the system may receive a tactile image from a tactile glove of the visually impaired user and compare the tactile image with the reference tactile image to identify pressure variation data.

Furthermore, the system may generate a second set of audio instructions for guiding the visually impaired user to grip the object generated using the pressure variation data. Thus the invention relates to the field of navigation and employment in assembly lines or similar fields where gripping an object is an essential part of work.

whereas the proposed invention discloses a system to make diagrams and graphical information accessible to users with all degrees of vision loss in real time and in an affordable manner. The proposed invention provides simultaneous multilingual audio narration with an existing tactile image in real time using a mobile device. The mobile device scans the tactile image and renders simultaneous audio of particular image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a portable stand. This arrangement facilitates multimodal (tactual and auditory) interaction for visually impaired persons for understanding graphical information in an affordable manner.

In D3 the smart glass worn by the users receives an image in real time and provides auditory instructions for properly gripping an object by comparing the received image with the reference images. The tactile glove receives tactile image and provides a second set of audio instructions by comparing with the reference tactile images.

Thus the system of D3 does not narrate any information about the 3D object. It is rather related to properly gripping the object and no tactile information is provided.

Further, in D3 the auditory instructions are provided to guide the user to properly grip

<p>computing device (110).</p>	<p><i>an object and no corresponding/simultaneous audio is provided about the object.</i></p> <p>In D3 the system receives images of 3D objects in real time for the purpose of guiding users to properly grip the object by means of auditory instruction <i>and it does not utilise the haptic information for providing any details about the object to the user as in the proposed invention.</i></p>
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Applicant respectfully submits that **D3** relates to the field of navigation and discloses a system and method for assisting a visually impaired user to grip an object. The system of D3 receive a tactile image from a tactile glove of the visually impaired user and compare the tactile image with the reference tactile image to identify pressure variation data and then generate a second set of audio instructions for guiding the visually impaired user to grip the object generated using the pressure variation data whereas proposed invention relates to a system for providing a tactual and a synchronized auditory stimulus in real time to a visually impaired for reading a tactile image, braille, tactile text, and printed text on an accessible page by using a computing device. The computing device processes the tactile image by capturing tactile image by camera, filtering for coordinate extraction, tactile graphics, tactile text and/or printed text identification, linking a pre-stored audio file corresponding to the tactile graphics, tactile text and/or printed text and generating a synchronized auditory stimulus to the visually impaired. Thus the application and steps are nowhere disclosed in D1

[Emphasis added] Nowhere does D1, D2 and D3 disclose the explicit limitations of claim 1. Applicant believes the interpretation asserted by the Learned Controller is not supported by the disclosure of D1, D2 & D3. Further, there is no equivalence between the cited section of D1, D2 & D3 and the recitations of amended Claim 1. D1, D2 & D3 provides completely different solutions and is nowhere related to the application claimed invention. There is no similarity between the Applicant claim invention and D1, D2 & D3. D1, D2 &

D3 is in the same technical domain but discloses a completely different solution and does not set motivation to combine D1, D2 & D3 to arrive at the Applicant claimed invention. Even the problem statement of D1, D2 & D3 and Applicant claimed invention is different and hence the solutions. The problem statement is clearly evident from background of D1, D2 & D3 and Applicant claimed invention. Hence the solutions are different which is clearly evident from the claims of D1, D2 & D3 when compared with the claims of Applicant. It is important to consider the functions and underlying essence of the invention as described in all elements mentioned in the claims. Therefore, it is respectfully submitted that the interpretation asserted by the Learned Controller is not supported by the disclosure of D1, D2 & D3. Further, Applicant believes the interpretation asserted by the Learned Controller regarding the claimed steps is not supported by the disclosure of D1, D2 & D3. Nowhere in the cited portions and the whole document does D1, D2 & D3 describe or reasonably suggest the above indicated features claimed in the amended independent claim 1.

At least because D1, D2 & D3 fails to disclose the elements of the amended claim 1 as mentioned above, hence Applicant believes that the claim 1 is patentable over D1, D2 & D3. Therefore, the system of D1, D2 & D3 are different from that of Applicant's claimed subject matter. Additionally, a prima facie obviousness has not been established. Merely recitation of portions from prior art does not sustain the rejection of obviousness unless the prior art reasonably teaches and provides articulated reasoning with rational underpinning to support the legal conclusion of obviousness.

Accordingly, it is respectfully stated that the technical feature used to realize the complete invention is different from the cited prior art D1, D2 and D3 and hence makes the proposed invention non-obvious.

Applicant respectfully submits that the amended claim 1 is not obvious over D1, D2 and D3 since none of the references (either alone or combined) discloses a system of Claim1.

Therefore, a skilled artisan would not modify any of the cited references with an expectation of successfully arriving at that which is claimed as the invention because there is no teaching or disclosure of the aforementioned features defined by amended claim 1 and subsequent dependent claims 2-6. The dependent claims 2-6 are novel and inventive by virtue of their dependency on claim 1 respectively.

Accordingly, it is respectfully stated that none of the cited prior arts, either taken alone or in any combination thereof, will motivate a person ordinarily skilled in the art to arrive at the claimed invention. The Learned Controller is, therefore, requested to reconsider and waive the objection favorably.

Technical Advancement

The Proposed invention solves the problem of prior art using Braille, handmade tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired people. Braille has served as a great alternative for text but there is no such alternative for diagrams as an affordable and multimodal solution is not available. Listening to audio alone doesn't help either in diagram visualization. Also, having customized print sizes for every individual is not feasible. Thus, diagrams are omitted in textbooks across schools and colleges in India and other developing countries. Globally, expensive customized hardware multimodal solutions starting from 595\$ are used in developed countries and they require other expensive proprietary supplementary devices for providing assistance to visually impaired users. Thus, the availability and penetration of affordable multimodal devices across the globe for making diagrams accessible to visually impaired is almost negligible. Therefore, as a solution to existing problem proposed invention provides device for assisting a visually impaired user in accessing diagrams. The proposed invention provides simultaneous multilingual audio narration with a tactile image in real time using a mobile device. The

portable mechanism comprises of three major components namely the computational device- the mobile/smartphone, the tactile image and the portable stand for aligning both the diagram/tactile image and mobile device in the desired way for properly capturing the tactile image from mobile device to generate corresponding audio. The mobile device scans the tactile image and renders simultaneous audio of particular image regions using off the shelf image processing algorithms. The mobile device is aligned to the particular/desired height for scanning the image with the help of a stand. This arrangement facilitates multimodal (tactual and auditory) interaction for visually impaired persons for understanding graphical information in an affordable and portable manner to assist them in the field of education and employment.

Therefore, at the time of filing of this application, it would not have been obvious to a person skilled in the art to combine the teachings of D1-D3 to arrive at the claimed invention as D1-D3 is completely different which has no connection or relevance with the application claimed invention. Reconsideration is respectfully requested.

Objection 3: Non Patentability

Claim(s) (1-9) are statutorily non-patentable under the provision of clause (i) of Section 3 for the following reasons:

Without prejudice to the above objection, claims 1-9 are not patentable under section 3(i) of Patents Act as they are falling within the scope of any process for the medicinal, surgical, curative, prophylactic diagnostic, therapeutic or other treatment of human beings or any process for a similar treatment of animals to render them free of disease or to increase their economic value or that of their products.

Applicant respectfully submits the following submissions with regard to patentability of the claimed invention:

Applicant has amended the original claims 1-9 to overcome the above objection. Also Applicant believes that the claimed subject matter in amended claims 1-6 does not describe or relate to “any process for the medicinal, surgical, curative, prophylactic diagnostic, therapeutic or other treatment of human beings or any process for a similar treatment of animals to render them free of disease or to increase their economic value or that of their products”. Instead applicant claimed invention is related to solve a technical problem faced by visually impaired in reading diagrams, images and graphics. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not give similar enjoyment as the books available for sighted children. Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Therefore, such devices are not suitable for visually impaired children. Thus, a solution is required which just doesn't only provide narration but also help visually impaired children in visualizing various characters, concepts & themes, Therefore, as solution to the existing problem proposed invention provides a

multimodal interaction system for visually impaired or sighted elderly as well as for people with learning disabilities which gives haptic stimuli in addition to audio stimulus. So, that integration of these two inputs can help the visually impaired user in developing an understanding of the concept.

Further, the original claims 1-9 have been amended to include the inventive constructional feature and reference numerals have been given wherever necessary. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

Objection 4: Sufficiency of Disclosure

1. The Abstract does not sufficiently provide technical information about the invention. The abstract should be prepared as the instructions given in rule 13(7)(b), 13(7)(c) and 13(7)(d) of the Patents Rules, 2003 (as amended), including drawings.

The applicant respectfully submits that reference numerals have been given wherever necessary in abstract and the abstract is freshly prepared to include the technical feature of the invention in accordance with the instructions contained in Rule 13{7} of the Patent Rules, 2003 (as amended). Accordingly, the objection stands moot.

Objection 5: Clarity and Conciseness

Claim(s) 1-9 are not clearly worded in respect of:

1. In view of the plurality of the independent set of claims, nature, and scope of the alleged invention are not clearly understood. The subject matter for which protection is sought may be different from that defined by the claims, thereby resulting in a lack of clarity of the claims when the description is used to interpret the claims. The claims should be redrafted to make them sufficiently definitive and Inventive features should be brought out clearly and reference numerals should be supplemented in parenthesis to enhance the

intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10 (4) (c) of The Patents Act, 1970 (as amended). During revision and redrafting, care should be taken not to add any subject matter, which extends beyond the scope of the application as originally filed here your attention is also drawn towards section 59 of The Patents Act, 1970. The Principal claim should be characterized and clearly, bring out the inventive step. Inventive technical features should be incorporated in the claims and should be referenced with numerals in parentheses to enhance the intelligibility of claims.

The applicant submits that

1. The original multiple independent claim 1 & 9 are amended and retained as single independent claim 1.

2. Further, the original claim 1, 7 and 8 has been amended to include limitations of original dependent claim 2-6 and as such original claims claim 2-6 and 9 has been deleted. Also, new claim 2, 5 & 6 has been added to claim various embodiments of the invention that can be combined to form the invention disclosed in the specification.

3. The technical features of the claims are referenced with numerals in parentheses to enhance intelligibility of claims.

Hence, the amended claim set 1-6 is properly worded to make invention clear and concise. Therefore, Applicant humbly requests the Learned Controller to take the amendments in markup copy of specification on the patent office records and waive the above objections.

Objection 6: Definitiveness:

Claim(s) 1-9 do not sufficiently define the invention for the reasons as follows:

Claims 1-9 are vague and too broad regarding “ multimodal interaction system” , "text display corresponding to printed image/tactile data", "audible signal corresponding to printed

image/tactile data", "at least one image is to be captured", "wherein printed page includes graphical object, shapes, and body sensible by a visually impaired or sighted elderly or user with learning disabilities", "wherein printed page 5 includes nonvisible codes and images", "multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed", "a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand (101), a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (101) are attached through the stand frame body (103) with adjustable height" and "tactile data" etc. Claims should define the scope of the for which protection is claimed as per section 10 (4)(c) of The Patents Act, 1970 (as amended). Sufficiently definitive and Inventive features should be brought out clearly and reference numerals should be supplemented in parenthesis to enhance the intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10 (4) (c) of The Patents Act, 1970 (as amended). During revision and re-drafting, care should be taken not to add any subject matter, which extends beyond the scope of the application as originally filed here your attention is also drawn towards section 59 of The Patents Act, 1970. All essential features should be brought out clearly under the characterized clause in the main claim and supplemented with the reference numeral in parenthesis to enhance the intelligibility of the claims.

Applicant respectfully submits that claims are redrafted for limiting the broad terms and adding limitation of embodiment to the claims. The technical features of the claims are referenced with numerals in parentheses to enhance intelligibility of claims. Thus the amended claims 1-6 are clear and sufficiently define the invention. Therefore, Applicant humbly requests the Learned Controller to take the amendments in markup copy of Claims on the patent office records and waive the above objections.

Part-III

Formal requirements

1. **Date and Signature of Applicant:** Fresh Form-1 should be filed with the necessary details with the duly signed by the applicant.

Applicant respectfully submits that fresh FORM-1 signed by all inventors and applicant's agent is submitted. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

2. **Statement & Under Taking (Form 3 Details):** Fresh Form 3 should be filed. Details regarding application for Patents which may be filed outside India from time to time for the same or substantially the same invention should be furnished within six months from the date of filing of the said application under clause (b) of subsection(1) of section 8 and rule 12(1) of Indian Patent Act.

Applicant respectfully submits that there are no updates to form 3 filed at IPO dated 02.06.2016. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

3. Power of Attorney (Whether GPA, SPA, Stamped, requisite fee etc.):

1. Fresh Power of Attorney in favor of signatories to various Forms should be filed with proper stamp duty.

Applicant respectfully submits that a fresh PA/GPA in the name of the agent is filed. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

4. **Registered Agent as per Patent Agent Register:** Write the patent agent's name/number to verify the agent electronically on all Forms with duly signed.

Applicant respectfully submits that all necessary Forms 1, 2, 3, 5, 18 and related documents signed by applicant's agent originally indicating Name of the agent with original signature and IN/PA no. are submitted. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

5. Format of Specification (rule 13): Irrelevant portion shall be deleted and blank spaces shall be scored out in the complete specification. Claims should be prefaced with the words "We Claim" and Claims must be signed by the applicant.

Applicant respectfully submits that irrelevant portion and the blank spaces are deleted complete specification. The Claims are prefaced with the words "We Claim". Therefore, Applicant humbly requests the Learned Controller to take the amendments in markup copy of specification and claims on the patent office records and waive the above objections.

6. Format of Drawings: The Drawings referred to in the specification should be prepared in accordance with the instructions contained in Rule 15 of the Patent Rules, 2003(as amended in 2006).

Applicant respectfully submits that fresh drawings prepared in accordance with the instructions contained in Rule 15 of the Patent Rules, 2003(as amended in 2006) are submitted. Therefore, Applicant humbly requests the Learned Controller to take the amendments in markup copy of drawings on the patent office records and waive the above objections.

7. Other Deficiencies: If any amendment is necessitated in the complete specification then it is required to clearly identify (submission of marked copy) the amendments carried

out and to indicate the portion (page no and line no) of the complete specification as filed on which these amendments are based on. Further, the pages wherever amendments are carried out need to be freshly typed on white pages and to be filed in duplicate.

Applicant respectfully submits that a marked up copy of the amended specification indicating basis for the claim amendment from description or illustration of as filed in complete specification is submitted herewith for immediate reference. The pages numbers and claims of the complete specification as filed on which these amendments are based on are clearly indicated in a tabulated form in response sheet. Therefore, Applicant humbly requests the Controller to waive the above objections.

PRAYER

It is therefore prayed that:

- (a) the objections may be dropped;
- (b) the application may be favorably considered for early grant; and
- (c) a personal hearing may be granted in the event of any outstanding issue.

Dated this 26th day of August 2020

Rashmi Tyagi

RASHMI TYAGI

IN/PA-1594

AGENT FOR THE APPLICANT

To,

The Controller of Patents

The Patent Office, at New Delhi

Enclosures:

- 1. A mark-up copy of Claims**
- 2. A clean copy of Claims**
- 3. A mark-up copy Abstract**
- 4. A clean copy of Abstract**
- 5. A mark-up copy of Complete Specification**
- 6. A clean copy of Complete Specification**
- 7. A mark-up copy of Drawing**
- 8. A Clean copy of Drawings**
- 9. Annexure 1 for following Forms**
FORM-1, FORM-2, FORM-3, FORM-5 & Form-18 (signed by patent agent)
- 10. Fresh Form-1**
- 11. Fresh Form-3**
- 12. GPA (Fresh signed by Applicant in favour of Patent agent)**



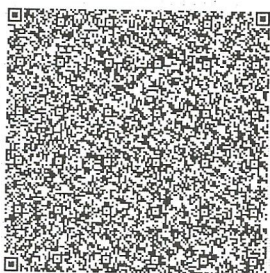
सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

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Certificate No. : IN-DL56367190598411N
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Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

I, **ANKITA GULATI**, Indian, of address CD 28 E, DDA Flats, Hari Nagar, New Delhi – 110064, India, and **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of address Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi (IN/PA-1594)**, Indian, of the address of correspondence #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and we request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 10th day of **May 2016**

Ankita
(Signature)

Ankita Gulati
CD 28 E, DDA Flats,
Hari Nagar, New Delhi - 110064

(Signature, Stamp)

Dr. S. Ramanarayana Reddy
HoD, Department of CSE, IGDTUW,
Kashmere Gate, New Delhi - 110006

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

FORM 3

THE PATENTS ACT, 1970

(39 of 1970)

and

THE PATENTS RULES, 2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).		I/We <u>Ankita Gulati</u> , Indian, of address <u>CD 28 E, DDA Flats, Hari Nagar, New Delhi - 110064, India</u> and <u>Indira Gandhi Delhi Technical University for Women</u> , Indian, of address <u>Kashmere Gate, New Delhi – 110006, India</u> hereby declare:			
2. Name, address and nationality of the joint applicant.		(i) that I/We have not made any application for the same/substantially the same invention titled " Multimodal Interaction System & Method for Visually Impaired " outside India Or (ii) that I/We who have made this application No. <u>N/A</u> dated <u>N/A</u> alone/jointly with <u>N/A</u> , made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:			
Name of the country	Date of Application	Application No.	Status of the application	Date of publication	Date of grant
N/A					
3. Name and address of the assignee		(iii) that the rights in the application(s) has/have been assigned to <u>None</u> that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India			

	<p>within six months from the date of filing of such application.</p> <p>Dated this <u>02nd</u> day of <u>June 2016</u></p>
4. To be signed by the applicant or his authorized registered patent agent.	<p>Signature <u>Rashmi Tyagi</u></p>
5. Name of the natural person who has signed.	<p><u>RASHMI TYAGI</u> <u>Agent for Applicant (IN/PA-1594).</u></p>
	<p>To The Controller of Patents, The Patent Office, at <u>New Delhi</u>.</p>
<p>Note.- Strike out whichever is not applicable;</p>	

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

1. NAME OF APPLICANT(S): ANKITA GULATI of CD 28 E, DDA Flats, Hari Nagar, New Delhi-110064, India & **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 201611016353 dated 10 May, 2016 are:-

2. INVENTORS(S)

(a) NAME : **GULATI** Ankita
(b) NATIONALITY : Indian
(c) ADDRESS : CD 28 E, DDA Flats, Hari Nagar,
New Delhi-110064, India

(a) NAME : **BALAKRISHNAN** Meenakshi
(b) NATIONALITY : Indian
(c) ADDRESS : Room No. 117, CSE Department, SIT Building,
Indian Institute of Technology Delhi,
Hauz Khas, New Delhi-110016, India

(a) NAME : **REDDY S.** Ramanarayana
(b) NATIONALITY : Indian
(c) ADDRESS : Room No. 107, Electrical Block,
Indira Gandhi Delhi Technical University for Women,
Kashmere Gate, New Delhi-110006, India

Dated this **14th** day of **May, 2017**

Rashmi Tyagi

Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. APPLICANT

- a. **NAME:** ANKITA GULATI
- b. **NATIONALITY:** INDIAN
- a. **ADDRESS:** CD 28 E, DDA FLATS, HARI NAGAR, NEW DELHI-110064, INDIA

- a. **NAME:** INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
- b. **NATIONALITY:** INDIAN
- c. **ADDRESS:** KASHMERE GATE, NEW DELHI-110006, INDIA

2. Statement in case of request for examination made by the applicants

We hereby request that our application for patent no. **201611016353** filed on **10th May, 2016** for the invention titled "**MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED**" shall be examined under sections 12 and 13 of the Act.

3. ADDRESS FOR SERVICE:

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh – 201007, India

Mobile No.: +91-9968284766

E-mail: rashmi@elpisinnovation.com

Dated 10th day of July, 2017

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANTS)

To,
The Controller of Patents
The Patent office, at New Delhi

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7, 54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No: Filing Date: Amount of Fee Paid: CBR No: Signature:
---	---

1. APPLICANT(S)

Name	Nationality	Address
ANKITA GULATI	Indian	CD 28 E, DDA Flats, Hari Nagar, New Delhi-110064, India
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN	Indian	Kashmere Gate, New Delhi-110006, India

2. INVENTOR(S)

Name	Nationality	Address
GULATI Ankita	Indian	CD 28 E, DDA Flats, Hari Nagar, New Delhi-110064, India
BALAKRISHNAN Meenakshi	Indian	Room No. 117, CSE Department, SIT Building, Indian Institute of Technology Delhi, Hauz Khas, New Delhi-110016, India
REDDY S. Ramanarayana	Indian	Room No. 107, Electrical Block, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

3. TITLE OF THE INVENTION

“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED”

4. ADDRESS FOR CORRESPONDENCE OF AUTHORISED PATENT AGENT IN INDIA

#250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh - 201007, India

Mobile No.: +91 9968284766

E-mail: rashmi@elpisinnovation.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
N.A.	N.A.	N.A.	---	---

6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International application number	International filing date as allotted by the receiving office
N.A.	N.A.

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) application number	Date of filing Original (first) application
N.A.	N.A.

8. PARTICULARS FOR FILING PATENT OF ADDITION

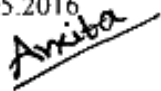
Main application/Patent Number	Date of filing of main application
N.A.	N.A.

9. DECLARATIONS:

(i) Declaration by the inventor(s)

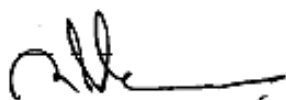
I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 10.05.2016

(b) Signature: 

(c) Name: GULATI, Ankita

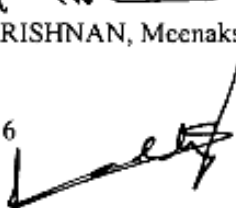
(b) Signature:



(c) Name: BALAKRISHNAN, Meenakshi

(a) Date: 10.05.2016

(b) Signature:



(c) Name: REDDY, S. Ramanarayana

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:

(b) Signature

(c) Name

(iii) Declaration by the applicant(s):

I/we, the applicant(s) hereby declare(s) that:-

- ✓ I am/We are in possession of the above-mentioned invention.
- ✓ The provisional specification relating to the invention is filed with this application.
- ✗ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ✓ There is no lawful ground of objection to the grant of patent to me/us.
- ✓ I am/We are the assignee or legal representative of true & first inventors
- ✗ The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention.
- ✗ I/We claim the priority from the above mentioned application(s) file in the convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- ✗ My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para – 6.
- ✗ The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed onunder section 16 of the Act.
- ✗ The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

(a) Form 2 (Provisional Specification) [Total No. of pages: *15*; *Specification: 11*, *Drawings: 04*]

Fee **Rs. 8,000/-** through online payment gateway on **10.05.2016**.

I/We hereby declare that to best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/we request that a patent may be granted to me/us for the said invention.

Dated this **10th** day of **May 2016**

Signature: 

Name: **RASHMI TYAGI**

(IN/PA-1594)

AGENT FOR THE APPLICANT

To,
The Controller of Patents
The Patent Office,
Intellectual Property Office Building,
Plot No. 32, Sector 14, Dwarka,
New Delhi-110075

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. APPLICANT

- a. **NAME:** ANKITA GULATI
- b. **NATIONALITY:** INDIAN
- a. **ADDRESS:** CD 28 E, DDA FLATS, HARI NAGAR, NEW DELHI-110064, INDIA

- a. **NAME:** INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
- b. **NATIONALITY:** INDIAN
- c. **ADDRESS:** KASHMERE GATE, NEW DELHI-110006, INDIA

2. Statement in case of request for examination made by the applicants

We hereby request that our application for patent no. **201611016353** filed on **10th May, 2016** for the invention titled "**MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED**" shall be examined under sections 12 and 13 of the Act.

3. ADDRESS FOR SERVICE:

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Dated 10th day of July, 2017

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANTS)

To,
The Controller of Patents
The Patent office, at New Delhi

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

1. NAME OF APPLICANT(S): ANKITA GULATI of CD 28 E, DDA Flats, Hari Nagar, New Delhi-110064, India & **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 201611016353 dated 10 May, 2016 are:-

2. INVENTORS(S)

(a) NAME : **GULATI** Ankita
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Dated this **14th** day of **May, 2017**

Rashmi Tyagi

Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED”**

ANKITA GULATI
INDIAN
CD 28 E, DDA FLATS, HARI NAGAR, NEW DELHI-110064, INDIA

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA

The following specification describes the invention and the manner in which it is to be performed.

MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED

FIELD OF INVENTION

5 The present invention relates to the field of assistive technologies for visually impaired people. More particularly, the invention relates to multimodal interaction system for visually impaired which provides a synchronized audio stimulus in addition to a haptic stimulation to the user.

10 **BACKGROUND OF THE INVENTION**

According to WHO, about 285 million people are estimated to be visually impaired worldwide, 90% of whom live in low income settings. Out of these 19 million are children under the age of 15 years. Children below the age of 10 years have limited resources in terms of learning material. Also, what options do they have in terms of recreational material? A solution to this problem could be the use of assistive technology. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not give similar enjoyment as the books available for sighted children.

Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Due to these problems, children become vulnerable to developmental delays and other learning difficulties which hinder their inclusion into the society.

30

Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Therefore, such devices are not suitable for visually impaired children.

Thus, a solution is required which just doesn't only provide narration but also help visually impaired children in visualizing various characters, concepts & themes which can eventually help in cognition and perception development. In this way, not just only knowledge can be imparted amongst children but they can also be made aware of many things like social scenarios so that they can adapt to different surroundings easily. Thus, in this way their inclusion into the society can be accelerated.

Therefore, to overcome the disadvantages of prior art present invention provides a multimodal interaction system for visually impaired or sighted elderly as well as for people with learning disabilities which gives haptic stimuli in addition to audio stimulus. So, that integration of these two inputs can help the user in developing an understanding of the concept and thus can eventually help in perception and cognition development.

SUMMARY OF THE INVENTION

An object of the invention provides a multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory

storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

10 An another object of the invention provides a multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

25 An furthermore object of the invention provides a system enabling vision-impaired or people with low-vision to view objects or source material, including reading text (handwritten or printed), viewing pictures and physical object by feeling or touching and through audio speech signal.

30 An furthermore object of the invention provides a system for reading graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

- 5 FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system according to a preferred embodiment of the present invention;
FIG. 2 illustrates a tactile printed material according to a preferred embodiment of the present invention;
- 10 FIG. 3 illustrates work flowchart of the multimodal interaction system according to a preferred embodiment of the present invention; and
FIG. 4 illustrates a working configuration of the multimodal interaction system according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 The present invention provides a multimodal interaction system for visually impaired children, elderly as well as people with learning disabilities. The system of the present invention comprises primarily of a tactile printed material, a reading stand and a computing device that provides a
15 synchronized audio stimulus in addition to a haptic stimuli to the visually impaired.

FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system (100) according to a preferred embodiment of the present invention. The present invention provides a system (100)
20 enabling people with vision impairment or learning disabilities to view printed objects or source material, including reading text, graphics, shapes, handwritten or printed, viewing pictures and physical objects. The system (100) includes a computing device (110) preferably a mobile phone or smartphone, a foldable stand (101) and a page (10) with printed
25 3D/2D object, graphics, shapes or text. The foldable stand (101) includes a mobile phone sliding holder (102), over which mobile holder moves back and forth for a relevant position with respect to printed page preferably a tactile book (10) explained later in the specification, a height adjustable stand frame (103) and clamps (105) with back support (104).

30

According to a preferred embodiment of the present invention the printed material is a storybook having 3D embossed images and graphics so that the user can actually feel the characters & concepts in the book. The graphics and text is identified by the software application running on
5 computing device preferably a camera mobile phone or smartphone and a corresponding audio is generated to the user. The software application is configured to use the camera of the computing device for scanning and the computer vision techniques for processing and filtering the image and extracting relevant features from the image. The book as described
10 comprises learning material made up of tactile sheets. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided to the user by the software application on the computing device. The software application is configured to perform image processing on each page separately &
15 playing the corresponding audio file. Further, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a simple stand is provided in the system. The stand is a wooden or plastic stand with clips or clamps to position the storybook appropriately & grooves on the top are used to hold the computing device
20 in proper position.

The prime components according to a preferred embodiment of the present invention are described in details herein:

- A. Tactile Printed Material
- 25 B. Wooden/Plastic Stand
- C. Software Application

A. Tactile Printed Material

Images and diagrams that are normally used by sighted people for
30 understanding concepts or conveying information are useless for visually impaired people. Visually impaired children below the age of ten years

explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. FIG. 2 illustrates a tactile printed material (200) according to a preferred embodiment of the present invention that includes 3D cut-outs (201) for proper shape estimation. These 3D cut-out tactile diagrams are produced using embossing or other technologies on physical medium like swell paper or PVC sheets. The printed material on page comprises high contrast embossed illustrations in which images or figures are embossed with different depth marking. It also provides audio land marking. Some Interesting question answers are provided at the end of material.

B. Stand

The stand (101) of the present invention is foldable, portable, light in weight, compact and easy to assemble & carry and adjustable in height to accommodate scanning of tactile sheets from A4 to upto A3 size. The stand supports multiple functionalities as explained herein:

- I. Mobile Holder: Visually Impaired children while reading can't keep the computing device for example, mobile phone in hand all the time and also can't keep it in position for proper scanning. Thus, a sliding holder (102) of design but not limited to Dove-tail is provided. It possesses a variable sized mobile device holder, whose length and width could be adjusted depending upon the customer's computing device dimensions. To prevent the computing device such as a mobile phone from falling while working, the computing device is locked into the holder during the initial set up, i.e. before running the system. The design for the stand used in the embodiment described herein may include any other suitable design whether now known or hereafter described in the construction art to achieve the particular purpose.

5 II. Support at the back: Due to the height of stand there is a possibility that the stand as a whole might vibrate or fall due to shocks or weight of computing device kept at the mobile holder (As computing device weight would tend to form a couple which in turn would have the tendency to rotate the stand as whole). Thus, the stand is provided with support (104) at the back to prevent vibration.

10 III. Book Holding Clamps/Frame: Clamps (105) are provided to prevent the relative motion between the printed matter for example a book and the stand to ensure that the book remains in a proper reading position.

15 IV. LED Light: Portable LED lights are placed on the top, on the backside of mobile holder to ensure proper lighting while scanning the documents/graphics.

C. Software Application

20 The software application in the present invention is configured to perform image processing on the specific images attached to each page of printed material and playing the corresponding audio file as illustrated in the work flowchart of FIG. 3 (explained later in specification). The camera of mobile phone captures the images of the printed subject matter which is processed by software application running on the computing device. The application first extracts feature of the images and identifies object after processing it. The identified regions of interest are linked to pre-stored audio data and a corresponding audio file is identified and generated. The audio file can be generated in different languages through various formats including text.

30 According to other embodiment of the present invention, an audio tactile storybook for visually impaired children is provided which offers a helping

hand to visualize the concepts in the real world and also provides an imaginary view of the original character and happenings all around in the book. In the present invention different learning concepts are incorporated as a part of the book such as on the page depicting a party scenario, the child is asked to count the number of balloons in the party. In this way, children learn new things in the flow of storybook reading only. It is also includes interactive Braille questions with audio answers at the end of the storybook to make the storybook more interesting for the visually impaired child who perceives as a fun Q & A game. The short puzzle provided at the end of the storybook also helps in improving the learning capacity of the child.

FIG. 3 illustrates work flowchart (300) of the multimodal interaction system according to a preferred embodiment of the present invention. The process starts at step (301) and (302) when storybook to be read is placed in the base of the stand and mobile phone is kept in the holder of the stand frame. At step (303) software application is launched in the mobile phone. Upon launch of the application camera first identifies the object or shape of graphics/image (at step 304). Once the image/graphic is identified it is further processed for the identification of text (if present) within it. Once the object/image is identified using feature extraction processes a corresponding audio/display file stored in the phone memory is retrieved (at step 306) and displayed/played to the user in an appropriate output format (at step 307). In a preferred embodiment output format, may be an audio file for a visual impaired user or may be a display form for the user with listening disability. If the application is unable to identify object/shape of image/graphics the system generates an error to the user in a suitable form.

According to preferred embodiment of present invention whenever a visually impaired child/adult or user wants to read the storybook (401), the

parent/caretaker sets up the system as illustrated in FIG. 4. The parent then fixes the book (401) on clamps (404) & computing device (402) in proper position on the holder (405) of the reading stand (403) respectively. Now, the parents leave the visually impaired child alone after starting the software application so that the child can enjoy the story. Thereafter, the image at the cover page is scanned & the central character of the story introduces itself & about the context of story. The image on the cover page also provides instructions to the child regarding the use the storybook so that the child can enjoy the story properly. After the introduction is complete, the child is asked to flip the cover. Now, on first page, there is a specific image (406) which is scanned by the camera of the computing device and software application performs image processing on the specific image for identification of page and region of interest for linkage and generation of audio in different languages through various formats including text. When the child feels the 3D embossed images on the page, the corresponding generated audio file is played via the software application. Likewise the story continues, and on the last page of the book Braille questions with audio answers are provided to make the child's experience more interactive.

20

In the present invention various embodiments have been explained in reference to visually impaired children however the system of present invention is not being limited to children only it can be used by other users such as all age groups of visually impaired, sighted elderly, as well as by people with learning disabilities.

25

The multimodal interaction system of the present invention has following advantages:

- I. It provides simultaneous tactile and audio stimulus for the user.
- II. The audio is provided via software application installed on the computing device.

30

- III. The multimodal interaction system of the present invention is provided in an affordable kit to the user.
- IV. The user requires minimum operational training to operate the multimodal interaction system of present invention.
- 5 V. The multimodal interaction system of present invention helps user in perception and cognition development.
- VI. It can be used as one of the tools in early intervention programs for blind/visually impaired children for better understanding of real world objects.
- 10 VII. The multimodal interaction system of the present invention provides edutainment that is education plus entertainment.
- VIII. The audio tactile books of the present invention help in auditory perception development and cognition development.
- IX. Special stuffed toys with audio feedback help in cognition development.
- 15

In the present invention tactile is sometimes referred to as haptic and mobile phone is sometimes referred to as smartphone or simply mobile or phone. These terms are used interchangeably in this specification.

20

In the present invention printed matter can refer to any of a wide variety of printed matter including, books, storybooks, learning material, hard cover bound books, paper back books, publications, newspapers, magazines, journals, periodicals, reading materials, literature, brochures, memos, notes, certificates, commercial paper, money, paper money, negotiable instruments, stock certificates, legal documents, legal papers, motions, discovery, interrogatories, decrees, judgments, wills, trusts, stamps, business cards, folders, files, packaging, boxes, letters, envelopes, labels, notebooks, papers checks, negotiable instruments, checks, money orders, credit cards, and any and all other types of conventional or new types of printed matter. Further, the term printed matter can specifically refer to

30

marks, fonts, text, images, pictures, illustrations, texture, dots, bumps, bar codes, matrix, and even Braille.

5 A “computing device,” as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory capability. Examples of computing devices, these teachings not being limited to only these examples, mobile phones, smartphones, tablets, digital personal assistants, and laptops, etc.

10

The “software application” or “app” can be available for download or installation on a user computing device from the provider of multimodal interaction system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided in the Kit to download the app. In an embodiment, the software application can be initialized when a user first time uses the multimodal interaction system. After the “software application” has been downloaded, the application can be installed on the computing device in an executable format. The executable form of the application permits the user to access 15 embodiments of the invention via an electronic resource, such as a mobile “app” or website. 20

WE CLAIM

1. A multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising:
 - 5 a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format;
 - 10 a stand frame (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.
2. The multimodal interaction system of claim 1, wherein the output format is a Braille display, or a text display corresponding to printed image/tactile data.
- 20 3. The multimodal interaction system of claim 1, wherein the output format is an audible signal corresponding to printed image/tactile data.
4. The multimodal interaction system of claim 1, comprising a light source capable of illuminating the printed object from which at least one image is to be captured.
- 25 5. The multimodal interaction system of claim 1, wherein the stand (101) when folded is portable.
6. The multimodal interaction system of claim 1, wherein the adjustable stand frame body (103) height collapse towards the clamp support for storage.
- 30

7. The multimodal interaction system of claim 1, wherein printed page includes graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.
8. The multimodal interaction system of claim 1, wherein printed page includes nonvisible codes and images.
9. A multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising:
a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format;
a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand (101), a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (101) are attached through the stand frame body (103) with adjustable height.

Dated this 10th day of May 2017

**RASHMI TYAGI
AGENT FOR APPLICANTS**

ABSTRACT
MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED

The present invention relates to a multimodal interaction system for visually impaired. The system of the present invention provides synchronized audio stimuli in addition to haptic stimulus to the visually impaired and comprises of a tactile printed material, an application on a computing device for providing audio and a stand to hold the computing device at a specific angle. The application is configured to use the camera of the computing device for scanning the printed material and computer vision techniques for processing and filtering the scanned image and extracting relevant features from the image.

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED”**

ANKITA GULATI
INDIAN
CD 28 E, DDA FLATS, HARI NAGAR, NEW DELHI-110064, INDIA

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA

The following specification describes the invention and the manner in which it is to be performed.

MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED

FIELD OF INVENTION

5 The present invention relates to the field of assistive technologies for visually impaired people. More particularly, the invention relates to multimodal interaction system for visually impaired which provides a synchronized audio stimulus in addition to a haptic stimulation to the user.

10 **BACKGROUND OF THE INVENTION**

According to WHO, about 285 million people are estimated to be visually impaired worldwide, 90% of whom live in low income settings. Out of these 19 million are children under the age of 15 years. Children below the age of 10 years have limited resources in terms of learning material. Also, 15 what options do they have in terms of recreational material? A solution to this problem could be the use of assistive technology. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not 20 give similar enjoyment as the books available for sighted children.

Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is 25 not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Due to these problems, children become vulnerable to developmental delays and other learning difficulties which hinder their inclusion into the society.

30

Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Therefore, such devices are not suitable for visually impaired children.

Thus, a solution is required which just doesn't only provide narration but also help visually impaired children in visualizing various characters, concepts & themes which can eventually help in cognition and perception development. In this way, not just only knowledge can be imparted amongst children but they can also be made aware of many things like social scenarios so that they can adapt to different surroundings easily. Thus, in this way their inclusion into the society can be accelerated.

Therefore, to overcome the disadvantages of prior art present invention provides a multimodal interaction system for visually impaired or sighted elderly as well as for people with learning disabilities which gives haptic stimuli in addition to audio stimulus. So, that integration of these two inputs can help the user in developing an understanding of the concept and thus can eventually help in perception and cognition development.

SUMMARY OF THE INVENTION

An object of the invention provides a multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory

storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

10 An another object of the invention provides a multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format, a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.

25 An furthermore object of the invention provides a system enabling vision-impaired or people with low-vision to view objects or source material, including reading text (handwritten or printed), viewing pictures and physical object by feeling or touching and through audio speech signal.

30 An furthermore object of the invention provides a system for reading graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

- 5 FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system according to a preferred embodiment of the present invention;
FIG. 2 illustrates a tactile printed material according to a preferred embodiment of the present invention;
- 10 FIG. 3 illustrates work flowchart of the multimodal interaction system according to a preferred embodiment of the present invention; and
FIG. 4 illustrates a working configuration of the multimodal interaction system according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 The present invention provides a multimodal interaction system for visually impaired children, elderly as well as people with learning disabilities. The system of the present invention comprises primarily of a tactile printed material, a reading stand and a computing device that provides a
15 synchronized audio stimulus in addition to a haptic stimuli to the visually impaired.

FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system (100) according to a preferred embodiment of the present invention. The present invention provides a system (100)
20 enabling people with vision impairment or learning disabilities to view printed objects or source material, including reading text, graphics, shapes, handwritten or printed, viewing pictures and physical objects. The system (100) includes a computing device (110) preferably a mobile phone or smartphone, a foldable stand (101) and a page (10) with printed
25 3D/2D object, graphics, shapes or text. The foldable stand (101) includes a mobile phone sliding holder (102), over which mobile holder moves back and forth for a relevant position with respect to printed page preferably a tactile book (10) explained later in the specification, a height adjustable stand frame (103) and clamps (105) with back support (104).

30

According to a preferred embodiment of the present invention the printed material is a storybook having 3D embossed images and graphics so that the user can actually feel the characters & concepts in the book. The graphics and text is identified by the software application running on
5 computing device preferably a camera mobile phone or smartphone and a corresponding audio is generated to the user. The software application is configured to use the camera of the computing device for scanning and the computer vision techniques for processing and filtering the image and extracting relevant features from the image. The book as described
10 comprises learning material made up of tactile sheets. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided to the user by the software application on the computing device. The software application is configured to perform image processing on each page separately &
15 playing the corresponding audio file. Further, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a simple stand is provided in the system. The stand is a wooden or plastic stand with clips or clamps to position the storybook appropriately & grooves on the top are used to hold the computing device
20 in proper position.

The prime components according to a preferred embodiment of the present invention are described in details herein:

- A. Tactile Printed Material
- 25 B. Wooden/Plastic Stand
- C. Software Application

A. Tactile Printed Material

Images and diagrams that are normally used by sighted people for
30 understanding concepts or conveying information are useless for visually impaired people. Visually impaired children below the age of ten years

explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. FIG. 2 illustrates a tactile printed material (200) according to a preferred embodiment of the present invention that includes 3D cut-outs (201) for proper shape estimation. These 3D cut-out tactile diagrams are produced using embossing or other technologies on physical medium like swell paper or PVC sheets. The printed material on page comprises high contrast embossed illustrations in which images or figures are embossed with different depth marking. It also provides audio land marking. Some Interesting question answers are provided at the end of material.

B. Stand

The stand (101) of the present invention is foldable, portable, light in weight, compact and easy to assemble & carry and adjustable in height to accommodate scanning of tactile sheets from A4 to upto A3 size. The stand supports multiple functionalities as explained herein:

- I. Mobile Holder: Visually Impaired children while reading can't keep the computing device for example, mobile phone in hand all the time and also can't keep it in position for proper scanning. Thus, a sliding holder (102) of design but not limited to Dove-tail is provided. It possesses a variable sized mobile device holder, whose length and width could be adjusted depending upon the customer's computing device dimensions. To prevent the computing device such as a mobile phone from falling while working, the computing device is locked into the holder during the initial set up, i.e. before running the system. The design for the stand used in the embodiment described herein may include any other suitable design whether now known or hereafter described in the construction art to achieve the particular purpose.

30

5 II. Support at the back: Due to the height of stand there is a possibility that the stand as a whole might vibrate or fall due to shocks or weight of computing device kept at the mobile holder (As computing device weight would tend to form a couple which in turn would have the tendency to rotate the stand as whole). Thus, the stand is provided with support (104) at the back to prevent vibration.

10 III. Book Holding Clamps/Frame: Clamps (105) are provided to prevent the relative motion between the printed matter for example a book and the stand to ensure that the book remains in a proper reading position.

15 IV. LED Light: Portable LED lights are placed on the top, on the backside of mobile holder to ensure proper lighting while scanning the documents/graphics.

C. Software Application

20 The software application in the present invention is configured to perform image processing on the specific images attached to each page of printed material and playing the corresponding audio file as illustrated in the work flowchart of FIG. 3 (explained later in specification). The camera of mobile phone captures the images of the printed subject matter which is processed by software application running on the computing device. The application first extracts feature of the images and identifies object after
25 processing it. The identified regions of interest are linked to pre-stored audio data and a corresponding audio file is identified and generated. The audio file can be generated in different languages through various formats including text.

30 According to other embodiment of the present invention, an audio tactile storybook for visually impaired children is provided which offers a helping

hand to visualize the concepts in the real world and also provides an imaginary view of the original character and happenings all around in the book. In the present invention different learning concepts are incorporated as a part of the book such as on the page depicting a party scenario, the child is asked to count the number of balloons in the party. In this way, children learn new things in the flow of storybook reading only. It is also includes interactive Braille questions with audio answers at the end of the storybook to make the storybook more interesting for the visually impaired child who perceives as a fun Q & A game. The short puzzle provided at the end of the storybook also helps in improving the learning capacity of the child.

FIG. 3 illustrates work flowchart (300) of the multimodal interaction system according to a preferred embodiment of the present invention. The process starts at step (301) and (302) when storybook to be read is placed in the base of the stand and mobile phone is kept in the holder of the stand frame. At step (303) software application is launched in the mobile phone. Upon launch of the application camera first identifies the object or shape of graphics/image (at step 304). Once the image/graphic is identified it is further processed for the identification of text (if present) within it. Once the object/image is identified using feature extraction processes a corresponding audio/display file stored in the phone memory is retrieved (at step 306) and displayed/played to the user in an appropriate output format (at step 307). In a preferred embodiment output format, may be an audio file for a visual impaired user or may be a display form for the user with listening disability. If the application is unable to identify object/shape of image/graphics the system generates an error to the user in a suitable form.

According to preferred embodiment of present invention whenever a visually impaired child/adult or user wants to read the storybook (401), the

parent/caretaker sets up the system as illustrated in FIG. 4. The parent then fixes the book (401) on clamps (404) & computing device (402) in proper position on the holder (405) of the reading stand (403) respectively. Now, the parents leave the visually impaired child alone after starting the software application so that the child can enjoy the story. Thereafter, the image at the cover page is scanned & the central character of the story introduces itself & about the context of story. The image on the cover page also provides instructions to the child regarding the use the storybook so that the child can enjoy the story properly. After the introduction is complete, the child is asked to flip the cover. Now, on first page, there is a specific image (406) which is scanned by the camera of the computing device and software application performs image processing on the specific image for identification of page and region of interest for linkage and generation of audio in different languages through various formats including text. When the child feels the 3D embossed images on the page, the corresponding generated audio file is played via the software application. Likewise the story continues, and on the last page of the book Braille questions with audio answers are provided to make the child's experience more interactive.

20

In the present invention various embodiments have been explained in reference to visually impaired children however the system of present invention is not being limited to children only it can be used by other users such as all age groups of visually impaired, sighted elderly, as well as by people with learning disabilities.

25

The multimodal interaction system of the present invention has following advantages:

- I. It provides simultaneous tactile and audio stimulus for the user.
- II. The audio is provided via software application installed on the computing device.

30

- III. The multimodal interaction system of the present invention is provided in an affordable kit to the user.
- IV. The user requires minimum operational training to operate the multimodal interaction system of present invention.
- 5 V. The multimodal interaction system of present invention helps user in perception and cognition development.
- VI. It can be used as one of the tools in early intervention programs for blind/visually impaired children for better understanding of real world objects.
- 10 VII. The multimodal interaction system of the present invention provides edutainment that is education plus entertainment.
- VIII. The audio tactile books of the present invention help in auditory perception development and cognition development.
- IX. Special stuffed toys with audio feedback help in cognition development.
- 15

In the present invention tactile is sometimes referred to as haptic and mobile phone is sometimes referred to as smartphone or simply mobile or phone. These terms are used interchangeably in this specification.

20

In the present invention printed matter can refer to any of a wide variety of printed matter including, books, storybooks, learning material, hard cover bound books, paper back books, publications, newspapers, magazines, journals, periodicals, reading materials, literature, brochures, memos, notes, certificates, commercial paper, money, paper money, negotiable instruments, stock certificates, legal documents, legal papers, motions, discovery, interrogatories, decrees, judgments, wills, trusts, stamps, business cards, folders, files, packaging, boxes, letters, envelopes, labels, notebooks, papers checks, negotiable instruments, checks, money orders, credit cards, and any and all other types of conventional or new types of printed matter. Further, the term printed matter can specifically refer to

30

marks, fonts, text, images, pictures, illustrations, texture, dots, bumps, bar codes, matrix, and even Braille.

5 A “computing device,” as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory capability. Examples of computing devices, these teachings not being limited to only these examples, mobile phones, smartphones, tablets, digital personal assistants, and laptops, etc.

10

The “software application” or “app” can be available for download or installation on a user computing device from the provider of multimodal interaction system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided in the Kit to download the app. In an embodiment, the software application can be initialized when a user first time uses the multimodal interaction system. After the “software application” has been downloaded, the application can be installed on the computing device in an executable format. The executable form of the application permits the user to access 15 embodiments of the invention via an electronic resource, such as a mobile 20 "app" or website.

WE CLAIM

1. A multimodal interaction system (100) for reading an embossed image and/or tactile data printed on a page (10) comprising:
 - 5 a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format;
 - 10 a stand frame (101) comprising a sliding holder (102) for holding the mobile device on top of the stand frame, a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (102) are attached through the stand frame body (103) with adjustable height.
2. The multimodal interaction system of claim 1, wherein the output format is a Braille display, or a text display corresponding to printed image/tactile data.
- 20 3. The multimodal interaction system of claim 1, wherein the output format is an audible signal corresponding to printed image/tactile data.
4. The multimodal interaction system of claim 1, comprising a light source capable of illuminating the printed object from which at least one image is to be captured.
- 25 5. The multimodal interaction system of claim 1, wherein the stand (101) when folded is portable.
6. The multimodal interaction system of claim 1, wherein the adjustable stand frame body (103) height collapse towards the clamp support for storage.
- 30

7. The multimodal interaction system of claim 1, wherein printed page includes graphical object, shapes and body sensible by a visually impaired or sighted elderly or user with learning disabilities.
8. The multimodal interaction system of claim 1, wherein printed page includes nonvisible codes and images.
9. A multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed on a page (10) comprising:
a mobile device (110) comprising a camera, a microphone, a speaker and a memory coupled to a processor, wherein the memory storing a set of instructions for reading the 2D/3D embossed image and/or tactile data printed on the page, the mobile device captures the image and/or tactile data and converts into an output format;
a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand (101), a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104), wherein the clamp support (105), the back support (104) and the mobile device holder (101) are attached through the stand frame body (103) with adjustable height.

Dated this 10th day of May 2017

**RASHMI TYAGI
AGENT FOR APPLICANTS**

ABSTRACT
MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED

The present invention relates to a multimodal interaction system for visually impaired. The system of the present invention provides synchronized audio stimuli in addition to haptic stimulus to the visually impaired and comprises of a tactile printed material, an application on a computing device for providing audio and a stand to hold the computing device at a specific angle. The application is configured to use the camera of the computing device for scanning the printed material and computer vision techniques for processing and filtering the scanned image and extracting relevant features from the image.

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 01

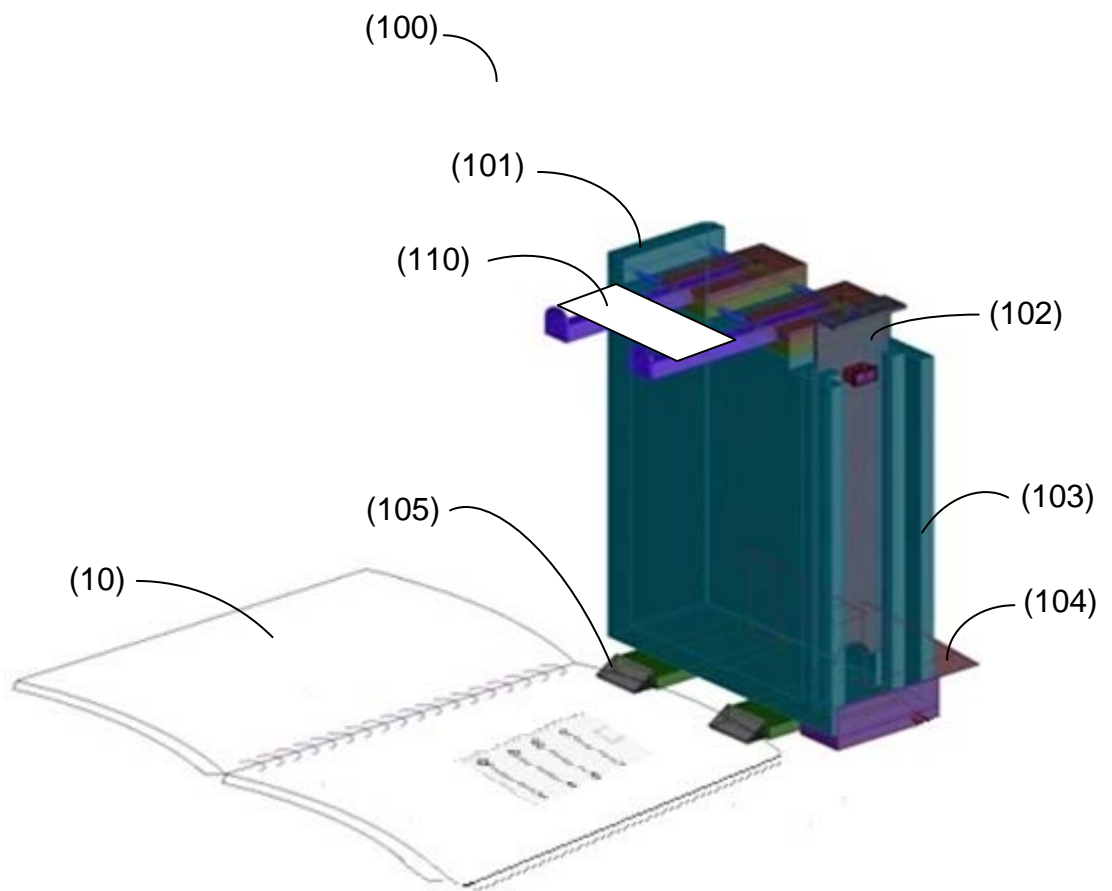


FIG. 1

RASHMI TYAGI
AGENT FOR APPLICANTS

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 02

(200)



(201)

FIG. 2

**RASHMI TYAGI
AGENT FOR APPLICANTS**

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 03

300

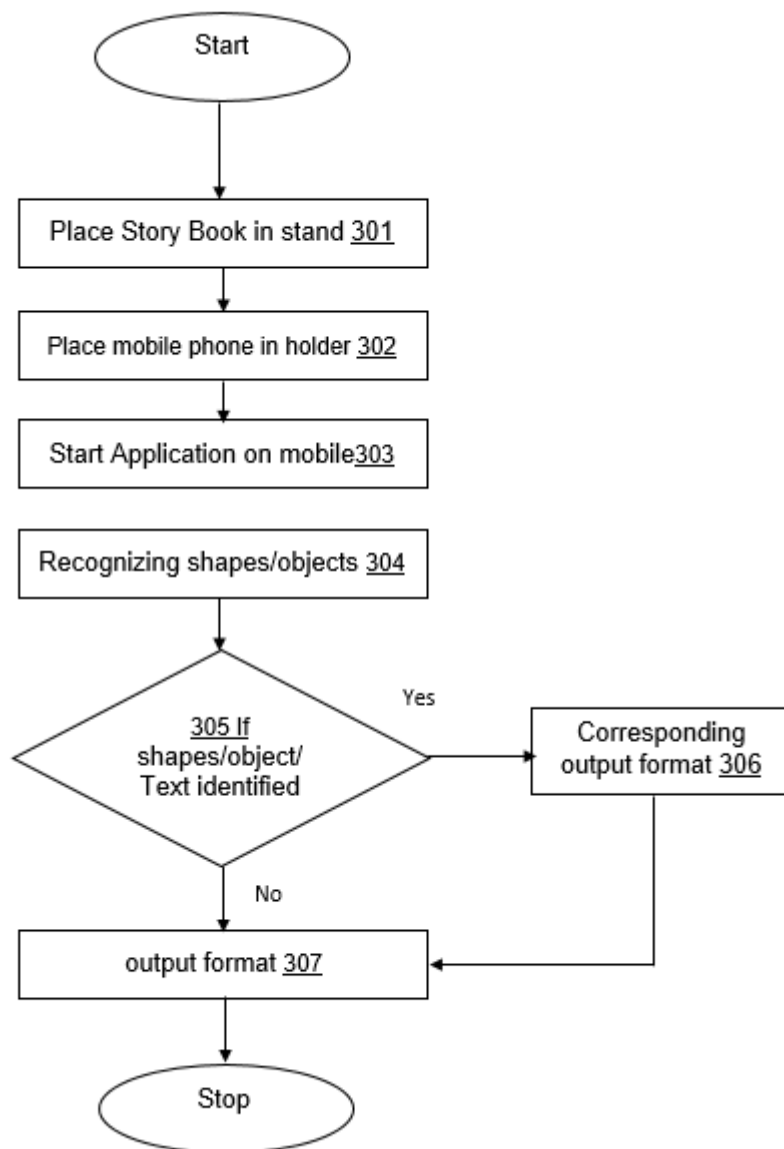


FIG. 3

RASHMI TYAGI
AGENT FOR APPLICANTS

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 04

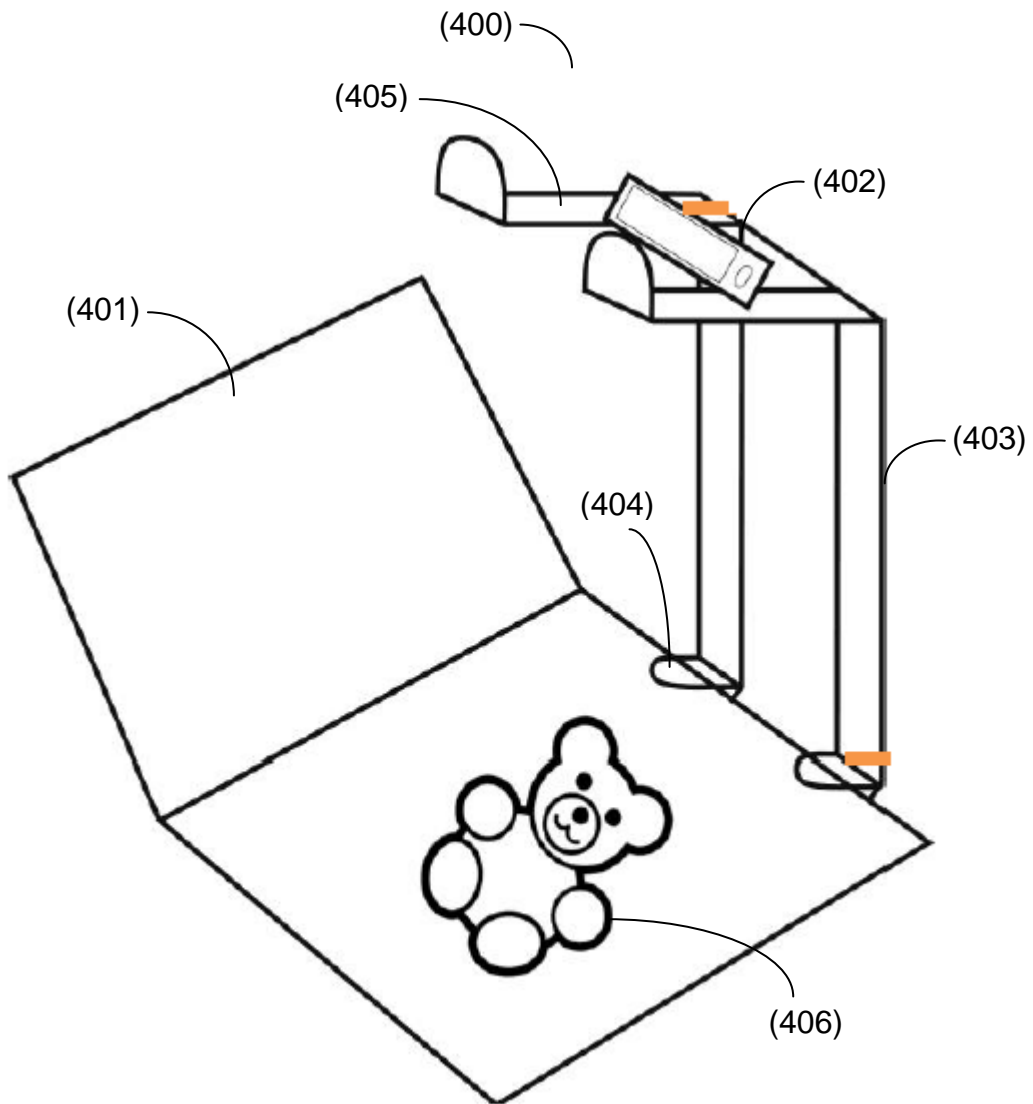


FIG. 4

**RASHMI TYAGI
AGENT FOR APPLICANTS**

FORM 3

THE PATENTS ACT, 1970

(39 of 1970)

and

THE PATENTS RULES, 2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).		I/We <u>Ankita Gulati</u> , Indian, of address <u>CD 28 E, DDA Flats, Hari Nagar, New Delhi - 110064, India</u> and <u>Indira Gandhi Delhi Technical University for Women</u> , Indian, of address <u>Kashmere Gate, New Delhi – 110006, India</u> hereby declare:			
2. Name, address and nationality of the joint applicant.		(i) that I/We have not made any application for the same/substantially the same invention titled " Multimodal Interaction System & Method for Visually Impaired " outside India Or (ii) that I/We who have made this application No. <u>N/A</u> dated <u>N/A</u> alone/jointly with <u>N/A</u> , made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:			
Name of the country	Date of Application	Application No.	Status of the application	Date of publication	Date of grant
N/A					
3. Name and address of the assignee		(iii) that the rights in the application(s) has/have been assigned to <u>None</u> that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India			

	<p>within six months from the date of filing of such application.</p> <p>Dated this <u>02nd</u> day of <u>June 2016</u></p>
4. To be signed by the applicant or his authorized registered patent agent.	Signature
5. Name of the natural person who has signed.	<p style="text-align: center;"><u>RASHMI TYAGI</u> <u>Agent for Applicant (IN/PA-1594).</u></p>
	<p>To The Controller of Patents, The Patent Office, at <u>New Delhi.</u></p>
Note.- Strike out whichever is not applicable;	



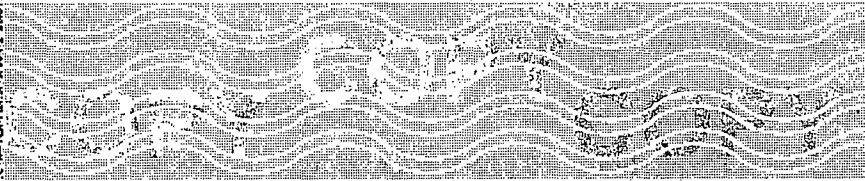
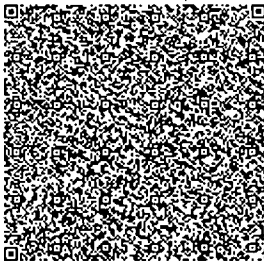
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सत्यमेव जयते

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Stamp Duty Paid By	: ELPIS INNOVATION
Stamp Duty Amount (Rs.)	: 100 (One Hundred only)



Please write or type below this line

**THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY**

I, Arpit Dhupar, Indian, Son of Shri Ravi Kant Dhupar, of address C-22, Anand Vihar Colony, Delhi - 110092, India, hereby authorise & appoint Rashmi Tyagi, Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India, jointly and severally, to act on my behalf as my agent for securing from the

Statutory Alert:

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2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

DLHI 01-06-2016 15:14

Government of India in my name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and I request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

I hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

I hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 07th day of **January 2016**


(ARPIT DHUPAR)

To
The Controller of Patents,
The Patent Office, at New Delhi



El: RT: NA-201611016353

May 30, 2016

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION GENERAL POWER OF AUTHORITY (GPA), FORM-1 & FORM-3
IN ORIGINAL

Dear Sir,

Re: Ankita Gulati; Indira Gandhi Delhi Technical University for Women
Indian Patent Application No. 201611016353
e-Filed: May 10, 2016
Title: Multimodal Interaction System & Method for Visually Impaired

We are submitting herewith General Power or Authority, Form-1 & Form-3 in original for provisional Patent application number 201611016353 titled "Multimodal Interaction System & Method for Visually Impaired" e-filed on May 10, 2016 for grant of a patent.

Enclosures:

1. General Power of Authority (Original)
2. Form-1 (Original)
3. Form-3 (Original) *Rashmi Tyagi*

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi
Rashmi Tyagi (IN/PA-1594)

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007, India

Contact: 9968284766

Email: rashmi.tyagi@hotmail.com

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION
(Section 10 & Rule 13)

**“MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY
IMPAIRED”**

ANKITA GULATI
INDIAN
CD 28 E, DDA FLATS, HARI NAGAR, NEW DELHI-110064, INDIA

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA

The following specification describes the invention.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of assistive technologies for visually impaired people. More particularly, the invention relates to multimodal interaction system for visually impaired which provides a synchronized audio stimulus in addition to a haptic stimuli to the user.

10

BACKGROUND OF THE INVENTION

According to WHO, about 285 million people are estimated to be visually impaired worldwide, 90% of whom live in low income settings. Out of these 19 million are children under the age of 15 years.

15

Children below the age of 10 years have limited resources in terms of learning material. Also, what options do they have in terms of recreational material? A solution to this problem could be the use of assistive technology. Existing solutions mostly use Braille, tactile diagrams, customized print sizes and audio in order to provide assistance to visually impaired children. But children are not accustomed to Braille at such an early age and Braille books do not give similar enjoyment as the books available for sighted children. Tactile books for children below the age of 10 years are not available. The problem with audio books is that listening to audio alone doesn't help in visualization. Also, having customized print sizes for each & every child is not feasible. All the above solutions effectively translate text for the visually impaired child but none of them provides the graphics translation. Due to these problems, children become vulnerable to developmental delays and other learning difficulties which hinder their inclusion into the society.

20
25
30

Commercially available assistive technologies for visually impaired adults comprise of complex and expensive tabular displays and OCR systems which provide audio/tactile feedback with the help of an additional module. But using these devices & receiving accurate auditory/tactile feedback requires rigorous training sessions with visually impaired users. Also, such devices are useful for people possessing perception & having the concept of object orientation. But visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively

35

5 over the edges of the object. Therefore, such devices are not suitable for visually
impaired children.

Thus, we require a solution which just doesn't only provides narration but also
help visually impaired children in visualizing various characters & scenarios
10 which can eventually help in cognition and perception development. In this way,
we can just not only impart knowledge among them but they can be made aware
of many things like social scenarios so that they can adapt to different
surroundings easily. Thus, in this way we can accelerate their inclusion into the
society.

15

Therefore, to overcome the disadvantages of prior art present invention provides
a multimodal interaction system for visually impaired which give haptic stimuli in
addition to audio stimulus. So, that integration of these two can help the children
in developing an understanding of the concept and thus can eventually help in
20 perception and cognition development.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

10 FIG. 1 illustrates the arrangement of the basic components of the multimodal interaction system according to a preferred embodiment of the present invention;

FIG. 2 illustrates a tactile printed material according to a preferred embodiment of the present invention;

15

FIG. 3 illustrates work flowchart of the multimodal interaction system according to a preferred embodiment of the present invention;

FIG. 4 illustrates a working configuration of the multimodal interaction system
20 according to a preferred embodiment of the present invention.

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain
10 more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides a multimodal interaction system for visually
15 impaired children. The system of the present invention comprises primarily of a tactile printed material and a computing device that provides a synchronized audio stimulus in addition to a haptic stimuli to the visually impaired.

According to a preferred embodiment of the present invention the printed matter
20 is a storybook having 3D embossed images so that the child can actually feel the characters & happenings in the book & the audio is provided by a software application or program installed on the computing device. The software application is configured to use the camera of the computing device for scanning and computer vision techniques for processing and filtering the image and
25 extracting relevant features from the image.

The multimodal interaction system of the present invention has following novel features:

- I. It provides simultaneous tactile and audio stimulus for the user.
- 30 II. The audio is provided via software application installed on the computing device.
- III. The multimodal interaction system of the present invention is provided in an affordable kit to the user.
- IV. The user requires minimum operational training to operate the multimodal
35 interaction system of present invention.
- V. The multimodal interaction system of present invention helps user in perception and cognition development.

- 5 VI. It can be used as one of the tools in early intervention programmes for blind/visually impaired children for better understanding of real world objects.
- VII. The multimodal interaction device of the present invention provides edutainment that is education + entertainment.

10

In a preferred embodiment, present invention provides a kit comprising a book or learning material made up of tactile sheets, a software application and a stand as illustrated in FIG. 1. The tactile sheets are basically sheets with 3D embossed images so that the user can use touch stimulus & a simultaneous audio is provided by the software application on the computing device. The software application is configured to perform image processing on each page separately & playing the corresponding audio file. Further, to align the book in proper reading position and to align computing device's camera at an appropriate scanning angle a simple stand is provided in the kit. The stand is a wooden or plastic stand with clips to position the storybook appropriately & groves on the top is used to hold the computing device in proper position.

The prime components according to a preferred embodiment of the present invention are described in details herein:

- 25 A. Tactile Printed Material
B. Wooden/Plastic Stand
C. Software Application

A. Tactile Printed Material

30 Images and diagrams that are normally used by sighted people for understanding concepts or conveying information are useless for visually impaired people. Visually impaired children below the age of ten years explore shapes by using the contour following strategy. They move their fingers smoothly and non-repetitively over the edges of the object. Thus, as illustrated in FIG. 2 present invention utilizes 3D cut-outs for proper shape estimation. These 3D cutout tactile diagrams are produced using embossing or other technologies on physical medium like swell paper or PVC sheets.

35

- 5 Printed Material of the present invention has following features:
- I. It comprises high contrast embossed illustrations
 - II. The images or figures are embossed with different depth marking
 - III. It provides audio land marking.
 - IV. Interesting question answers are provided at the end of material.

10

B. Stand

The stand of the present invention supports multiple functionalities as explained herein:

- I. Mobile Holder
15 Visually Impaired children while reading can't keep the computing device in hand all the time and also can't keep it in position for proper scanning. Thus, a holder of design but not limited to Dove-tail is provided. It possesses a variable sized mobile holder, whose length and width could be adjusted depending upon the customer's computing device
20 dimensions. To prevent the computing device such as a smart phone device from falling while working, the computing device is locked into the holder during the initial set up, i.e. before running the system. The design for the stand used in the embodiment described herein may include any other suitable design whether now known or hereafter described in the
25 construction art to achieve the particular purpose.
- II. Support at the back
Due to the height of stand there is a possibility that the stand as a whole might vibrate or fall due to shocks or weight of computing device kept at
30 the mobile holder (As computing device weight would tend to form a couple which in turn would have the tendency to rotate the stand as whole). Thus, the stand is provided with supports at the back to prevent vibration.
- 35 III. Book Holding Clamps/Frame
These are provided to prevent the relative motion between the book and the stand to ensure that the book remains in a proper reading position.

5 **C. Software Application**

The software application in the present invention is configured to perform image processing on the specific images attached to each page of printed material and playing the corresponding audio file as illustrated in the work flowchart of FIG. 3. The images are processed by software application for identification of page and region of interest for linking & generating the audio in different languages through various formats including text.

The multimodal interaction system of the present invention offers the following advantages:

- 15 I. Audio Books of the present help in auditory perception development and cognition development.
- II. Special stuffed toys with audio feedback help in cognition development.

According to other embodiment of the present invention, an audio tactile storybook for visually impaired children, provides a helping hand to visualize the happenings in the real world and also provides an imaginary view of the original character and happenings all around in the story. In the present invention different learning concepts are incorporated as a part of the story such as on the page depicting a party scenario, the child is asked to count the number of balloons in the party. In this way, children are learning new things in the flow of storybook reading only. It is also includes interactive Braille questions with audio answers at the end of the storybook to make the storybook more interesting for the visually impaired child which perceives as a fun Q & A game. The short puzzle provided at the end of the storybook also helps in improving the learning capacity of the child.

In the present invention according to flowchart of FIG. 3 whenever a visually impaired child wants to read the storybook, the parent/caretaker sets up the kit as shown in FIG. 1. The parent then fixes the book & computing device in proper position & fixes the shelf with buttons appropriately. Now, the parents leave the visually impaired child alone after starting the software application so that the child can enjoy the story. Thereafter, the image at the cover page is scanned & the central character of the story introduces itself & about the context of story.

5 The image on the cover page will also provide instructions to the child regarding
the use the storybook so that the child can enjoy the story properly. After the
introduction is complete, the child is asked to flip the cover. Now, on first page,
there is a specific image which is scanned by the camera of the computing
device and software application performs image processing on the specific image
10 for identification of page and region of interest for linkage and generation of audio
in different languages through various formats including from text. When the child
feels the 3D embossed images on the page, the corresponding generated audio
file is played via the software application. Likewise the story continues, and on
the last page Braille questions with audio answers are provided to make the
15 child's experience more interactive.

In the present invention printed matter can refer to any of a wide variety of printed
matter including, books, hard cover bound books, paper back books,
publications, newspapers, magazines, journals, periodicals, reading materials,
20 literature, brochures, memos, notes, certificates, commercial paper, money,
paper money, negotiable instruments, stock certificates, legal documents, legal
papers, motions, discovery, interrogatories, decrees, judgments, wills, trusts,
stamps, business cards, folders, files, packaging, boxes, letters, envelopes,
labels, notebooks, papers checks, negotiable instruments, checks, money orders,
25 credit cards, and any and all other types of conventional or new types of printed
matter. Further, the term printed matter can specifically refer to marks, fonts, text,
images, pictures, illustrations, texture, dots, bumps, bar codes, matrix, and even
Braille.

30 A "computing device," as used herein, refers to a device capable of executing
applications, and which is portable. In one instance, the computing device has
one or more processors and memory capability. Examples of computing devices,
these teachings not being limited to only these examples, mobile phones, smart
mobile phones, tablets, digital personal assistants, and laptops, etc.

35

The "software application" or "app" can be available for download or installation
on a user computing device from the provider of multimodal interaction system
described herein, for example from the provider's web site, or through a mobile

5 store application or a link or code can be provided in the Kit to download the app.
In an embodiment, the software application can be initialized when a user first
time uses the multimodal interaction system. After the “software application” has
been downloaded, the application can be installed on the computing device in an
executable format. The executable form of the application permits the user to
10 access embodiments of the invention via an electronic resource, such as a
mobile "app" or website.

ABSTRACT

MULTIMODAL INTERACTION SYSTEM & METHOD FOR VISUALLY IMPAIRED

The present invention relates to a multimodal interaction system for visually impaired. The system of the present invention provides synchronized audio stimuli in addition to haptic stimulus to the visually impaired and comprises of a tactile printed material, an application on a computing device for providing audio and a stand to hold the computing devices at a specific angle. The application is configured to use the camera of the computing device for scanning the printed material and computer vision techniques for processing and filtering the scanned image and extracting relevant features from the image.

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 01

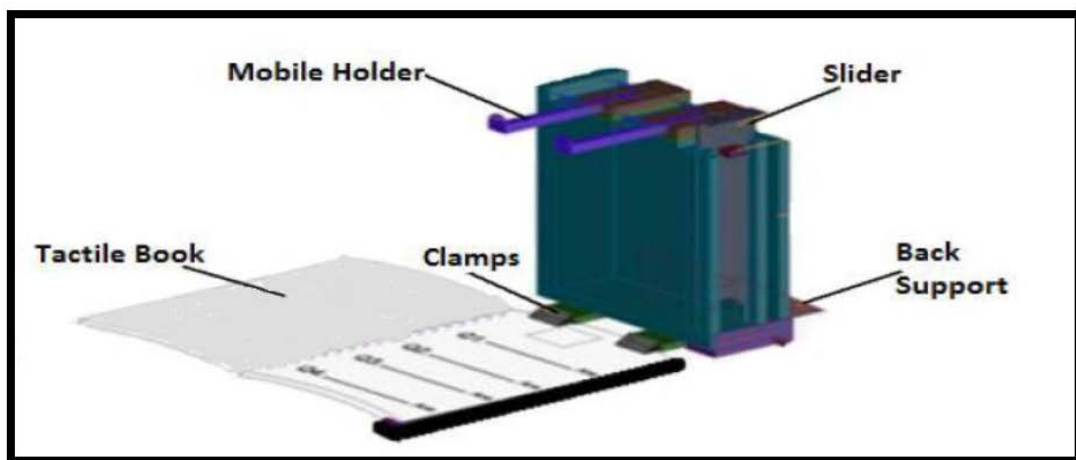


FIG. 1

**RASHMI TYAGI
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TOTAL SHEETS: 04

SHEET NO: 02

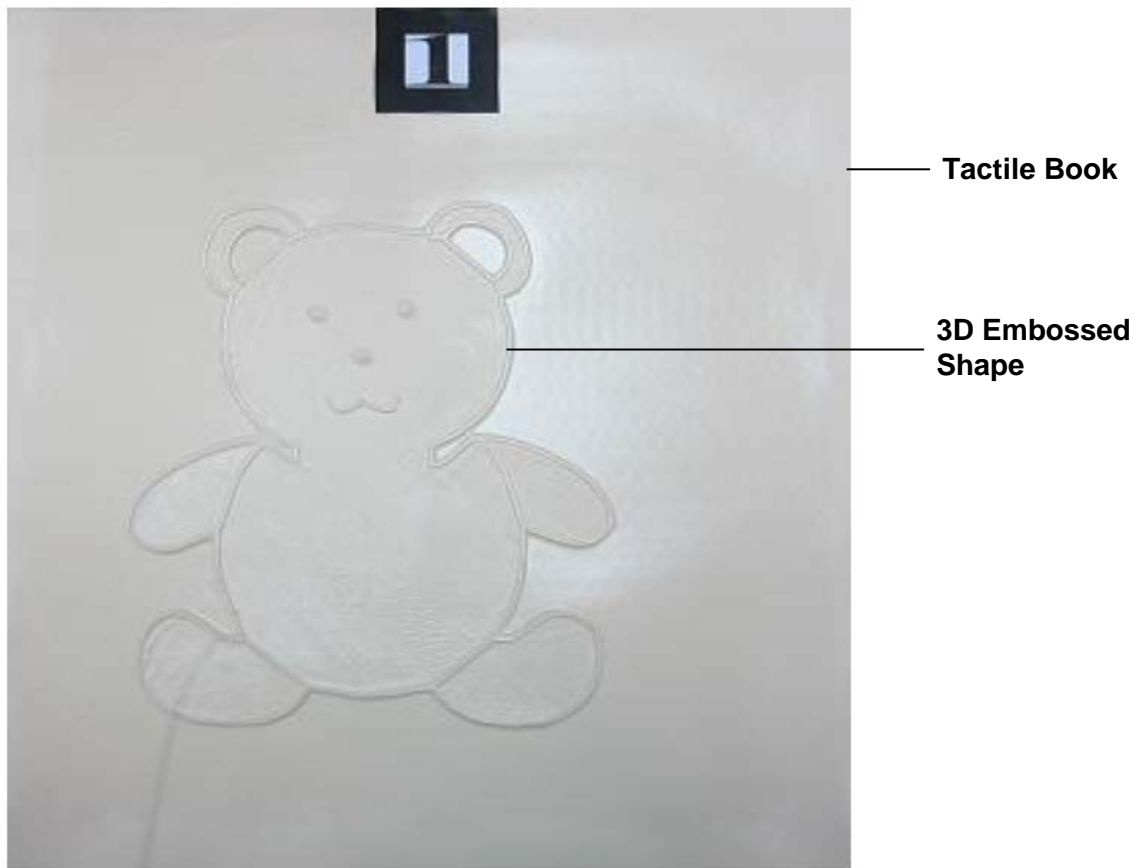


FIG. 2

**RASHMI TYAGI
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TOTAL SHEETS: 04

SHEET NO: 03

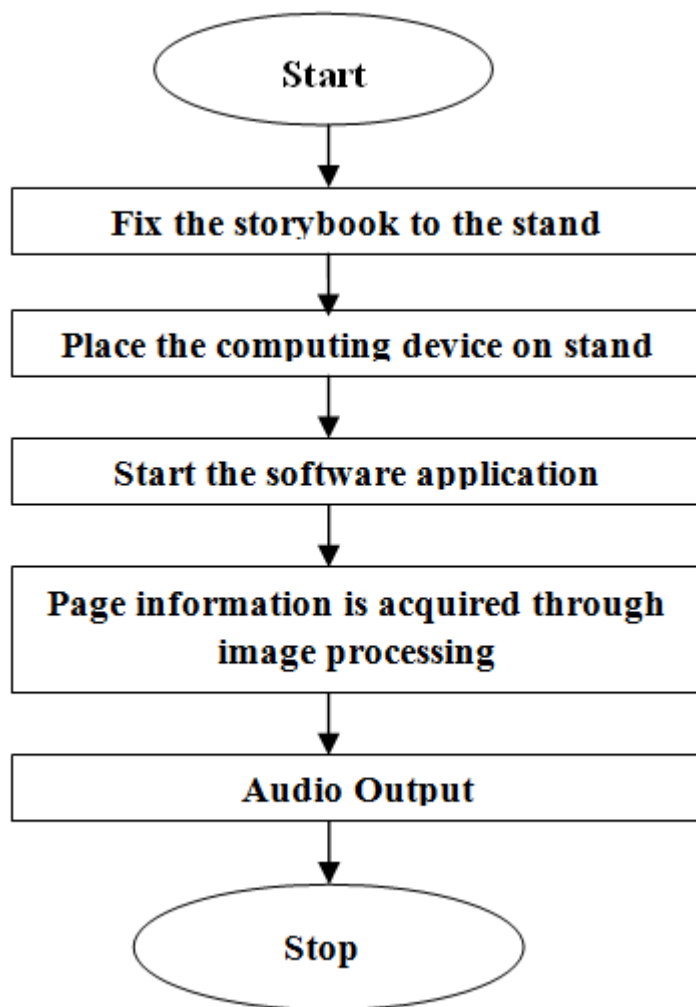


FIG. 3

**RASHMI TYAGI
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ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 04

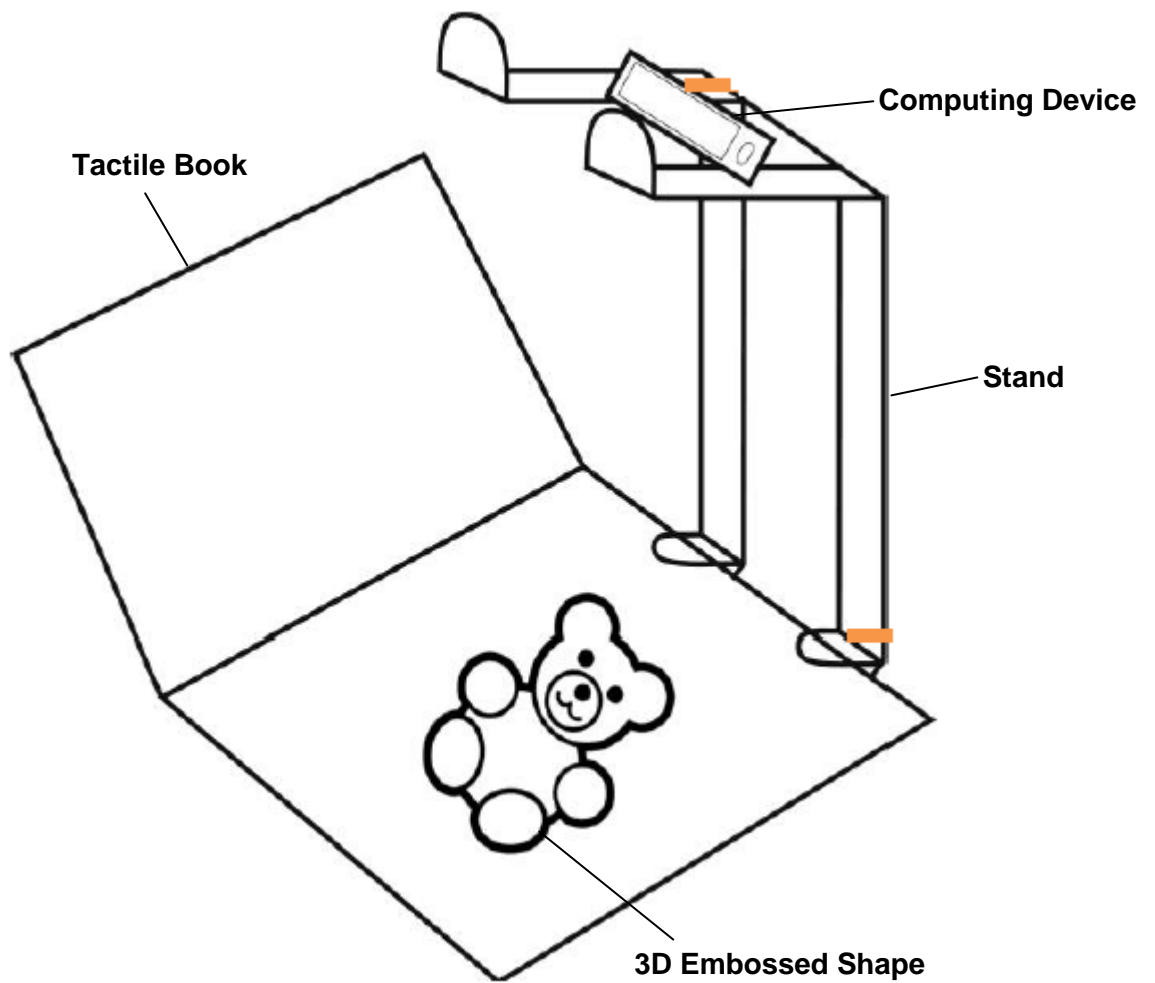


FIG. 4

**RASHMI TYAGI
AGENT FOR APPLICANTS**

ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 01

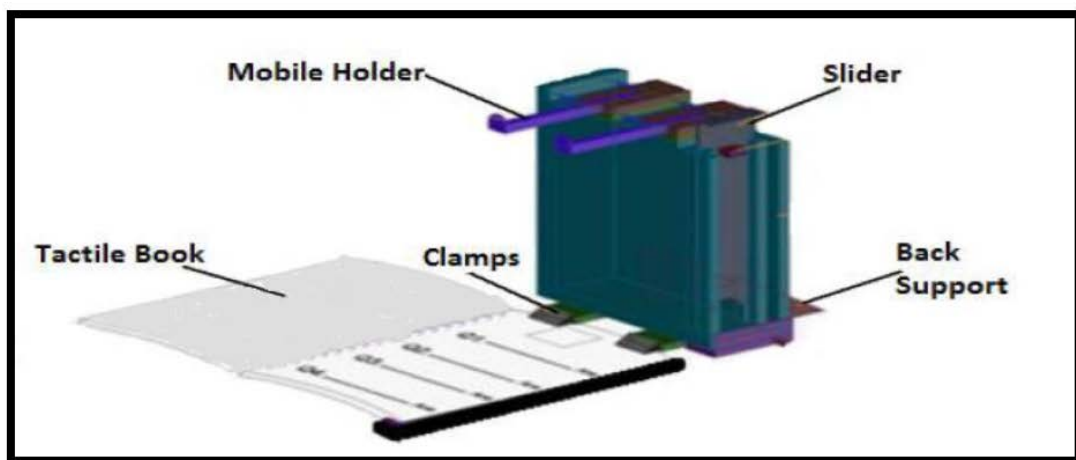


FIG. 1

**RASHMI TYAGI
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ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 02

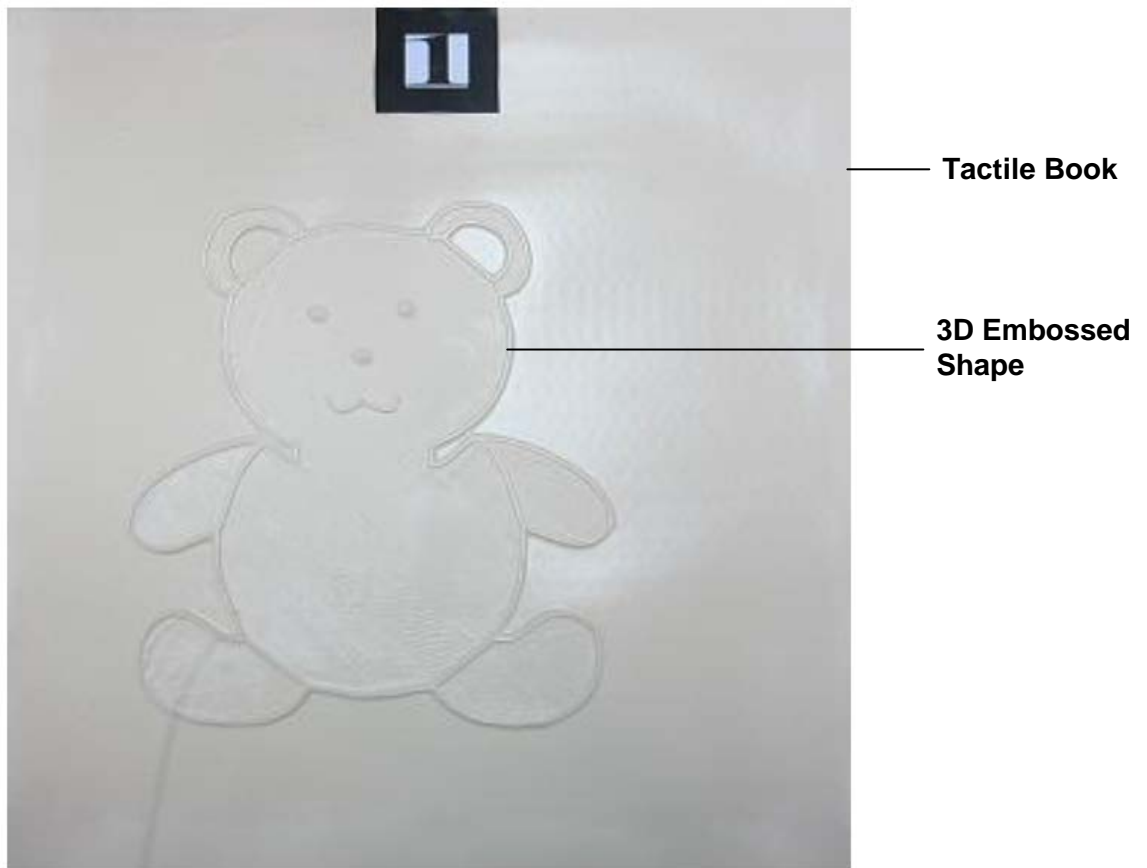


FIG. 2

**RASHMI TYAGI
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TOTAL SHEETS: 04

SHEET NO: 03

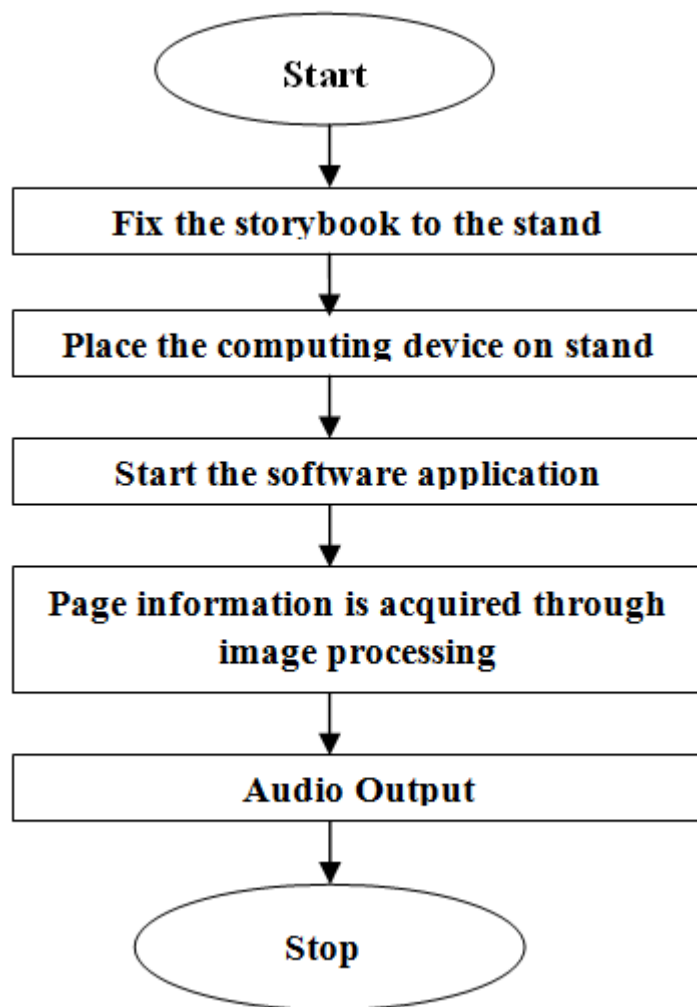


FIG. 3

**RASHMI TYAGI
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ANKITA GULATI;

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

TOTAL SHEETS: 04

SHEET NO: 04

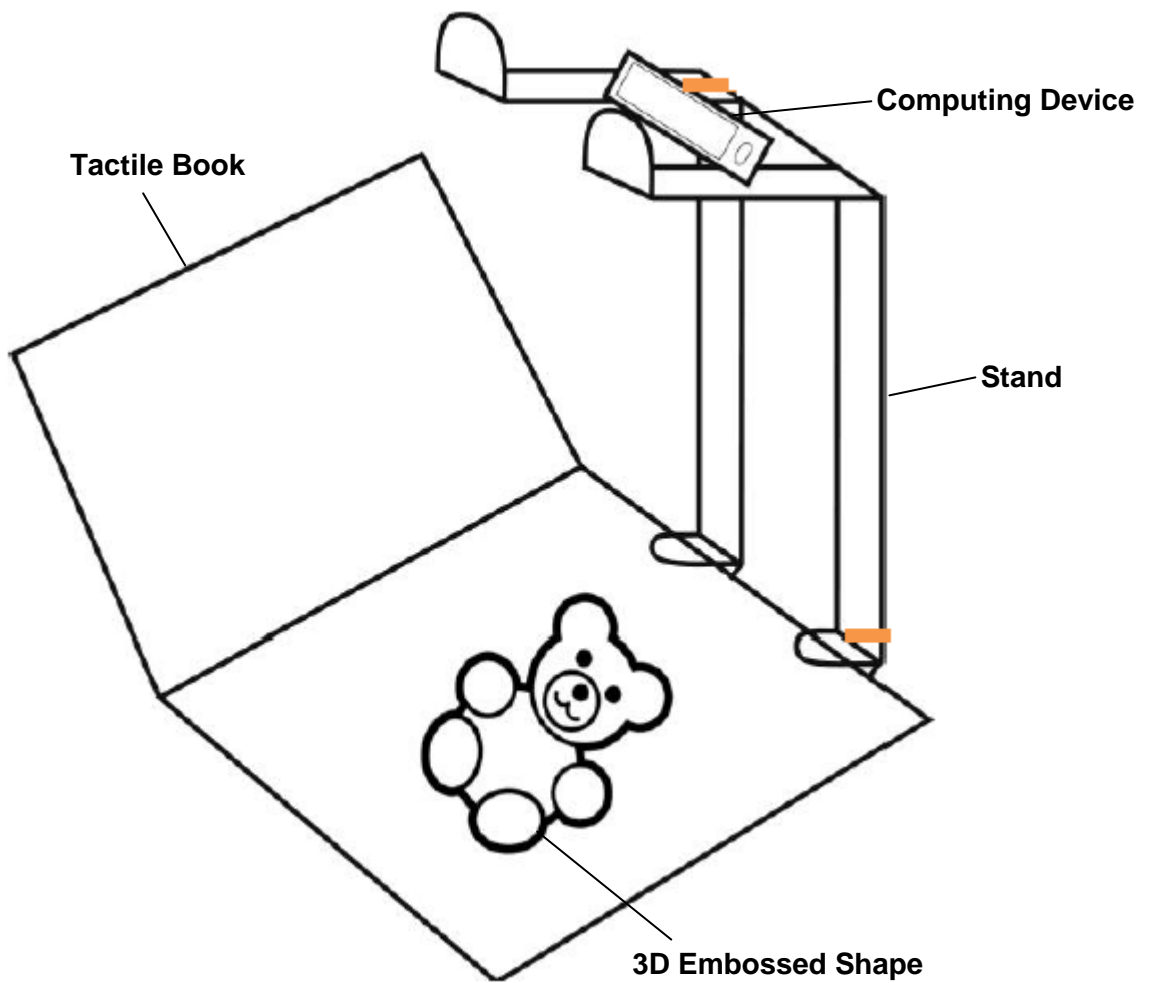


FIG. 4

**RASHMI TYAGI
AGENT FOR APPLICANTS**



**INTELLECTUAL
PROPERTY INDIA**
एकस्व/PATENTS|अभिकल्प/DESIGNS|
व्यापार चिह्न/TRADE MARKS|भौगोलिक
उपदर्शन/GEOGRAPHICAL INDICATIONS



सत्यमेव जयते
भारत सरकार
GOVERNMENT OF INDIA

एकस्व कार्यालय /THE PATENT OFFICE
बौद्धिक सम्पदा भवन / I.P.O. BUILDING
प्लॉट नं. 32/ PLOT NO. 32
सेक्टर -14/ SECTOR 14, द्वारका/ DWARKA
नई दिल्ली/NEW DELHI -110078
दूरभाष /Tel. No. : 011-25300200
फ़ैक्स /Fax : 011-28034301/02/15
ई मेल /Email : delhi-patent@nic.in
वेबसाइट /Website:<http://ipindia.nic.in>

सं.संख्या/Ref.No /आवेदन संख्या/Application No/ 201611016353

दिनांक/Date of Dispatch/Email: 26/02/2020

सेवा में,/To

RASHMI TYAGI,
250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India
Email : rashmi@elpisinnovation.com

विषय: एकस्व अधिनियम, 1970 की धारा 12 व 13 तथा एकस्व नियम, 2003 के अधीन परीक्षण रिपोर्ट

Subject: Examination report under sections 12 & 13 of the Patents Act, 1970 and the Patents Rules, 2003.

- उपर्युक्त आवेदन के संदर्भ में परीक्षण रिपोर्ट (अर्थात्, एकस्व नियम, 2003 (यथा संशोधित) के नियम 24-ख(3) में विनिर्दिष्ट आपत्तियों का प्रथम कथन) इसके साथ संलग्न है। यह रिपोर्ट परीक्षण हेतु अनुरोध दिनांक 15/07/2017 के उत्तर में जारी की गयी है। परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि (अर्थात्, इस रिपोर्ट में लगाई गयी सभी आवश्यकताओं के अनुपालन की अवधि) आवेदक को आपत्तियों का प्रथम कथन जारी होने की तिथि से छः माह है।
Please find enclosed herewith an Examination Report (i.e. a first statement of objections as specified in Rule 24-B(3) of The Patents Rules, 2003 (as amended)) in respect of above-mentioned application. This report is issued with reference to a request for examination dated 15/07/2017. The last date for filing a response to the Examination Report (i.e. a period to comply with all the requirements raised in this examination report) is six months from the date on which the first statement of objections is issued to the Applicant.
- यदि रिपोर्ट के अंतर्गत लगाई गयी आवश्यकताओं का अनुपालन एकस्व नियम, 2003 (यथा संशोधित) के नियम 24 ख(5) में विनिर्दिष्ट अवधि के भीतर अंदर अनुपालन नहीं किया गया तो एकस्व अधिनियम 1970 की धारा 21(1) के अधीन वर्तमान आवेदन को परित्यक्त माना जाएगा।
The instant application shall be deemed to have been abandoned under Section 21(1) of The Patents Act, 1970, unless all the requirements raised in this report are complied with in the period as specified in Rule 24-B (5) of The Patents Rules, 2003 (as amended).
- आपका ध्यान एकस्व नियम, 2003 के नियम 24 ख(6) के प्रावधानों की ओर भी आमंत्रित किया जाता है।
Your attention is also invited to the provisions of Rule 24-B (6) of the Patents Rules 2003.
- आपको सलाह दी जाती है कि शीघ्र निपटान हेतु अपना उत्तर शीघ्र प्रस्तुत करें।
You are advised to file the reply at the earliest for early disposal.

Rakesh Kumar Kushwaha
नियंत्रक पेटेंट/ Controller of Patents

संलग्न/Enclosed: अपरोक्त अनुसार/As above

टिप्पणी: यह इलेक्ट्रॉनिक रूप से उत्पन्न रिपोर्ट है।

NOTE: This is an electronically generated report.

सभी पत्राचार नियंत्रक एकस्व को उपरोक्त पते पर भेजा जाये।

All communications should be sent to the Controller of Patents at the above mentioned address.

परीक्षण रिपोर्ट / Examination Report

आवेदन संख्या / Application Number	201611016353
दाखिल करने की तिथि / Date of Filing	10/05/2016
पूर्विका दिनांक / Date of Priority	--
पीसीटी अंतर्राष्ट्रीय आवेदन की संख्या व दिनांक / PCT International Application No. & Date	--
आवेदक / Applicant	ANKITA GULATI
परीक्षण हेतु अनुरोध की संख्या व दिनांक / Request for Examination No. & Date	R20171021333 15/07/2017
प्रकाशन की तिथि / Date of Publication	09/02/2018

इस परीक्षण रिपोर्ट के चार भाग हैं, अर्थात रिपोर्ट का सारांश, विस्तृत तकनीकी रिपोर्ट, औपचारिक आवश्यकताएँ तथा रिकॉर्ड में दस्तावेज़ / This examination report consists of four parts, namely summary of the report, detailed technical report, formal requirements and documents on record.

भाग -1: रिपोर्ट का सारांश

PART-I: SUMMARY OF THE REPORT

क्र. सं. / Sl. No.	अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ / Requirements under the Act	दावों की संख्या / Claim Numbers	टिप्पणी / Remarks
1.	नवीनता / Novelty	दावे / Claims:	हाँ / Yes
		दावे / Claims: 1-9	नहीं / No
	धारा 2(1)(ग) के तहत आविष्कार / Invention u/s 2(1)(j)	दावे / Claims:	हाँ / Yes
		दावे / Claims: 1-9	नहीं / No
	आविष्कारी कदम / Inventive step	दावे / Claims: 1-9	हाँ / Yes
		दावे / Claims:	नहीं / No
औद्योगिक उपयोगिता / Industrial Applicability	दावे / Claims: 1-9	हाँ / Yes	
	दावे / Claims:	नहीं / No	
2.	धारा 3 के अधीन पेटेंट-अयोग्यता (यदि हाँ, खंड 3(क-त) / Non-patentability u/s 3 (if yes, specify section 3(a-p))	दावे / Claims: 1-9	हाँ / Yes (i)
		दावे / Claims:	नहीं / No
3.	स्पष्टता/ संक्षिप्तता / Clarity / Conciseness	दावे / Claims:	हाँ / Yes
		दावे / Claims: 1 & 9	नहीं / No
	[धारा 10(5) व 10(4) (ग)] के अधीन दावे / Claims [u/s 10(5) & 10(4) (c)]	दावे / Claims:	हाँ / Yes
		दावे / Claims: 1-9	नहीं / No
परिभाषिकता / Definitive	दावे / Claims:	हाँ / Yes	
	दावे / Claims: 1-9	नहीं / No	

भाग -II विस्तृत तकनीकी रिपोर्ट

PART-II: DETAILED TECHNICAL REPORT

क. उद्धरित दस्तावेजों की सूची / A. List of documents cited:

(क) पेटेंट साहित्य / (a). Patent Literature :

क्र. सं. / Sl.no	दस्तावेजों का विवरण / Details of documents	प्रकाशन तिथि(दिन/माह/वर्ष) / Publication date	उद्धरित दस्तावेज का प्रासंगिक विवरण (पृष्ठ व अनुच्छेद संख्या) / Relevant description (page and paragraph no.) of cited document	उद्धरित दस्तावेज के प्रासंगिक दावे / Relevant claims of cited document	अभिकथित आविष्कार के दावे / Claims of alleged invention
1	D1: WO 2014014175 A1	23/01/2014	Whole Document	[1-24]	[1-9]

2	D2: WO 2012169810 A2	13/12/2012	Whole Document	[1-12]	[1-9]
3	D3: IN 201611011175 A	29/04/2016	Whole Document	[1-13]	[1-9]

(ख) गैर-पेटेंट साहित्य / (b). Non-patent literature

कोई दस्तावेज़ उद्धृत नहीं है / No Document Cited

ख. अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ / B. Detailed observations on the requirements under the Act:

(1). नवीनता / NOVELTY:

(I) ऊपर उद्धरित दस्तावेज़ के संदर्भ (1-9) में दिये गए प्रकटन के पूर्वानुमान को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-9) में नवीनता की कमी है /

Claim(s) (1-9) lack(s) novelty, being anticipated in view of disclosure in the document cited above under reference D1-D3 for the following reasons:

The Subject matter of claims 1-9 does not constitute an invention under section 2(1)(j) of the Patents Act, 1970 (as amended) because it is not novel in view of D1-D3. Regarding the independent claims 1 & 9, D1 discloses the image region and the character region extraction step in the general education material to extract the text area and the image area for each information mixed in the general education material, by analyzing the extracted image area. The image information tactile step of each complex classifying the low complexity image and the high complexity image and processing each image into the tactile information and recognizing the character information in the tactile text area and the character information in the video area, respectively. It is a haptic display-based visual information display method for the visually impaired, including a character recognition and braille conversion step to convert to braille information and the image area and the text area extracting step in the general education data are classified into text areas other than the video area, text areas in the video area, and video areas and the image area and the text area extraction step in the general education material, for the brightness (brightness) image and label for the characteristic analysis of the text and visual material for the general education material. General education data input step for generating the base information, image area extraction step for classifying the text area and the image area based on the characteristics of the text and visual data appearing in the generated brightness image, and extracting the video area, and the classified image. And a character extraction step in the image region for detecting the character region in the region [Whole Document]. D2 discloses A haptic electronic board-based system and a method for providing learning information for visually impaired persons is disclosed. The system for providing learning information for visually impaired persons comprises a learning information server, which is linked to a lecture and a writing program; a first information output device (PC) for receiving from the learning information server learning information for persons with poor vision via a wired and wireless network (LAN, WLAN), and on which a viewer program of the persons with poor vision for providing screen magnification and reduction functions is installed; and a second information output device (haptic electronic board) for connecting to the learning information server through a short distance wireless network (ZigBee or Bluetooth) using a unique device ID, and converting learning information for completely blind persons, which is received from the learning information server by the haptic electronic board, into tactile information and transferring the tactile information to the completely blind persons. The learning information server transfers the lecture and the learning information that is written by the writing program to visually impaired persons having various degrees of visual impairment using a tactile information automatic conversion technology [Whole Document]. D3 discloses a device, systems, and methods for assisting a visually impaired user in gripping an object and the aspects are further described below in the detailed description. This summary is not intended to identify essential features of the claimed subject matter nor is it intended for use in determining or limiting the scope of the claimed subject matter and a system for assisting a visually impaired user to grip objects is illustrated. The system comprises a memory and a processor coupled to the memory. The processor is configured to execute program instructions stored in the memory. The processor may execute programmed instructions stored in the memory to receive an image of an object in real-time and identify a

reference image corresponding to the image by comparing the image with reference images present in a database. Further, the processor may execute programmed instructions stored in the memory to identify a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. Further, the processor may execute programmed instructions stored in the memory to generate the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. Further, the processor may execute programmed instructions stored in the memory to receive a tactile image from a tactile glove put on by the visually impaired user. Further, the processor may execute programmed instructions stored in the memory to compare the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image. Furthermore, the processor may execute programmed instructions stored in the memory to generate a second set of audio instructions for guiding the visually impaired user to grip the object base on a second set of audio instructions, wherein the second set of audio instructions are generated based on the pressure variation data and a device for assisting a visually impaired user to grip an object is illustrated. The device comprises a camera mounted over a wearable device and a central processing unit coupled to the camera and tactile gloves. The central processing unit comprises a memory and a processor coupled to the memory. The processor is configured to execute program instructions stored in the memory. The processor may execute programmed instructions stored in the memory to receive an image of an object in real-time from the camera and identify a reference image corresponding to the image by comparing the image with reference images present in a database. Further, the processor may execute programmed instructions stored in the memory to identify a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. Further, the processor may execute programmed instructions stored in the memory to generate the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. Further, the processor may execute programmed instructions stored in the memory to receive a tactile image from a tactile glove put on by the visually impaired user. Further, the processor may execute programmed instructions stored in the memory to compare the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image. Furthermore, the processor may execute programmed instructions stored in the memory to generate a second set of audio instructions for guiding the visually impaired user to grip the object base on a second set of audio instructions, wherein the second set of audio instructions are generated based on the pressure variation data and a non-transitory computer-readable medium embodying a program executable in a computing device for assisting a visually impaired user to grip an object is disclosed. The program comprises program code for receiving an image of an object in real-time from the camera and identifying a reference image corresponding to the image by comparing the image with reference images present in a database. The program comprises program code for identifying a reference tactile image corresponding to the reference image, wherein the reference tactile image is stored in the database. The program comprises program code for generating the first set of audio instructions for assisting the visually impaired user to grip the object based on the reference tactile image. The program comprises program code for receiving a tactile image from a tactile glove put on by the visually impaired user. The program comprises program code for comparing the tactile image with the reference tactile image to identify pressure variation data corresponding to one or more points in the tactile image and the reference tactile image. The program comprises program code for generating a second set of audio instructions for guiding the visually impaired user to grip the object base on a second set of audio instructions, wherein the second set of audio instructions are generated based on the pressure variation data. Therefore independent claims 1 & 9 do not consider the novel in the light of prior art document D1-D3. The additional technical features of dependent claims 2-8 are common technical means in the art and said claims do not comply with the requirement of novelty. Therefore claims 1-9 do not consider the novel in the view of prior art document D1-D3.

(2). आविष्कारी कदम / INVENTIVE STEP:

(I) ऊपर उद्धरित दस्तावेज़(जों) के संदर्भ D1-D3 and common general knowledge in the art मे स्पष्ट अध्यापन(नों) को ध्यान मे रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-9) मे आविष्कारी कदम की कमी है

Claim(s) (1-9) lack(s) inventive step, being obvious in view of teaching (s) of cited document(s) above under reference D1-D3 and common general knowledge in the art for the following reasons:

At the time of filing of this application, in the view of prior art document D1-D3, claims 1-9 lacks an inventive step.

(3).पेटेंट अयोग्यता /NON PATENTABILITY:

(I) निम्नलिखित कारणों से धारा 3 के खंड ((i))के प्रावधान के तहत दावा(वे) (1-9) सांविधिक रूप से पेटेंट योग्य नहीं हैं /
Claim(s) (1-9) are statutorily non-patentable under the provision of clause (i) of Section 3 for the following reasons:

Without prejudice to the above objection, claims 1-9 are not patentable under section 3(i) of Patents Act as they are falling within the scope of any process for the medicinal, surgical, curative, prophylactic diagnostic, therapeutic or other treatment of human beings or any process for a similar treatment of animals to render them free of disease or to increase their economic value or that of their products.

(4).प्रकटन की दक्षता /SUFFICIENCY OF DISCLOSURE:

(I) सार /Abstract:

The Abstract does not sufficiently provide technical information about the invention. The abstract should be prepared as the instructions given in rule 13(7)(b), 13(7)(c) and 13(7)(d) of the Patents Rules, 2003 (as amended), including drawings.

(5).स्पष्टता एवं संक्षिप्तता /CLARITY AND CONCISENESS:

(I) दावा(वे) 1 & 9 के संबंध में स्पष्ट रूप से परीभाषित नहीं हैं.
Claim(s) 1 & 9 are not clearly worded in respect of:

In view of the plurality of the independent set of claims, nature, and scope of the alleged invention are not clearly understood. The subject matter for which protection is sought may be different from that defined by the claims, thereby resulting in a lack of clarity of the claims when the description is used to interpret the claims. The claims should be redrafted to make them sufficiently definitive and Inventive features should be brought out clearly and reference numerals should be supplemented in parenthesis to enhance the intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10 (4) (c) of The Patents Act, 1970 (as amended). During revision and redrafting, care should be taken not to add any subject matter, which extends beyond the scope of the application as originally filed here your attention is also drawn towards section 59 of The Patents Act, 1970. The Principal claim should be characterized and clearly, bring out the inventive step. Inventive technical features should be incorporated in the claims and should be referenced with numerals in parentheses to enhance the intelligibility of claims.

(6).परिभाषिकता /DEFINITIVENESS:

(I) दावा(वे)1-9 निम्नलिखित कारणों से आविष्कार को पर्याप्त रूप से परीभाषित नहीं करता(ते) हैं
Claim(s) 1-9 do not sufficiently define the invention for the reasons as follows:

Claims 1-9 are vague and too broad regarding "multimodal interaction system", "text display corresponding to printed image/tactile data", "audible signal corresponding to printed image/tactile data", "at least one image is to be captured", "wherein printed page includes graphical object, shapes, and body sensible by a visually impaired or sighted elderly or user with learning disabilities", "wherein printed page 5 includes nonvisible codes and images", "multimodal interaction system (100) for reading 2D/3D embossed image and/or tactile data printed", "a stand (101) comprising a sliding holder (102) for holding the mobile device on top of the stand (101), a clamp support (105) for keeping printed page (10) below the mobile camera field view and a back support (104),

wherein the clamp support (105), the back support (104) and the mobile device holder (101) are attached through the stand frame body (103) with adjustable height" and "tactile data" etc. Claims should define the scope of the for which protection is claimed as per section 10 (4)(c) of The Patents Act, 1970 (as amended). Sufficiently definitive and Inventive features should be brought out clearly and reference numerals should be supplemented in parenthesis to enhance the intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10 (4) (c) of The Patents Act, 1970 (as amended). During revision and re-drafting, care should be taken not to add any subject matter, which extends beyond the scope of the application as originally filed here your attention is also drawn towards section 59 of The Patents Act, 1970. All essential features should be brought out clearly under the characterized clause in the main claim and supplemented with the reference numeral in parenthesis to enhance the intelligibility of the claims.

(7).अन्य आवश्यकताएँ /OTHERS REQUIREMENTS:

(I)

Please note that this Examination is done on the basis of electronically uploaded documents in the e-module only. You may verify if all documents as filed are uploaded electronically, and bring to the notice of the concerned discrepancies if any.

भाग – III: औपचारिक आवश्यकताएँ /PART-III: FORMAL REQUIREMENTS

आपत्तियां /Objections	टिप्पणी /Remarks
Date and Signature of Applicant	Fresh Form-1 should be filed with the necessary details with the duly signed by the applicant.
Statement & Under Taking (Form 3 Details)	Fresh Form 3 should be filed. Details regarding application for Patents which may be filed outside India from time to time for the same or substantially the same invention should be furnished within six months from the date of filing of the said application under clause (b) of subsection(1) of section 8 and rule 12(1) of Indian Patent Act.
Power of Attorney (Whether GPA, SPA, Stamped, requisite fee etc.)	Fresh Power of Attorney in favor of signatories to various Forms should be filed with proper stamp duty.
Registered Agent as per Patent Agent Register	Write the patent agent's name/number to verify the agent electronically on all Forms with duly signed.
Format of Specification (rule 13)	Irrelevant portion shall be deleted and blank spaces shall be scored out in the complete specification. Claims should be prefaced with the words "We Claim" and Claims must be signed by the applicant.
Format of Drawings	The Drawings referred to in the specification should be prepared in accordance with the instructions contained in Rule 15 of the Patent Rules, 2003(as amended in 2006).

Other Deficiencies	If any amendment is necessitated in the complete specification then it is required to clearly identify (submission of marked copy) the amendments carried out and to indicate the portion (page no and line no) of the complete specification as filed on which these amendments are based on. Further, the pages wherever amendments are carried out need to be freshly typed on white pages and to be filed in duplicate.
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भाग-IV: रिकॉर्ड में दस्तावेज़ /PART-IV: DOCUMENTS ON RECORD

निम्नलिखित दस्तावेज़ों के आधार पर यह परीक्षण रिपोर्ट तैयार की गयी है

The examination report has been prepared based on the following documents:

कार्यसूची तिथि / Docket Date	कार्यसूची संख्या /Docket Number	प्रविष्टि संख्या विवरण /Entry Number Description
10 May 2016	17161	1-New Application For Patent With Provisional /Complete Specification
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
02 Jun 2016	21541	3-Statement & Undertaking - Form 3
10 May 2017	30860	2-Complete After Provisional Specification - Form 2 Check For No. OF Pages & Claims
14 May 2017	31555	5-Declaration As To Inventorship - Form 5
15 Jul 2017	44834	28(i)-Request For Examination After 18 months Publication - Form 18

नियंत्रक का नाम /Name of the Controller: [Rakesh Kumar Kushwaha](#)

नियंत्रक स्थान /Controller Location: [Delhi](#)

टिप्पणी: परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि / Note: Last date for filing response to the Examination Report:
26/08/2020



Office of the Controller General of Patents, Designs & Trade Marks
 Department of Industrial Policy & Promotion,
 Ministry of Commerce & Industry,
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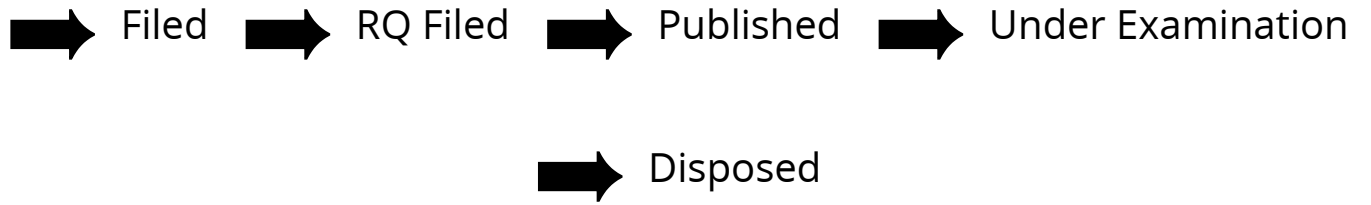
Application Details

APPLICATION NUMBER	201611017103
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	18/05/2016
APPLICANT NAME	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
TITLE OF INVENTION	AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM
FIELD OF INVENTION	ELECTRONICS
E-MAIL (As Per Record)	RASHMI.TYAGI@HOTMAIL.COM
ADDITIONAL-EMAIL (As Per Record)	RASHMI@ELPISINNOVATION.COM
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	29/08/2017
PUBLICATION DATE (U/S 11A)	09/02/2018
REPLY TO FER DATE	24/08/2020

Application Status

APPLICATION STATUS	Reply Filed. Application in amended examination
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Patent Search

Invention Title	AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM
Publication Number	06/2018
Publication Date	09/02/2018
Publication Type	INA
Application Number	201611017103
Application Filing Date	18/05/2016
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	ELECTRONICS
Classification (IPC)	A01K63/04

Inventor

Name	Address	Country
REDDY S.Ramanarayana	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi - 110006, India	India
SHAREEF Zeenat	PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi - 110006, India	India

Applicant

Name	Address	Country	Na
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN	KASHMERE GATE, NEW DELHI - 110006, INDIA	India	Inc

Abstract:

The present invention relates to an integrated system (100) for remote monitoring of multiple parameters of water for aquaculture. The system of the present invention comprises of a floating sensor nodes (11) consisting of multiple sensors to measure water parameters, a base station (101) for transferring the measured parameter: from sensor node (11) of a particular site to a remote unit, a remote monitoring unit (102) for receiving data from multiple base stations (101) for storing, analysis and software application to access the real time parameters data on smart device (103) of user and an actuator node (12) for regulation of the water parameters based on data. The sensor node (11) also consists of an integrated GPS to provide location of each sensor node and a communication module for transmitting the measured data station.

Complete Specification

a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory module coupled to the processor, for storing measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively; and a remote monitoring unit (102) for processing the measured parameters and issuing notification to a user's device (103).

3. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, comprises actuator nodes (12) for regulating the water parameter:
4. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 3, wherein the actuators (12) are controlled using control signal received from the remote monitoring unit (102).
5. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the floating sensor node (11) includes one or more sensors for measuring chemical and physical parameters of water.
6. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 5, wherein the chemical and/or physical parameters are selected from a group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.
7. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein a notification is sent to the user's device (103) when measured parameters breach a threshold value.
8. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein base station (101) communicates with sensor nodes (11) and actuator nodes (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
9. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance communication technologies.
10. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the user's device (103) includes a multiple language support.

[View Application Status](#)



**Department of Industrial
Policy and Promotion**
Government of India

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Page last updated on: 26/06/2019

RT: NA-201611017103

August 24, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION OF PETITION FOR CONDONING DELAY IN FILING FORM-5

Dear Sir,

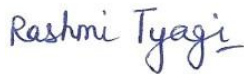
**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 201611017103
e-Filed: May 18, 2016
Title: Aqua-Parameters Real Time Monitoring and Controlling System**

We are submitting herewith petition for condoning delay in filing Form-5 towards Proof of Right. The Applicant has rectified the irregularity occasioned by filing updated Form-5 to overcome objection in FER on 24/08/2020 along with the Petition.

We, therefore, humbly request that irregularity with regard to filing updated Form-5 may be condoned.

Thanking you,

Sincerely Yours,



**Rashmi Tyagi
IN/PA-1594
Agent for Applicant
250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007**

**Contact: 9968284766
Email: rashmi.tyagi@hotmail.com**

To
The Controller of Patents,
The Patent Office, at New Delhi

RT: NA-201611017103

August 24, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

**SUB: SUBMISSION OF PETITION FOR CONDONING DELAY IN FILING FORM-1
TOWARDS PROOF OF RIGHT**

Dear Sir,

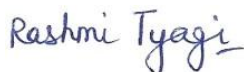
**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 201611017103
e-Filed: May 18, 2016
Title: Aqua-Parameters Real Time Monitoring and Controlling System**

We are submitting herewith petition for condoning delay in filing Form-1 towards Proof of Right. The Applicant has rectified the irregularity occasioned by filing updated Form-1 to overcome objection in FER on 24/08/2020 along with the Petition.

We, therefore, humbly request that irregularity with regard to filing updated Form-1 may be condoned.

Thanking you,

Sincerely Yours,



**Rashmi Tyagi
IN/PA-1594
Agent for Applicant
250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007**

**Contact: 9968284766
Email: rashmi.tyagi@hotmail.com**

To
The Controller of Patents,
The Patent Office, at New Delhi

In the matter of the Patent Act, 1970
And
In the matter of The Patent Rules, 2003
And
In the matter of Indian Patent Application
No. 201641019802 filed on 18/05/2016

PETITION UNDER RULE 137

We, **Indira Gandhi Delhi Technical University for Women**, the applicants in the above application and petitioners herein beg to submit as follows:

- That we have filed an application at the Indian Patent Office, Delhi on 18/05/2016 as assignees of the true and first inventors.
- That there was a delay in submitting Form 5.
- That rule 137 allows the Applicant to rectify the irregularity occasioned by filing a Petition U/R 137.
- That the Applicant has rectified the irregularity occasioned by filing Form 5 (to overcome objection in FER) on 24/08/2020 along with this Petition.

We, therefore, humbly request that irregularity with regard to filing Form 5 may be condoned.

For this act of kindness, your petitioner shall ever be grateful.

Dated this 24th day of August 2020

Rashmi Tyagi

Rashmi Tyagi

IN/PA-1594

Agent for Applicant

To
The Controller of Patents,
The Patent Office, at New Delhi

In the matter of the Patent Act, 1970
And
In the matter of The Patent Rules, 2003
And
In the matter of Indian Patent Application
No. 201641019802 filed on 18/05/2016

PETITION UNDER RULE 137

We, **Indira Gandhi Delhi Technical University for Women**, the applicants in the above application and petitioners herein beg to submit as follows:

- That we have filed an application at the Indian Patent Office, Delhi on 18/05/2016 as assignees of the true and first inventors.
- That there was a delay in submitting Form-1 towards Proof of Right.
- That rule 137 allows the Applicant to rectify the irregularity occasioned by filing a Petition U/R 137.
- That the Applicant has rectified the irregularity occasioned by filing updated Form-1 (to overcome objection in FER) on 24/08/2020 along with this Petition.

We, therefore, humbly request that irregularity with regard to filing updated Form-1 may be condoned.

For this act of kindness, your petitioner shall ever be grateful.

Dated this 24th day of August 2020

Rashmi Tyagi

Rashmi Tyagi

IN/PA-1594

Agent for Applicant

To
The Controller of Patents,
The Patent Office, at New Delhi



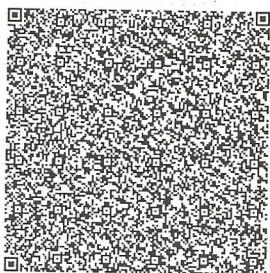
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Government of National Capital Territory of Delhi

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Original GPA is submitted for Application No. 156/DEL/2015

Rashmi Tyagi

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THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi, (IN/PA-1594) Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007**, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and

We request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi



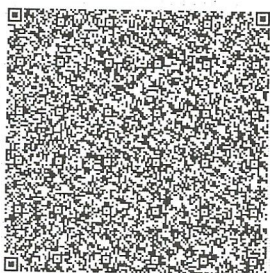
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Certificate No. : IN-DL56367190598411N
Certificate Issued Date : 12-Jan-2015 12:55 PM
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Unique Doc. Reference : SUBIN-DL82200309630522127835N
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Description of Document : Article Others
Property Description : Not Applicable
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Original GPA is submitted for Application No. 156/DEL/2015

Rashmi Tyagi

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3. In case of any discrepancy please inform the Competent Authority.

THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi, (IN/PA-1594) Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007**, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and

We request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification [particularly](#) describes the invention and the manner in which it is to be performed.

WE CLAIM

1. A system (100) for monitoring and controlling physico-chemical parameters of water for ~~A water parameters monitoring system (100) for aquaculture needs~~ comprising:

a plurality of floating sensor node (11) including one or more sensors for measuring water parameters;

an actuator node (12) for regulating one or more water condition;

a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12); comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102) ~~and a processor coupled the memory and the transceiver;~~ and

a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter;

wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.

~~2. A water parameters monitoring system (100) for aquaculture needs comprising:~~

~~a floating sensor node (11) including sensors for measuring water parameters;~~

~~a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory module coupled to the processor, for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively; and~~

~~a remote monitoring unit (102) for processing the measured parameters and issuing notification to a user's device (103).~~

~~3. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, comprises actuator nodes (12) for regulating the water parameters.~~

~~4. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 3, wherein the actuators (12) are controlled using control signal received from the remote monitoring unit (102).~~

~~5. The water parameters monitoring system (100) for aquaculture needs claimed in claim 2, wherein the floating sensor node (11) includes one or more sensors for measuring chemical and physical parameters of water.~~

6.2. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1.~~The water parameters monitoring system (100) for aquaculture needs as claimed in claim 5,~~ wherein the ~~chemical and/or physical~~physico-chemical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.

~~7. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein a notification is sent to the user's device (103) when measured parameters breach a threshold value.~~

3. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is low power self-sustained node either chargeable by battery or solar energy.

4. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is floating in water in a predetermined optimal path for collecting one or more parameter.
5. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is controlled remotely by user without going into the water and further consists of a GPS module for providing location of the particular sensor node (11).
6. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions by turning ON or OFF the heaters, feeders, inflators, etc.
7. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) stores the measured parameters received from the base station (101), perform analysis and provides statistical information to the user.
8. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1.~~The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2,~~ wherein base station (101) communicates with sensor nodes (11) and actuator nodes (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.

9. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1.~~The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2,~~ wherein the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance communication technologies.
10. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1.~~The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2,~~ wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters remotely.

Dated this 18th day of May 2017

Rashmi Tyagi

(RASHMI TYAGI)

IN/PA-1594

AGENT FOR APPLICANT

WE CLAIM

1. A system (100) for monitoring and controlling physico-chemical parameters of water for aquaculture comprising:
 - a plurality of floating sensor node (11) including one or more sensor for measuring water parameters;
 - an actuator node (12) for regulating one or more water condition;
 - a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102); and
 - a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter;wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.

2. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the physico-chemical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.

3. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is low power self-sustained node either chargeable by battery or solar energy.

4. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is floating in water in a predetermined optimal path for collecting one or more parameter.
5. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is controlled remotely by user without going into the water and further consists of a GPS module for providing location of the particular sensor node (11).
6. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions by turning ON or OFF the heaters, feeders, inflators, etc.
7. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) stores the measured parameters received from the base station (101), perform analysis and provides statistical information to the user.
8. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1,, wherein base station (101) communicates with sensor node (11) and actuator node (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
9. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the transceiver

transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance communication technologies.

10. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters remotely.

Dated this 18th day of May 2017

Rashmi Tyagi

(RASHMI TYAGI)

IN/PA-1594

AGENT FOR APPLICANT

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification particularly describes the invention and the manner in which it is to be performed.

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification describes the invention and the manner in which it is to be performed.

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

FIELD OF THE INVENTION

5 The present invention relates to the field of remote real time monitoring, storage and analysis of water parameters for aquaculture. More particularly, the invention relates to an integrated system for real time remote monitoring and controlling of aqua-parameters.

10 BACKGROUND OF THE INVENTION

In most of the cases the monitoring of water parameters is performed manually after taking water samples in field tests and chemically performing experiments to analyze the quality of water. This process is time consuming and lengthy. A lot of energy, time and money are wasted
15 in this process. Also real time monitoring of water parameters is not possible in manual process of water quality measurement.

In the work of prior art in the field of integrating internet of things into the aquaculture industry, there is lack of cloud environment and decision
20 support system. Also generally one or two water parameters are measured in these systems for transmission. These devices don't have GPS capabilities for locating the sensor nodes placed on the ponds. For mobile access, there is lack of smartphone mobile application for viewing the measured readings while on move. Having sensors and actuators in
25 the same node hampers the efficient functioning of the node.

Therefore, the current invention aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture.

SUMMARY OF THE INVENTION

5 An object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver and a remote monitoring unit (102) wirelessly coupled to the base station (101).

10 An another object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory coupled to the processor for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively and a remote monitoring unit (102) for processing the measured parameters and issuing a notification to a user's device (103).

20 A furthermore object of the present invention provides a system for enabling remote analysis and correction of a water parameters required to control for fish farmer's needs, through a real time self-correcting and automated system that incorporates balancing technology.

25 A furthermore object of the present invention provides a water contamination detection system.

30 A furthermore object of the present invention provides a custom built mobile application supporting multiple local languages, that has been integrated in the system.

A furthermore object of the present invention provides a decision support system designed to integrate the domain knowledge and provide the right information to the right people at right time. The mobile application connects to the decision support system and displays the parameters to the users as per need.

A furthermore object of the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention;

FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention. The system (100) of present invention comprises a base station (101), remote monitoring system (102) and user's device (103). The base station (101) communicates with sensor nodes (11) which
15 include multiple sensors to measure water parameters such as water temperature, pH, salinity, specific conductance, turbidity and dissolved oxygen. The sensor node (11) further comprises a GPS to provide location within the ponds or agriculture land and the sensor nodes (11) are designed to float within the water for easy monitoring of water parameters.

20 The base station (101) includes a processor, a memory module coupled to the processor, and transceiver (not shown). The transceiver wirelessly communicates with the sensors nodes (11) and collects data about different measured water parameters and stores in into base station memory (not shown). The base station (101) communicates with sensors
25 nodes (11) and actuator nodes (12) (explained later) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies. Further, base station (101) also sends this parametric information to the remote monitoring unit (102) also named as central monitoring station (102). The remote monitoring unit
30 (102) receives measured data from different base stations (101) and analyses it. The remote monitoring unit (102) or central monitoring station

includes a decision support system designed to integrate the domain knowledge and process the measured information and user's details to provide the right information to right people at right time. The remote monitoring unit (102) monitors and issues an alert or notification to a specific user in case of violating of any predefined threshold value of a parameter. The remote monitoring unit based on the measured parameters also send control signal for issuing the control command to the floating actuator (12) for regulating the water conditions by turning on/off the heaters, feeders, inflators, etc.

5

10

According to an embodiment of the present invention remote monitoring unit (102) communicates with the base station (101) and the user's device (103) using GSM/UMTS/LTE communication and other long distance communication technologies.

15

The system (100) of the present invention monitors and controls the water parameters in real time. A user of a mobile device can easily control and monitors the water parameter from a remote location. The user's mobile device (103) comprises an application to provide access to the remote/central monitoring station. The mobile application connects to the decision support system and displays the parameters to the users as per need. Thus the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

20

25

The integrated system of the present invention has many novel features such as the system (100) of the present invention has GPS capability on sensor node. The system also has decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their

30

requirements and eliminating other irrelevant data. The system of the present invention has provision to integrate other sensors such as for monitoring the growth and diseases of the fishery farms. The system of the present invention also has provision to remotely control the placement of the node and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

The basic components of the system (100) of present invention are herein described in details:

- 10 A. Sensor node (11): The sensor node is provided for measuring the physical, chemical and biological parameters of water such as but not limited to water temperature, dissolved oxygen, turbidity, pH, nitrate and carbonate, viral and algae growth and regular monitoring of water parameters. It also consists of a wireless communication module for sending the measured data to a nearby base station (101) at regular intervals. The sensor nodes of the present invention are low power self-sustained nodes either chargeable by battery or solar energy. In the present invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.
- 15
- 20
- 25 B. Base Station (101): It consists of a transceiver which receives measured data from sensor nodes of a particular location and transfers it to a central monitoring unit (102) via wireless mode. This base station act as receiver for the laid node data and as a controller for the actuators (12).

30

5 C. Central Monitoring Unit (102): This is the decision making unit of the entire system (100) of the present invention. It receives the measured data from base station (101) for storing it in the database, analyzing and providing statistical graphs for the user. It contains algorithm and logic to make decisions at critical conditions and send the control signal accordingly. In case of any discrepancy, control signal is passed from the central monitoring unit (102) to the actuator node (12) through the base station (101).

10 D. Actuator node (12): It consists of actuators which are turned on/off when a control signal is received from the central monitoring unit (102) via the base station (101). If the measured value crosses the threshold limit, then a control signal is sent to the actuator node through the base station to regulate the water conditions by turning
15 on/off such as but not limited to heaters, feeders, inflators.

E. Software Application: The software application is provided for installation on the user's smart device (103) through which the user can log into the central monitoring unit data and view or perform
20 analysis of the data while on move. The user may also report any comment from their device through software application to the monitoring unit (102).

The integrated system of the present invention offers numerous
25 advantages such as the system (100) of the present invention provides real time monitoring of the water parameters and storing data in cloud for remote access of said parameters on the user's smart device through an application. The system (100) provides regulation of the water parameters by turning on/off the actuators (12) when needed. Further, the system
30 (100) of the present invention provides creation of a Knowledge base with

fishery department for further research and provides advisement in water conditions well in advance so as to avoid losses to the farmers.

5 FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling of aqua-parameters according to a preferred embodiment of the present invention. The present invention provides an integrated system (200) for remotely monitoring & controlling of multiple aqua-parameters. In the present invention, the floating sensor nodes (21) are placed in the water of multiple sites for measuring various physical, 10 chemical & biological parameters of water. The data measured by these sensors is transferred to the base station (201) through wireless communication module and the location of each sensor node is provided by the GPS module integrated in the sensor node (21). The base station (201) further transmits the received data to a remotely located central monitoring unit (202) by a wireless transceiver mode. The central 15 monitoring unit (202) on receiving measured data from multiple base stations stores the data, performs analysis and provides statistical graphs and upon detection of any critical condition or threshold breach of any measured parameter transmits a control signal to the respective base station (201) wherein, the base stations (201) sends the control signal received from central monitoring unit (202) to the actuator nodes (22) for regulating the water conditions by turning on/off such as but not limited to heaters, feeders, inflators. The user can log in to the central monitoring unit (202) through a software application installed on the user's smart 20 device (203) for viewing or performing analysis of the measured parameters while on move. The user may also report any comment from their device through software application to the monitoring unit (202).

30 In the present invention a "smart device," as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory

capability. Examples of smart devices, these teachings not being limited to only these examples, mobile phones, smart mobile phones, tablets, digital personal assistants, and laptops, etc.

5 The “software application” or “app” or “mobile application” or “application” can be available for download or installation on a user smart device from the provider of integrated system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided to download the app. In an embodiment, the software
10 application can be initialized when a user first time uses the integrated system of the present invention. After the “software application” has been downloaded, the application can be installed on the smart device in an executable format. The executable form of the application permits the user to access embodiments of the invention via an electronic resource, such
15 as a mobile phone "app" or website.

WE CLAIM

1. A water parameters monitoring system (100) for aquaculture needs comprising:
- 5 a floating sensor node (11) including sensors for measuring water parameters;
- a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver; and
- 10 a remote monitoring unit (102) wirelessly coupled to the base station (101).
2. A water parameters monitoring system (100) for aquaculture needs comprising:
- 15 a floating sensor node (11) including sensors for measuring water parameters;
- a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory module coupled to the processor, for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively; and
- 20 a remote monitoring unit (102) for processing the measured parameters and issuing notification to a user's device (103).
- 25
3. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, comprises actuator nodes (12) for regulating the water parameters.
- 30
4. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 3, wherein the actuators (12) are

controlled using control signal received from the remote monitoring unit (102).

- 5 5. The water parameters monitoring system (100) for aquaculture needs claimed in claim 2, wherein the floating sensor node (11) includes one or more sensors for measuring chemical and physical parameters of water.
- 10 6. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 5, wherein the chemical and/or physical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.
- 15 7. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein a notification is sent to the user's device (103) when measured parameters breach a threshold value.
- 20 8. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein base station (101) communicates with sensor nodes (11) and actuator nodes (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
- 25 9. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance
30 communication technologies.

10. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters.

5

Dated this 18th day of May 2017

Rashmi Tyagi

**(RASHMI TYAGI)
AGENT FOR APPLICANT
IN/PA-1594**

ABSTRACT

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

The present invention relates to an integrated system (100) for remote monitoring of multiple parameters of water for aquaculture. The system of the present invention comprises of a floating sensor nodes (11) consisting of multiple sensors to measure water parameters, a base station (101) for transferring the measured parameters received from sensor node (11) of a particular site to a remote unit, a remote monitoring unit (102) for receiving data from multiple base stations (101) for storing, analysis and alerting, a software application to access the real time parameters data on smart device (103) of user and an actuator node (12) for regulation of the water parameters based on measured data. The sensor node (11) also consists of an integrated GPS to provide location of each sensor node and a communication module for transmitting the measured data to base station.

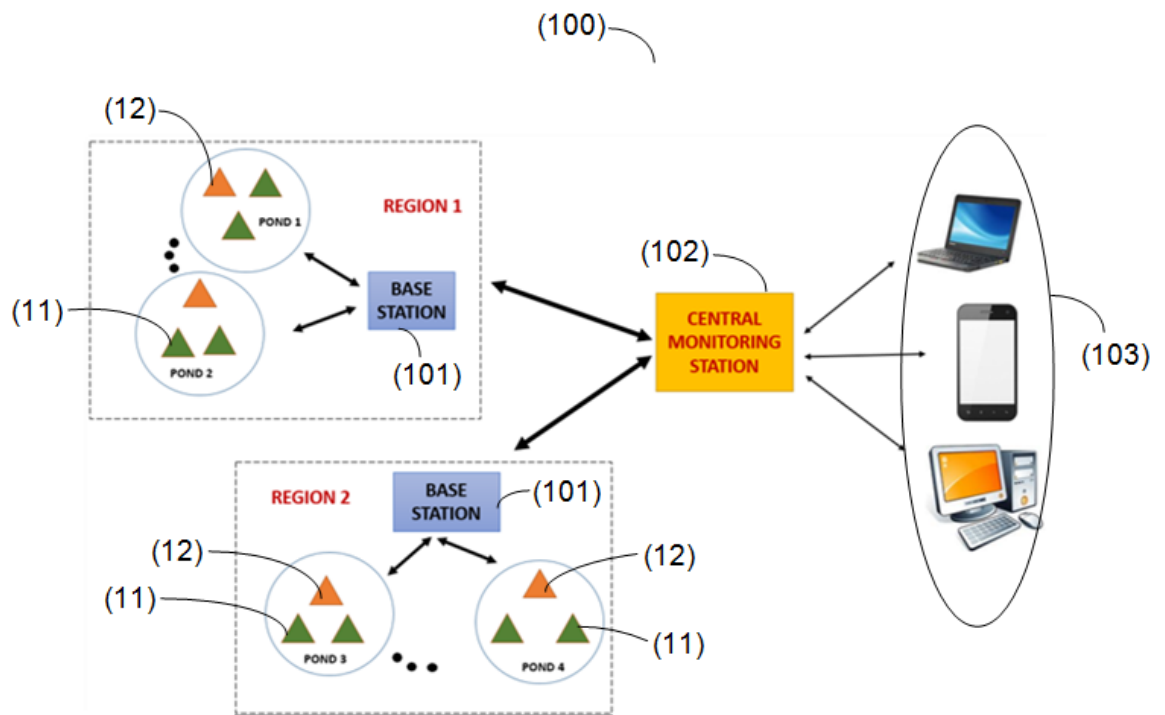


FIG. 1

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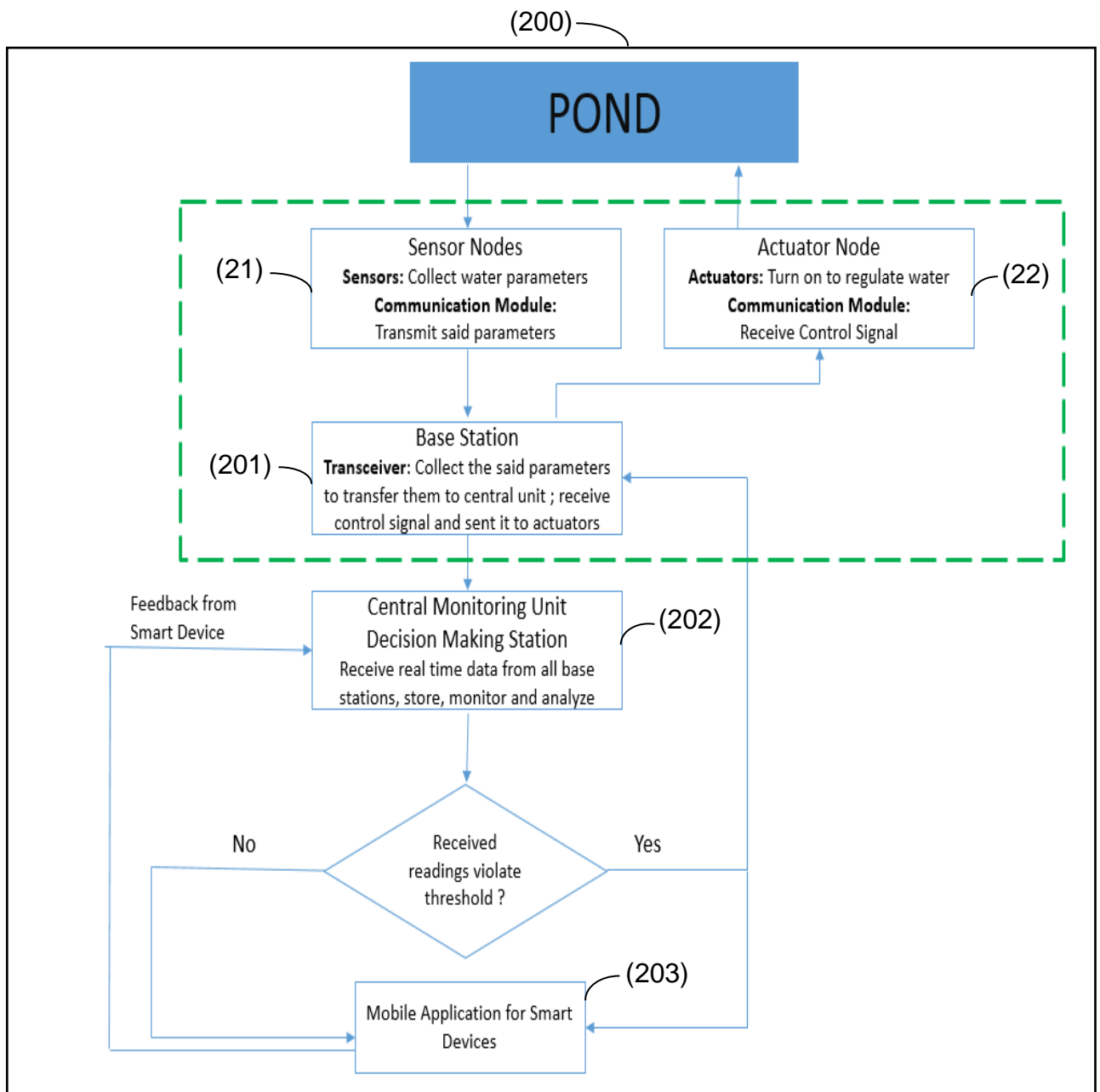


FIG. 2

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FORM 3

THE PATENTS ACT, 1970

(39 of 1970)

and

THE PATENTS RULES, 2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).		I/We <u>Indira Gandhi Delhi Technical University for Women</u> , Indian, of address <u>Kashmere Gate, New Delhi – 110006, India</u> hereby declare:			
2. Name, address and nationality of the joint applicant.		(i) that I/We have not made any application for the same/substantially the same invention titled “Aqua-Parameters Real Time Monitoring and Controlling System” outside India Or (ii) that I/We who have made this application No. <u>N/A</u> dated <u>N/A</u> alone/jointly with <u>N/A</u> , made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:			
Name of the country	Date of Application	Application No.	Status of the application	Date of publication	Date of grant
N/A					
3. Name and address of the assignee		(iii) that the rights in the application(s) has/have been assigned to <u>None</u> that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application.			

	Dated this <u>02nd</u> day of <u>June 2016</u>
4. To be signed by the applicant or his authorized registered patent agent.	Signature <u>Rashmi Tyagi</u> .
5. Name of the natural person who has signed.	<u>RASHMI TYAGI</u> <u>Agent for Applicant (IN/PA-1594).</u>
	To The Controller of Patents, The Patent Office, at <u>New Delhi</u> .
Note.- Strike out whichever is not applicable;	

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

**1. NAME OF APPLICANT(S): INDIRA GANDHI DELHI TECHNICAL UNIVERSITY
FOR WOMEN** of address Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 201611017103 dated 18.05.2016 are:-


2. INVENTORS(S)

(a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical
University for Women, Kashmere Gate, New Delhi-110006,
India

(a) NAME : **SHAREEF Zeenat**
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical
University for Women, Kashmere Gate, New Delhi-110006,
India

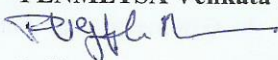
3. STATEMENT (to be signed by additional inventor(s) not mentioned in the application form)

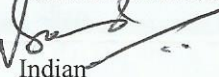
I/We assent to the invention referred to in the above declaration, being included in the complete specification file in pursuance of the stated application.

(a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and Engineering,

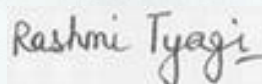
SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and Communication Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSA Venkata Gopala Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department, SRKR Engineering College, Bhimavaram, -534204, Andhra Pradesh, India

(a) NAME : **Bala Krishna Prasad Mathukumalli**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland - 20871, USA

Dated this 18th day of May 2016



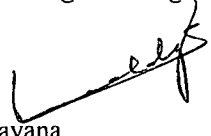
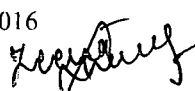
Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi



FORM 1				(FOR OFFICE USE ONLY)	
THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003					
APPLICATION FOR GRANT OF PATENT					
(See section 7, 54 and 135 and sub-rule (1) of rule 20)					
				Application No.	
				Filing Date:	
				Amount of Fees Paid	
				CBR No.	
				Signature:	
1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ()		PCT-NP ()	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN		INDIAN	INDIA	House No.	N/A
				Street	KASHMERE GATE
				City	NEW DELHI
				State	DELHI
				Country	INDIA
				Pin Code	110006
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity ()	Startup ()	Others (✓)	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	
If "No", furnish the details of the inventor(s)					
Name in Full		Nationality	Country of	Address of the Inventor	

		Residence		
REDDY S. Ramanarayana	INDIAN	INDIA	House No.	N/A
			Street	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
SHAREEF Zeenat	INDIAN	INDIA	House No.	N/A
			Street	PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
5. TITLE OF THE INVENTION				
AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM				
6. AUTHORISED REGISTERED PATENT AGENT(S)		IN/PA No.	1594	
		Name	RASHMI TYAGI	
		Mobile No.	9968284766	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA		Name	RASHMI TYAGI	
		Postal Address	250, STREET NO: 06, NEW COLONY KARHERA, MOHAN NAGAR, GHAZIABAD, UTTAR PRADESH - 201007, INDIA	
		Telephone No.	N/A	
		Mobile No.	9968284766	
		Fax No.	N/A	
		E-mail ID	RASHMI.TYAGI@HOTMAIL.COM	
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION				

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention	IPC (as classified in the convention country)
N/A	N/A	N/A	N/A	N/A	N/A
9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)					
International application number			International filing date		
N/A			N/A		
10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION					
Original (first) application No.			Date of filing of original (first) application		
N/A			N/A		
11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT					
Main application/patent No.: N/A			Date of filing of main application: N/A		
12. DECLARATIONS					
(i) Declaration by the inventor(s)					
<p>(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).</p> <p>I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.</p> <p>(a) Date: 18.05.2016</p> <p>(b) Signature(s): </p> <p>(c) Name(s): REDDY S. Ramanarayana</p> <p>(a) Date: 18.05.2016</p> <p>(b) Signature(s): </p> <p>(c) Name(s): SHAREEF Zeenat</p>					
(ii) Declaration by the applicant(s) in the convention country					
<p>(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)</p>					

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- ~~I am~~ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- ~~I am~~/we are the true & first inventor(s).
- ~~I am~~/we are the assignee or legal representative of true & first inventor(s).
- The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).
- I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.
- The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph- 11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete / Provisional Specification#	No. of pages: 10	8,000	
No. of Claim(s)	No. of claims and No. of pages: N/A		

Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 & No. of pages: 02		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

Total fee Rs. 8,000 through Online payment gateway Date 18/05/2016 on ICICI Bank.

~~I~~We hereby declare that to the best of ~~my~~/our knowledge, information and belief the fact and matters stated herein are correct and ~~I~~We request that a patent may be granted to ~~me~~/us for the said invention.

Dated this 18th day of May 2016.

Signature: Rashmi Tyagi

Name: RASHMI TYAGI

To,

The Controller of Patents

The Patent Office, at New Delhi

Note: -

- * Repeat boxes in case of more than one entry.
- * To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
- * Tick (✓)/cross (✗) whichever is applicable/not applicable in declaration in paragraph- 12.
- * Name of the inventor and applicant should be given in full, family name in the beginning.
- * Strike out the portion which is/are not applicable.
- * For fee: See "First Schedule".

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. APPLICANT

- a. **NAME:** INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
- b. **NATIONALITY:** INDIAN
- c. **ADDRESS:** KASHMERE GATE, NEW DELHI-110006, INDIA

2. Statement in case of request for examination made by the applicants

We hereby request that our application for patent no. **201611017103** filed on **18th May, 2016** for the invention titled "**AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM**" shall be examined under sections 12 and 13 of the Act.

3. ADDRESS FOR SERVICE:

250, Street No. 06, New Colony Karhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh – 201007, India

Mobile No.:+91-9968284766

E-mail: rashmi@elpisinnovation.com

Dated 26th day of August, 2017

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANT)

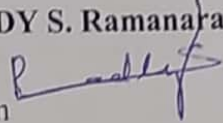
To,
The Controller of Patents
The Patent office, at New Delhi

Dated: 20th August, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

CONSENT FOR ADDITION OF INVENTORS

We are the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of application numbered **201611017103** dated **18.05.2016** in the name of **Indira Gandhi Delhi Technical University for Women** titled **Aqua-Parameters Real Time Monitoring and Controlling System.**

(a) NAME : **REDDY S. Ramanarayana**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **SHAREEF Zeenat**
(b) SIGNATURE :
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

We hereby provide our consent for addition of following inventors through FORM-5 in above mentioned application.

(1) NAME : **KALIDINDI Ramaprasada Raju**
(2) NAME : **KANUMURI Chalapathiraju**
(3) NAME : **PENMETSA Venkata Gopala Raju**
(4) NAME : **MATHUKUMALLI Bala Krishna Prasad**

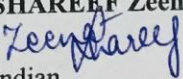
Dated: 20th August, 2020

To,
The Controller of Patents
The Patent Office, at New Delhi

CONSENT FOR ADDITION OF INVENTORS

We are the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of application numbered **201611017103** dated **18.05.2016** in the name of **Indira Gandhi Delhi Technical University for Women** titled **Aqua-Parameters Real Time Monitoring and Controlling System.**

(a) NAME : **REDDY S. Ramanarayana**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical
University for Women, Kashmere Gate, New Delhi-
110006, India

(a) NAME : **SHAREEF Zeenat**
(b) SIGNATURE : 
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi
Technical University for Women, Kashmere Gate, New
Delhi-110006, India

We hereby provide our consent for addition of following inventors through FORM-5 in above mentioned application.

(1) NAME : **KALIDINDI Ramaprasada Raju**
(2) NAME : **KANUMURI Chalapathiraju**
(3) NAME : **PENMETSA Venkata Gopala Raju**
(4) NAME : **MATHUKUMALLI Bala Krishna Prasad**

FORM 5

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENT RULES, 2003

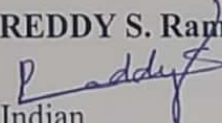
DECLARATION AS TO INVENTORSHIP

[See Section 10 (6) and rule 13 (6)]

1. **NAME OF APPLICANT(S):** **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of address Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered **201611017103** dated **18.05.2016** are:-

2. **INVENTORS(S)**

(a) NAME : **REDDY S. Ramanarayana**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESSAA : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **SHAREEF Zeenat**
(b) SIGNATURE :
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

3. **STATEMENT (to be signed by additional inventor(s) not mentioned in the application form)**

I/We assent to the invention referred to in the above declaration, being included in the complete specification file in pursuance of the stated application.

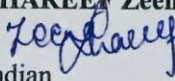
FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

1. NAME OF APPLICANT(S): INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN of address Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 201611017103 dated 18.05.2016 are:-

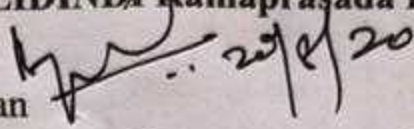
2. INVENTORS(S)

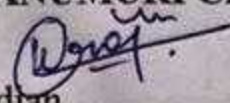
(a) NAME : **REDDY S. Ramanarayana**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESSAA : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

(a) NAME : **SHAREEF Zeenat**
(b) SIGNATURE : 
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

3. STATEMENT (to be signed by additional inventor(s) not mentioned in the application form)

I/We assent to the invention referred to in the above declaration, being included in the complete specification file in pursuance of the stated application.

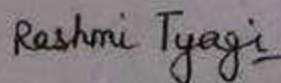
(a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and Engineering,
SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and Communication Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSА Venkata Gopala Raju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department, SRKR Engineering College, Bhimavaram, -534204, Andhra Pradesh, India

(a) NAME : **MATHUKUMALLI Bala Krishna Prasad**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland - 20871, USA

Dated this 20th day of August 2020



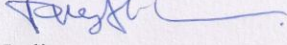
Name: **RASHMI TYAGI (IN/PA-1594)**

AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

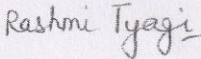
(a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and
Engineering,
SRKR Engineering College, Bhimavarm-534204, Andhra
Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and
Communication Engineering, SRKR Engineering College,
Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSA Venkata Gopala Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department,
SRKR Engineering College, Bhimavaram, -534204,
Andhra Pradesh, India

(a) NAME : **MATHUKUMALLI Bala Krishna Prasad**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland -
20871, USA

Dated this 20th day of August 2020



Name: **RASHMI TYAGI (IN/PA-1594)**


AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

(a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and
Engineering,
SRKR Engineering College, Bhimavarm-534204, Andhra
Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and
Communication Engineering, SRKR Engineering College,
Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSA Venkata Gopala Raju**
(b) SIGNATURE :
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department,
SRKR Engineering College, Bhimavaram, -534204,
Andhra Pradesh, India

(a) NAME : **MATHUKUMALLI Bala Krishna Prasad**
(b) SIGNATURE : 
(c) NATIONALITY : USA
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland -
20871, USA

Dated this **20th** day of **August 2020**



Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

Date: 24 August 2020

Our reference: 201611017103

To

The Controller of Patents

The Patent Office, at New Delhi

Kind attention of: Shri Shahid Anwar

Controller of Patents

Last Date: 25 August 2020

Dear Sir,

Re:

Applicant : Indira Gandhi Delhi Technical University for Women
Application No. : 201611017103
Filed on : 18 May 2016
Title : Aqua-Parameters Real Time Monitoring and Controlling System

This is further to the First Examination Report (FER) issued on 25 February 2020 in respect of the above-mentioned patent application. The Applicant, herein, submits response to all the objections raised in the FER. The last date to put the patent application in order for grant is 25 August 2020.

RESPONSE TO THE FER

Part 1: Summary of Amendments

Applicant humbly submits amended claims 1-10 are pending for examination. The original claims 1-10 are amended to more clearly articulate the subject matter and also to overcome the objections raised in the FER. No new matter has been introduced through these amendments. Applicant submits that the amended claims 1-10 are within the scope of the invention disclosed in the original filed complete specification and the amended claims 1-10

are in accordance with Section 59 (1) of the Patents Act, 1970. A marked up copy of the amended claims indicating basis for the claim amendment from description or illustration of as filed complete specification is submitted herewith.

The amendment and renumbering of the claims is as following:

Amended Claims	Deleted Claims	New Added Claims
Claim 1 amended to Claim 1	Original Claim 2,	Claim 3,
Claim 6 amended to Claim 2,	Original Claim 3,	Claim 4,
Claim 8 amended to Claim 8	Original Claim 4,	Claim 5,
Claim 9 amended to Claim 9, and	Original Claim 5, and	Claim 6, and
Claim 10 amended to Claim 10	Original Claim 7	Claim 7

The support and basis for amended claims are given below:

Proposed Claims	Specification Support
Claim 1	Page 05, Lines 1-31; Page 06, Lines 1-9
Claim 2	Page 05, Lines 10-17
Claim 3	Page 07, Lines 10-18
Claim 4	Page 07, Lines 10-20
Claim 5	Page 07, Lines 10-23
Claim 6	Page 06, Lines 03-08
Claim 7	Page 08, Lines 01-08
Claim 8	Page 05, Lines 20-27
Claim 9	Page 06, Lines 11-14
Claim 10	Page 06, Lines 16-24

The applicant, therefore, respectfully requests the Learned Controller for reconsideration of the present application in view of the forgoing amendments and following remarks.

Part-II: Detailed Technical Report

Objection 1: Novelty

The Learned controller has objected the novelty of originally filed claims 1-10 in view of document:

1. D1: US20050172910A1

Independent claim 1: A water parameters monitoring system for aquaculture needs comprising: a floating sensor node including sensors for measuring water parameters (See D1, Paragraph 0010 and claim 14, clearly mentioning a plurality of sensors for measuring various parameter); a base station wirelessly coupled to at least one floating sensor node (See D1 , paragraph 0039 , it is describing about input/output data can be sent through telemetry communication means such as RF frequencies, optical frequencies, IR frequencies, ultrasonic frequencies, magnetic effects, Bluetooth) comprising a memory, a transceiver and a processor coupled the memory and the transceiver (see D1, paragraph 0040, describing about how processor processes the data); and a remote monitoring unit wirelessly coupled to the base station (See D1, paragraph 0041, describing about remote monitoring station).All the features can be found in document D1, hence it is not novel in the view of document D1.

Independent claim 2- Additional feature mentioned in Independent claim 2 are “issuing notification to a user’s device” (See D1, paragraph 0054, describing about sending notification), “generating control signal” (See D1, paragraph 0040, clearly describing the after analysis by the processor, it may send the control signal to the aqua system control

devices for the dynamically control of parameter) are described in document D1. Hence, it is not novel in the view of D1.

Dependent claim's features like “monitoring of various parameters” (See D1, paragraph 0004), regulate the water parameters (See D1, paragraph 0041), uses of control signals (See D1, claim1) also available in document D1.Hence all dependent claims are also not novel in the view of D1.

Applicant submits the following submissions with regard to novelty of the claimed invention:

1. D1 discloses a system including a plurality of sensors for measure a respective parameter of the associated control device, and produce a sensor output related to its measured parameter. The system also includes a processor (controller) that receives the sensor outputs and processes the data. When processing the data, the processor may use data or sensor fusion algorithms, to determine the status of the control device and/or the overall state of the aquatic environment, based on the sets of relationship between the measured parameters and the reference parameters. The system uses the sensor data or output to perform system anomaly analysis and predictive failure diagnostics whereas the system of proposed invention is for monitoring and controlling physico-chemical parameters of water for aquaculture comprising a plurality of floating sensor node (11) including one or more sensor for measuring water parameters, an actuator node (12) for regulating one or more water condition, a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102), and a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach

of predefined threshold value of one or more parameter. The remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions such as turning ON or OFF the heaters, feeders, inflators, etc.

2. D1 discloses a system comprising of sensors and data fusion algorithm to perform system anomaly analysis and predictive failure diagnostics associated with the aquatic environment machinery or control devices of aquatic environment. Thus the system of D1 has been designed for an enclosure environment only and is for anomaly analysis and predictive failure diagnostics whereas the proposed invention provide a system for monitoring and controlling water parameters of real environment huge aquaculture farms hence consisting more sensor nodes and an integrated system to monitor efficiently in real time as compared to monitoring aquariums as only one node is sufficient to manage an aquarium. Hence, the proposed invention is novel being different in its architecture and application.

3. Further, the system disclosed in D1 comprises of sensors attached to the machinery including plumbing components or control devices whereas the system of proposed invention comprises a plurality of floating sensor node (11) including one or more sensors for measuring water parameters. In the proposed invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node. None of the features are present in the cited document.

4. Additionally, according to D1 as the sensor are attached to control system or machinery they have a limitation of being fixed to a location and hence are required in more numbers that is in proportion with number of control devices or machinery thus increasing

the complexity as well as cost of the system whereas the sensors being floating sensors in proposed invention reduces the number of sensor nodes required to cover a given area as mere one floating sensor node for example, can cover a nearby pond area and provides physico-chemical parameters of water.

5. According to D1, the system analysis include individual or collective performance of the component parts or machinery, such as the pumps, filters, using parameters such as current, vibration or acoustic data. Based on this real-time analysis of the integrated aqua system components, the system evaluate the data for likely environment anomaly, whereas in proposed invention the base station connects several sensor nodes together, processes the data received from these nodes and transmits to remote monitoring station. The base station in the proposed invention connects several other sensor nodes and forms a network in internet of things platform. Further, the remote monitoring coupled to the base station monitors and issue an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter and also send a control signal to the actuator node upon breach of a predefined threshold value for regulating the water conditions.

6. Further, in cited art D1 the transmission is only from sensors to processor and from processor to machinery in comparison to proposed invention where the remote monitoring unit is in the cloud platform which stores the measured parameters received from the base station, perform analysis, and provides statistical information to the user and hence it has facility of storage of more data and better processing facilities.

Accordingly, it is respectfully stated that the cited prior art does not teaches monitoring and controlling physico-chemical parameters of water by a plurality of floating sensor node and actuator node for regulating one or more water condition wherein the sensor nodes has GPS capability. The proposed system also has decision support system with knowledge base

for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their requirements and eliminating other irrelevant data. The system of the present invention also has provision to remotely control the placement of the sensor node and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

Objection 2: Inventive Step

The Learned controller has objected the inventive merit of originally filed claims 1-10 in view of document:

1. D1: US20050172910A1
2. D2: CN105516323A
3. D3: WO2014125419A4

Applicant submits the following submissions with regard to inventiveness of the claimed invention:

Regarding claim 1:

The claim 1 is amended to more clearly articulate the subject matter and also to overcome the objections raised in the FER. The amendments are fully supported in the specification on record. It is well settled that in determining the differences between the prior art and the claims, the question under is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. To this end, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.

[Emphasis Added] To establish a prima facie case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation to modify the reference or to

combine reference teachings; (2) there must be reasonable expectation of success; and (3) the prior art reference must teach or suggest all the claim limitations.

Thus, Applicant respectfully traverses the rejection because the approach disclosed in **D1, D2 and D3** and approach claimed in the proposed invention is not only different, but portions of **D1, D2 and D3** upon which the Learned Controller relied do not render the claimed invention render obvious.

Claim 1 has been amended to recite:

1. A system (100) for monitoring and controlling physico-chemical parameters of water for aquaculture comprising:

a plurality of floating sensor node (11) including one or more sensor for measuring water parameters;

an actuator node (12) for regulating one or more water condition;

a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102); and

a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter;

wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.

D1 discloses a system for monitoring and controlling an aquatic environment. This system uses sensor and data fusion algorithms to perform system anomaly analysis and

predictive failure diagnostics based on the output of sensors associated with the aquatic environment control devices. Based on the system anomaly analysis and/or predictive failure diagnostics, the system continuously adjust the system parameters to maintain an efficient and stable aquatic environment, alert local or remote monitors of failed or impending failure of control devices. In addition, the system present the system anomaly analysis and predictive failure diagnostics information at a local or remote location to enable the monitor to address any problems presented in situ.

D2 discloses an intelligent fish tank controlled by a mobile phone. It includes a central control module that can communicate wirelessly with a user's mobile phone through a 3G network and is connected to a controllable video probe in the box. The module obtains the fish tank video from the video probe in the box. Through the video probe in the box, the user can check the internal conditions of the fish tank in real time. The central control module also connects the temperature detection sensor and the light detection sensor in the box to detect the light intensity and temperature inside the fish tank. The data collected by the temperature detection sensor in the tank and the light detection sensor in the tank is in the form of short messages. It is transmitted to the user's mobile phone periodically or through user commands. The central control module is also connected to the feeding control switch, light control switch, inflation control switch, and heating control switch. Through these control switches, the user can remotely control the entire fish tank system.

D3 discloses a device for measuring a chemical and/or physical parameter (s) of water for an aquaculture, said device comprising a power management module, a water quality monitoring module for monitoring, detecting, processing and recording said chemical and physical parameter(s) of the water comprising solar powered Floating Buoy, a data transmission module (3) for transmitting recorded said chemical and physical parameter (s) wirelessly to a user using a communicating means, a controller module (4) for controlling

aerators (7) and Auto Feeder (8) on receiving said chemical and physical parameter(s) from said data transmission module (3) characterized in that, the user(s) transmit(s) schedules of measurement to controller (4) via SMS/Voice call/Smartphone (10) and based on schedules provided by the user(s) feed controller (8) turns ON/OFF, and wherein aerators (7) is optionally turned ON/OFF via SMS/Voice call/Smartphone by the user(s).

Applicant claimed features	D1 claimed features
<p>-a plurality of floating sensor node (11) including one or more sensor for measuring water parameters for aquaculture</p> <p>-an actuator node (12) for regulating one or more water condition;</p> <p>-a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102) and</p> <p>-a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter.</p> <p>wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.</p>	<p>D1 discloses a system for monitoring and controlling an aquatic environment which is an enclosure environment such as a semi-industrial size aquarium (as per example 2).</p> <p><i>whereas proposed invention is for monitoring and controlling of water parameters of open huge aquaculture farms.</i></p> <p>The system of D1 uses sensor and data fusion algorithms <u>to perform system anomaly analysis and predictive failure diagnostics</u> based on the output of sensors associated with the aquatic environment control devices. These sensors are attached to control system or machinery.</p> <p><i>whereas proposed invention comprises a plurality of floating sensor node (11) including one or more sensor for measuring water parameters for aquaculture.</i></p> <p><i>Further, the sensor node (11) collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node. None of the features are present in the cited document.</i></p> <p>In D1 the system analysis include individual or collective performance of the component parts or machinery, such as the pumps, filters, using parameters such as current, vibration or acoustic data. Based on this real-time analysis of the integrated aqua system components, the system evaluates the data for likely environment anomaly.</p>

	<p><i>whereas in proposed invention the base station connects several sensor nodes together, processes the data received from these nodes and transmits to remote monitoring station. The base station in the proposed invention connects several other sensor nodes and forms a network in internet of things platform. Further, the remote monitoring unit coupled to the base station monitors and issue an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter and also send a control signal to the actuator node upon breach of a predefined threshold value for regulating the water conditions.</i></p>
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Applicant respectfully submits that the system of proposed invention has been designed to monitor huge aquaculture farms whereas the system in document **D1** has been designed to monitor and control closed environment such as aquariums. Monitoring huge aquaculture farms requires more sensor nodes and integrated system to monitor efficiently in real time as compared to monitoring aquariums as only one node is sufficient to manage an aquarium.

In **D1**, the sensors transmit the water parameters to the processor which in turn performs anomaly and predictive analysis and generates control signals for the machinery. Hence, **D1** lacks the teaching of proposed invention.

The proposed invention is a three-tier system consisting of floating sensor nodes with sensors to monitor water parameters, base station to collect and transmit these parameters to the remote monitoring unit which further processes the data and generates alerts for the user on his/her device. Thus, proposed invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture. It has GPS capabilities on sensor nodes and decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their requirements and eliminating other irrelevant data.

Applicant claimed features	D2 claimed features
<p>-a plurality of floating sensor node (11) including one or more sensor for measuring water parameters for aquaculture</p> <p>-an actuator node (12) for regulating one or more water condition;</p> <p>-a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102) and</p> <p>-a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter.</p> <p>wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.</p>	<p>D2 discloses an intelligent fish tank controlled by a mobile phone. It includes a central control module that can communicate wirelessly with a user's mobile phone through a 3G network and is connected to a controllable video probe in the box. The module obtains the fish tank video from the video probe in the box. Through the video probe in the box, the user can check the internal conditions of the fish tank in real time.</p> <p><i>whereas system of proposed invention is for monitoring and controlling of water parameters of open huge aquaculture farms that comprises a plurality of floating sensor node (11) including one or more sensor for measuring water parameters for aquaculture. In the proposed invention the sensor nodes are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.</i></p> <p>In D2 the central control module also connects the temperature detection sensor and the light detection sensor in the box to detect the light intensity and temperature inside the fish tank. The central control module obtains the temperature data in the fish tank from the temperature detection sensor in the tank and the light intensity data in the fish tank from the light detection sensor in the tank. The data collected by the temperature detection sensor in the tank and the light detection sensor in the tank is in the form of short messages.</p> <p><i>whereas in proposed invention the base station connects several sensor nodes together, processes the data received from these nodes and transmits to remote monitoring station. The base station is wirelessly coupled to the floating sensor node and comprises a processor for processing measured parameter from each sensor node,</i></p>

a memory for storing measured parameters, and a transceiver for communicating with sensor node and transmitting collected parameters to a remote monitoring unit. In the proposed invention the remote monitoring unit issues

an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter,

send a control signal to the actuator node upon breach of a predefined threshold value for regulating the water conditions,

stores the measured parameters received from the base station,

perform analysis and provides statistical information to the user.

In D2 the collected data is transmitted to the user's mobile phone periodically or through user commands. The central control module is also connected to the feeding control switch, light control switch, inflation control switch, and heating control switch. Through these control switches, the user can remotely control the entire fish tank system.

whereas in proposed invention the data received from the sensor nodes is transmitted to remote monitoring station for

issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter

sending a control signal to the actuator node upon breach of a predefined threshold value for regulating the water conditions by turning ON or OFF the heaters, feeders, inflators, etc.

storing the measured parameters received from the base station, and

performing analysis & providing statistical information to the user.

In D2 when the temperature detection sensor in the box detects that the temperature inside the fish tank exceeds a certain threshold, a warning is sent to the user through a short message and if the user does not respond to the warning to control the fish tank within a period of time, the central control module will automatically take corresponding

	<p>temperature control measures.</p> <p><i>whereas in the proposed invention the remote monitoring unit is the decision making unit of the system which is designed to integrate the domain knowledge and process the measured information and user's details to provide the right information to right people at right time. The remote monitoring unit monitors and issues an alert or notification to a specific user in case of violating of any predefined threshold value of a parameter. The remote monitoring unit based on the measured parameters also send control signal for issuing the control command to the floating actuator for regulating the water conditions by turning on/off the heaters, feeders, inflators, etc.</i></p> <p><i>So the entire system of proposed invention is automated as the remote monitoring unit contains algorithm and logic to make decisions automatically without user command at critical conditions and send the control signal accordingly for regulating water conditions.</i></p> <p>In D2 the user can control the feeding control switch, the light control switch, the inflation control switch, and the heating control switch through a short message.</p> <p><i>whereas in the proposed invention decision is automatically taken by the decision taking remote monitoring unit for issuing control signal to the actuator node upon threshold breach to regulate water conditions.</i></p>
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Applicant respectfully submits that the system of proposed invention is an IoT based integrated system in which the physico-chemical parameters of water are stored in the cloud platform and as such the sensor node does not need to store data and can operate fast contrary to D2.

Further, D2 discloses a system designed for a closed encasement environment such as an aquarium, and it fail to disclose an integrated system for real environment such as for open

aquaculture fields. D2 does not teach about floating sensor nodes covering an optimal path and having GPS capability allowing to be controlled remotely without going into water.

D2 fail to disclose actuator node for controlling water condition upon receiving signal from a remote monitoring unit in case of threshold breach instead the user control the feeding control switch, the light control switch, the inflation control switch, and the heating control switch through a short message.

Additionally, the remote monitoring unit of proposed invention has intelligent decision making capability and automatically transmits alerts upon breach of threshold value to user and to actuator node for regulating the water conditions. The system also has decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their requirements and eliminating other irrelevant data. The system of the present invention has provision to integrate other sensors such as for monitoring the growth and diseases of the fishery farms.

Applicant claimed features	D3 claimed features
<p>-a plurality of floating sensor node (11) including one or more sensor for measuring water parameters for aquaculture</p> <p>-an actuator node (12) for regulating one or more water condition;</p> <p>-a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102) and</p> <p>-a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of</p>	<p>D3 discloses a device for measuring a chemical and/or physical parameter (s) of water for an aquaculture, said device comprising:</p> <p>a power management module (1);</p> <p>a water quality monitoring module (2) for monitoring, detecting, processing and recording said chemical and physical parameter(s) of the water comprising solar powered floating buoy (9).</p> <p><i>whereas proposed invention discloses a system for monitoring and controlling physico-chemical parameters of water for aquaculture comprising a plurality of <u>floating sensor node</u> including one or more sensor for measuring water parameters for aquaculture wherein the sensor node also consists of a wireless communication module for sending the measured data to a nearby base station at regular intervals. The sensor</i></p>

predefined threshold value of one or more parameter

wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.

nodes of the proposed invention are low power self-sustained nodes either chargeable by battery or solar energy. In the proposed invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.

In D3 the water quality monitoring module (2) comprise a data acquisition unit having sensor(s) for monitoring and detecting said chemical and physical parameter(s) of the water.

whereas in proposed invention there is a plurality of floating sensor node consisting of one or more sensor for measuring water parameter. These sensor nodes are remotely controlled for placement and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

D3 discloses a data transmission module for transmitting recorded chemical and physical parameter (s) wirelessly to a user using a communicating means when said chemical and physical parameter(s) drop below a threshold value wherein the said communicating means is an alert signal or a mobile sms or voice call.

whereas in proposed invention a base station wirelessly coupled to floating sensor node transmits via transceiver the collected parameters to a remote monitoring unit which

issues an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter and

stores the measured parameters received from the base station

perform analysis and provides statistical information to the user.

D3 discloses a controller module (4) for

	<p>controlling aerators (7) and auto Feeder (8) on receiving said chemical and physical parameter(s) from said data transmission module (3) characterized in that, the user(s) transmit(s) schedules of measurement to controller (4) via SMS/Voice call/Smartphone (10) and based on schedules provided by the user(s) feed controller (8) turns ON/OFF; and wherein aerators (7) is optionally turned ON/OFF via SMS/Voice call/Smartphone by the user(s).</p> <p><i>whereas in proposed invention the remote monitoring unit send a control signal to the actuator node upon breach of a predefined threshold value for regulating the water conditions such as turning ON or OFF the heaters, feeders, inflators, etc.</i></p>
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Applicant respectfully submits that though **D3 discloses** a device for measuring a chemical and/or physical parameter (s) of water for an aquaculture but it fail to disclose floating sensor nodes for measuring parameters, transmission of measured parameters to a remote monitoring unit for storage, analysis and further action such as sending an alert to user upon breach of threshold value and sending control signal to the actuators node for regulating water conditions turning ON or OFF the heaters, feeders, inflators, etc.

D3 discloses a single device comprising power management unit, a water quality monitoring module (2) for monitoring, detecting, processing and recording said chemical and physical parameter(s) of the water comprising solar powered floating Buoy, a communication module for sending alerts through SMS or mobile call, a controlling module to turn on/off the aerators. The water quality monitoring module further consists of a data acquisition unit comprising sensors for detecting and recording parameters. Hence in **D3** all the monitoring, detection, recording is done on-site on a single device and as such it fails to teach a system consisting of three tier architecture comprising of floating sensor node to collect the water quality parameters and transmit them to the base station which further forwards processed data to remote monitoring unit which consists of decision making unit and transmit the data

to the user, send alert to user and control signal to actuator node for regulating water conditions.

In the proposed invention the data is stored on the remote monitoring unit for analysis and appropriate action and hence sensor nodes can operate fast in comparison to **D3** where data measurement, processing and storing is all done on the single module (water quality monitoring module). Further, in **D3** as the water quality monitoring module is present on floating buoy it fail to disclose an IoT based integrated system in which the physico-chemical parameters of water transmitted and stored in the cloud platform or at remote location easily accessible by the user anytime from anywhere.

D3 fail to disclose floating sensor node consisting of one or more sensor for measuring water parameter wherein the sensor nodes are remotely controlled for placement and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

According to D3 a controller module controls aerators and auto Feeder on receiving chemical and physical parameter(s) from data transmission module. The user(s) transmit(s) schedules of measurement to controller via SMS/Voice call/Smartphone and based on schedules provided by the user(s) feed controller (8) turns ON/OFF and as such D3 fail to disclose automatic regulation of control devices based upon measured parameters.

[Emphasis added] Nowhere does D1, D2 and D3 disclose the explicit limitations of claim 1. Applicant believes the interpretation asserted by the Learned Controller is not supported by the disclosure of D1, D2 & D3. Further, there is no equivalence between the cited section of D1, D2 & D3 and the recitations of Claim 1. **D1** *merely discloses “a system for monitoring and controlling a closed environment by using sensor and data fusion algorithms to perform system anomaly analysis and predictive failure diagnostics based on the output of sensors associated with the aquatic environment control devices”*. **D2** *merely*

discloses “an intelligent fish tank controlled by a mobile phone. It includes a central control module that can communicate wirelessly with a user's mobile phone through a 3G network and is connected to a controllable video probe in the box”. D3 merely discloses “a single device for measuring a chemical and/or physical parameter (s) of water for an aquaculture comprising power management unit, a water quality monitoring module (2) for monitoring, detecting, processing and recording chemical and physical parameter(s) of the water comprising solar powered floating Buoy, a communication module for sending alerts through SMS or mobile call, a controlling module to turn on/off the aerators”. D1, D2 & D3 provides completely different solutions and is nowhere related to the application claimed invention. There is no similarity between the Applicant claim invention and D1, D2 & D3. D1, D2 & D3 is in the same technical domain but discloses a completely different solution and does not set motivation to combine D1, D2 & D3 to arrive at the Applicant claimed invention. Even the problem statement of D1, D2 & D3 and Applicant claimed invention is different and hence the solutions. The problem statement is clearly evident from background of D1, D2 & D3 and Applicant claimed invention. Hence the solutions are different which is clearly evident from the claims of D1, D2 & D3 when compared with the claims of Applicant. It is important to consider the functions and underlying essence of the invention as described in all elements mentioned in the claims. Therefore, it is respectfully submitted that the interpretation asserted by the Learned Controller is not supported by the disclosure of D1, D2 & D3. Further, Applicant believes the interpretation asserted by the Learned Controller regarding the claimed steps is not supported by the disclosure of D1, D2 & D3. Nowhere in the cited portions and the whole document does D1, D2 & D3 describe or reasonably suggest the above indicated features claimed in the amended independent claim 1.

At least because D1, D2 & D3 fails to disclose the elements of the amended claim 1 as mentioned above, hence Applicant believes that the claim 1 is patentable over D1, D2 & D3.

Therefore, the system of D1, D2 & D3 are different from that of Applicant's claimed subject matter. Additionally, a prima facie obviousness has not been established. Merely recitation of portions from prior art does not sustain the rejection of obviousness unless the prior art reasonably teaches and provides articulated reasoning with rational underpinning to support the legal conclusion of obviousness.

Accordingly, it is respectfully stated that the technical feature used to realize the complete invention is different from the cited prior art D1, D2 and D3 and hence makes the proposed invention non-obvious.

Applicant respectfully submits that the amended claim 1 is not obvious over D1, D2 and D3 since none of the references (either alone or combined) discloses a system of Claim1.

Therefore, a skilled artisan would not modify any of the cited references with an expectation of successfully arriving at that which is claimed as the invention because there is no teaching or disclosure of the aforementioned features defined by amended claim 1 and subsequent dependent claims 2-10. The dependent claims 2-10 are novel and inventive by virtue of their dependency on claim 1 respectively.

Accordingly, it is respectfully stated that none of the cited prior arts, either taken alone or in any combination thereof, will motivate a person ordinarily skilled in the art to arrive at the claimed invention. The Learned Controller is, therefore, requested to reconsider and waive the objection favorably.

Technical Advancement

The Proposed invention solves the problem of prior art where there is lack of cloud environment, remote placement of nodes, decision support system in the field of integrating internet of things into the aquaculture industry, Also, generally one or two water parameters are measured in these prior art systems for transmission. Additionally, these prior art devices

don't have GPS capabilities for locating the sensor nodes placed in open environment such as ponds. Further, for mobile access, there is lack of an application for viewing the measured readings while on move. Moreover, having sensors and actuators in the same node hampers the efficient functioning of the node. Therefore, the current invention aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture. The present invention provides a system having three tier architecture consisting of floating sensor nodes, a base station and a remote monitoring unit. All decisions on quality of water parameters such as sending alert, control signal and statistical data are made in remote monitoring unit and alerts are generated on the end user device which supports multiple languages.

Therefore, at the time of filing of this application, it would not have been obvious to a person skilled in the art to combine the teachings of D1-D3 to arrive at the claimed invention as D1-D3 is completely different which has no connection or relevance with the application claimed invention. Reconsideration is respectfully requested.

Regarding claim 2-10:

Applicant has reviewed the entire application of D1, D2 and D3 and found that nowhere in the entire applications does D1, D2, & D3 describe or reasonably suggest the following features

“wherein

the physico-chemical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.

wherein the sensor node (11) is low power self-sustained node either chargeable by battery or solar energy.

the sensor node (11) is floating in water in a predetermined optimal path for collecting one or more parameter.

the sensor node (11) is controlled remotely by user without going into the water and further consists of a GPS module for providing location of the particular sensor node (11).

the remote monitoring unit (102) sends a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions by turning ON or OFF the heaters, feeders, inflators, etc.

the remote monitoring unit (102) stores the measured parameters received from the base station (101), perform analysis and provides statistical information to the user.

the base station (101) communicates with sensor node (11) and actuator node (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.

the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance communication technologies.

the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters remotely.

Apart from the above, Applicant believes that dependent claim 2-10 is allowable not only by virtue of their dependency from patentable independent claim 1, but also by virtue of the additional features of the invention they define. The dependent claims describe various embodiments of the invention that can be combined to form the invention. The subject matter described in the instant application are different from D1, D2 and D3 so as the features described in dependent claim 2-10.

Objection 3: Non Patentability

The learned controller has objected the patentability of Claim(s) 1-10 under the provision of clause (K) of Section 3 for the following reasons:

1. Without prejudice to other objections, "Multiple languages supporting application software" claimed in claim 10 is a group of computer programming instructions, which is

nothing but a computer program per se. Hence the subject matter of claim 10 is not patentable under section 3(k) of The Patents Act, 1970.

Applicant respectfully submits the following submissions with regard to patentability of the claimed invention:

Applicant has amended the claims 1-10 to overcome the above objection. Also Applicant believes that amended claims 1-10 do not represent computer program per se and are allowable u/s 3(k) of the Patents Act, 1970. Hence, Applicant respectfully traverses the rejection and presents the following reply:

The Manual of Patents Practice and Procedure (MPPP), with regard to Section 3(k), cites that *“Algorithms in all forms including but not limited to, a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise, are excluded from patentability.”*

Further, with reference to revised Guidelines for Examination of Computer-related Inventions (CRIs) published on June 30, 2017, states that *“Even when the issue is related to hardware/software relation, the expression of the functionality as a “method” is to be judged on its substance. It is well-established that, in patentability cases, the focus should be on the underlying substance of the invention, not the particular form in which it is claimed. The Patents Act clearly excludes computer programmes per se and the exclusion should not be allowed to be avoided merely by camouflaging the substance of the claim by its wording.”*

Applicant respectfully states that the claimed subject matter in amended claims 1-10 does not describe or relate to “a set of rules or procedures or any sequence of steps or any method expressed by way of a finite list of defined instructions, whether for solving a problem or otherwise, and whether employing a logical, arithmetical or computational method, recursive or otherwise”. Instead applicant claimed invention is related to solve a

technical problem in the field of integrating internet of things into the aquaculture industry. There is lack of cloud environment and decision support system in prior art devices. Also generally one or two water parameters are measured in these systems for transmission. These prior art devices don't have GPS capabilities for locating the sensor nodes placed on the ponds. For mobile access, there is lack of an application for viewing the measured readings while on move. Having sensors and actuators in the same node hampers the efficient functioning of the node. Therefore, the proposed system aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture comprising floating sensor nodes, actuator nodes for controlling water condition and a remote monitoring unit as decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their requirements and eliminating other irrelevant data as compared to prior art. The present invention provides a system having three tier architecture consisting of floating sensor nodes, a base station and a remote monitoring unit. All decisions on quality of water parameters such as sending alert, control signal and statistical data are made in remote monitoring unit and alerts are generated on the end user device which supports multiple languages.

Further, applicant has included hardware limitation such as plurality of floating sensor nodes (11), actuator nodes (12) place at aquaculture land such as pond that implements the steps claimed in the amended claims 1-10. Additionally, the proposed invention is an integrated, compact and cost effective solution for monitoring and controlling of water parameters of huge aquaculture farms. It is an integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture. It has GPS capabilities and decision support system with knowledge base and as such composed of combination of hardware and software with multi-sensor inputs more than prior

art, multi-model support such as user and scientific modes for operations and data sharing via dynamic communication interfaces of multi-communication media. The system is composed of interconnection of hardware (floating sensors, actuators, signal conditioning circuitry, low-cost processor, analog to digital (A/D) convertors, memory device, communication modules (BLE, GSM, ZIGBEE), LCD display, solar panel, solar charging and power circuitry, Li-ion battery), physical structure (compact casing, solar panel stand) and software (embedded software for data acquisition, pre-processing, data-storage (Lightweight data-base), data analysis (Light-weight if-else threshold conditions), data transmission software). So considering the invention as mere algorithm implemented through software is not justifiable.

Applicant respectfully submits the following submissions with regard to patentability of Claim 10

Amended claim 10 has the hardware limitation of “User device” for accessing an android application which retrieves data from the remote monitoring station (102) and displays the data on the device of the user. The claim 10 is a dependent claim and must be read with claim 1 and as such it does not comprises only the software application (computer program per se) but an application to display data generated through the steps implemented in amended claim 1. The application follows if-then-else algorithm of comparison of physico-chemical parameters of water with the threshold values and then prints whether the parameters are within range or not in multiple language as per the ease of farmer or user. Hence amended claims 10 is allowable u/s 3(k) of the patents Act 1970.

Thus, the applicant believes that none of the amended claims 1-10 are directed solely towards software steps or algorithm or sequence of computational steps. Therefore subject matter of said amended claims 1-10 does not fall within scope of clause (k) of section (3) of the Patents Act, 1970 (as amended). Therefore invention claimed in said amended claims 1-

10 is patentable and applicant respectfully requests the Learned Controller to waive the above objection.

2. The physical constructional features shall be numbered in the apparatus/system claims and the inventive constructional feature shall be incorporated as a characterized portion of the independent claims, in order to define the alleged invention clearly and sufficiently. As such the claims fall U/S 2(1) (j), 10(4) & 3(k) of The Indian Patent Act 1970.

The applicant respectfully submits that the original claims 1-10 have been amended to include the inventive constructional feature and reference numerals have been given wherever necessary. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

Objection 4: Sufficiency of Disclosure

1. Claim(s)'10' are not fairly based on the matter disclosed in the specification or not supported by the disclosure in the specification for the following reasons:

Without prejudice to other objections, "Multiple language supporting application software" claimed in claim 10 is not properly supported by description or drawing that what type of programming is being done to make that application and what algorithm has been used. It should be fully and particularly described in the complete specification as per section 10(4) of the Patents Act, 1970 (as amended), so that it would be sufficient to enable a person in India possessing average skill and average knowledge of the art to which the invention relates to work the invention and to obtain the results claimed for the invention.

The applicant respectfully submits that amended claim 10 recites "*The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters remotely.*" The claim is based on the disclosure

in complete specification (Page 9; Lines 23-27) according to which the user can log in to the central monitoring unit (202) through a software application installed on the user's smart device (203) for viewing or performing analysis of the measured parameters while on move. The user may also report any comment from their device through software application to the monitoring unit (202).

Applicant respectfully submit that the claimed application is an android application which retrieves data from the remote monitoring station (102) and displays the data on the mobile phone of the user. The mobile application follows if-then-else algorithm of comparison of physico-chemical parameters of water with the threshold values and then prints whether the parameters are within range or not for the aquaculture farmer in a language selected by the farmer or user.

Objection 5: Clarity and Conciseness

Claim(s) 1-10 are not clearly worded in respect of:

Without prejudice to other objections,

1. The claims 1 and 2 lack conciseness because they have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. Hence, one independent claim for apparatus may be drafted and other essential feature may be included in principal claim and remaining features may be drafted dependent on principal independent claim. Hence, multiple independent claims should be deleted/ reworded in order to make invention clear and concise and if any new technical feature has been disclosed in the stated claims, and then it should be incorporated in principle claim. More than one

independent claim with single inventive concept only in exceptional, specifically defined cases will be allowable like transmitter-receiver, coding -decoding, these are interlinking with each other. In the present application none of the cases apply and thus multiple independent claims should be deleted/ reworded in order to make invention clear and concise and if any new technical feature has been disclosed in the stated claims, and then it should be incorporated in principle claim.

The applicant submits that

1. The original multiple independent claim 1 & 2 are amended and retained as single independent claim 1.

2. Further, the amended claim 1 has been amended to include limitations of original dependent claim 3-5 & claim 7 and as such original claims claim 3-5 & claim 7 has been deleted. Also, new claim 3-7 has been added to claim various embodiments of the invention that can be combined to form the invention disclosed in the specification.

3. The amended claims clearly recite structural feature as “floating sensor node”, “actuator node” as per section 10(4) (c) of the Act.

4. The technical features of the claims are referenced with numerals in parentheses to enhance intelligibility of claims.

Hence, the amended claim set 1-10 is properly worded to make invention clear and concise. Therefore, Applicant humbly requests the Learned Controller to take the amendments in markup copy of specification on the patent office records and waive the above objections.

2. In absence of characterizing of novel/ inventive features in independent claim1 and independent claim2, the subject matter of claims not seems to be clear u/s 10(5) of The Patent Act 1970 and u/r 13(4) of The Patent Rule 2003 .The independent claim should be cast in the two part form where appropriate, with those features known in combination from the prior art

and being placed in the preamble and the remaining features being included in the characterizing part. Hence comply with this requirement but within the well defined boundary and scope of the specification disclosed.

The applicant submits that the original claims 1-10 have been amended to include prior art in preamble and technical feature in characterizing part. Therefore, Applicant humbly requests the Controller to take the amendments in markup copy of specification on the patent office records and waive the above objections.

Objection 6: Clarity and Conciseness

1. In case the applicant decides to amend the claims subsequent to this report then while amending the specification the following care shall be taken:- (a) The applicant is required to clearly identify/mark the amendments carried out (if any) in a separate copy (from the originally filed set at the time of filing); irrespective of either they concern amendments by addition, correction, replacement or deletion or any amendments in the specification; The applicant should bring the description into conformity with the amended claims. (b) Care should be taken during the revision, especially of the introductory portion & any statements of problem or advantage etc., not to add any subject matter, which extends beyond the content of the application as originally filed. The applicant is requested to effect the amendments by filing replacement pages for only those pages, which have been amended. If any correction is made in any page of the specification that page should be freshly typed and filed in duplicate; The applicant shall undertake that, “ In amended pages of specification & drawings, there is no addition of matter or increase in the scope of invention” . While filing any amendment, the applicant shall be noted that any addition of new matter into description & claims are not allowed under section 59 of The Patents Act, as amended. While filing the

reply, amended claims should be submitted in line with the originally filed claims by strictly adhering to section 59 of The Patents Act, 1970 as amended.

Applicant respectfully submits that a marked up copy of the amended claims indicating basis for the claim amendment from description or illustration of as filed complete specification is submitted herewith for immediate reference. The paragraphs numbers and claims of the complete specification as filed on which these amendments are based on are clearly indicated in comments in the markup copy of the specification. Therefore, Applicant humbly requests the Controller to waive the above objections.

2. Reference numerals should be supplemented in parenthesis to enhance the intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10(4)(c) of The Patents Act 1970 as amended by the Patents (Amendment) Act 2005.

Applicant respectfully submits that the technical features of the claims are referenced with numerals in parentheses to enhance intelligibility of claims. Therefore, Applicant humbly requests the Controller to waive the above objections.

Part-III

Formal requirements

1. **Endorsement by/Assignment from Inventor:** The requirement of sec.7(2) (proof of right) from additional inventors has not been met within the prescribed period as mentioned in the Act. Hence, appropriate Proof of right should be filed accompanied by an appropriate petition.

Applicant respectfully submits that updated FORM-1 signed by all inventors is submitted towards proof of right with petition. Therefore, applicant humbly requests the Learned Controller to waive the above objection.

2. Date and Signature of Applicant: All necessary Forms 1,2,3,5, 18, drawing pages & last page of claims should be signed by applicants/or applicant's agent originally in a prescribed format. (Name of the agent with original signature and IN/PA no.).

Applicant respectfully submits that all necessary Forms 2,3,5, drawing pages & last page of claims signed by applicant's agent originally in a prescribed format is submitted. The Form-1 dated 01.06.2016 and Form-18 dated 29.08.2017 is already filed at IPO in prescribed format. Further, Applicant also submits the filed Form 1 and Form 18 for quick reference. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

3. Statement & Under Taking (Form 3 Details): 1. Updated form-3 should be filed with the petition, if applicable; 2. Annexure to form-3 should be filed in the prescribed manner, (i.e with form-3), the only annexure to form-3 is not allowable).

Applicant respectfully submits that there are no updated to form 3 filed at IPO dated 02.06.2016. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

4. Form 5

1. Form 5 has not been submitted within prescribed period as per section 10(6) and rule 13(6). so, it should be filed with the necessary petition along with form 4 in the prescribed manner.

Applicant respectfully submits that updated Form 5 with signatures of all inventors is filed with the necessary petition along with form 4 in the prescribed manner. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

5. Power of Attorney (Whether GPA, SPA, Stamped, requisite fee etc.):

1. Copy of GPA filed should be clear.
2. As per Rule 135(2) of the Patents Rules, 2003 (as amended), any document relating to any proceeding or matter under the Patents Act or Rules shall be addressed upon a patent

agent so authorized by the applicant. Further, as per the Patents Act and Rules, the patent agent, who is to be a citizen of India as provided under Section 126(1) of the Act is only authorized to practice before the Controller of Patents as per Section 127(a) of the Act and not any law firm /company in which he/she works. In fact, as per Section 129(2) of the Patents Act, no company or other bodies corporate shall practice as a patent agent in India. In this regard, prescribed Form 26- Para 2 thus, clearly provides to mention the name, address, and nationality of authorized patent agents and not names and addresses of their law firms/companies. Therefore, you are required to file a fresh PA/GPA in the name of the agent without mentioning the name of the firm they belong to and the application no./nos. should be mentioned for which it is made in the prescribed format as per rule 135(1) of the Patent Rules, 2016 (as amended). Further, the stamp value which is used in PA/GPA should be given as per the provision of the Indian Stamp Act, 1899 (2 of 1899).

3. A list of all the applications for which GPA is filed should be submitted.

Applicant respectfully submits that a fresh PA/GPA in the name of the agent is filed.

Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

6. Registered Agent as per Patent Agent Register: The agent who is currently dealing with the application should positively submit the patent agent number, along with relevant details for verification of the credibility of the agent as required by Chapter XXI of the Indian Patents Act. Also, it must be ensured that Form-1, Form-3, Form-5, and all other related documents are duly signed by that registered patent agent, clearly indicating Name, Patent agent number, and Date as in register of a patent agent.

Applicant respectfully submits that all necessary Forms 1, 2, 3, 5, and related documents signed by applicant's agent originally indicating Name of the agent with original signature and IN/PA no. are submitted. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

7. Other Requirements: .

1. Preamble in Form 2 of complete specification should be written as per prescribed format.

2. Form-5 should be submitted as per section 10(6) and rule 13(6) with the necessary petition along with form 4 in the prescribed manner as it was not submitted within stipulated time.

3. Since, there is an addition of 4 inventors, so supporting document having consent of both earlier inventors should be filed along with Form 5 and addition of inventor should be done in a prescribed manner. Updated Form 1 should be submitted.

4. Note that this Examination is done on the basis of electronically uploaded documents in the e-module only. You may verify all documents as filed are uploaded electronically or not, and bring to the notice of the concerned discrepancies if any.

Applicant respectfully submits that a fresh Preamble in Form 2 of complete specification written as per prescribed format is submitted. Therefore, Applicant humbly requests the Learned Controller to waive the above objection.

PRAYER

It is therefore prayed that:

- (a) the objections may be dropped;
- (b) the application may be favorably considered for early grant; and
- (c) a personal hearing may be granted in the event of any outstanding issue.

Dated this 24th day of August 2020

Rashmi Tyagi

RASHMI TYAGI

IN/PA-1594

AGENT FOR THE APPLICANT

To,

The Controller of Patents

The Patent Office, at New Delhi

Enclosures:

- 1. A mark-up copy of Claims**
- 2. A clean copy of Claims**
- 3. A mark-up copy of FORM-2 (Preamble)**
- 4. A clean copy of FORM-2 (Preamble)**
- 5. Annexure 1 for following Forms**

FORM-2, FORM-3, FORM-5 (signed by patent agent as prescribed)

Copy of FORM-1 as filed at IPO

Copy of FORM-18 as filed at IPO

- 6. Petition to condone delay in filing Proof of Right (Form-1) along with**
- 7. Updated Form-1 towards proof of right**
- 8. Petition to condone delay in filing Form-5**
- 9. Updated Form-5 with consent Letter**
- 10. Form-4 for extension of time regarding filing of Form-5**
- 11. GPA (Fresh signed by Applicant in favour of Patent agent)**



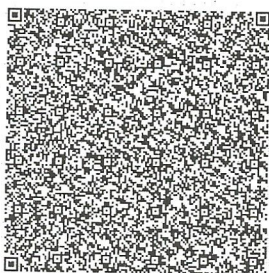
सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

e-Stamp

Certificate No. : IN-DL56367190598411N
Certificate Issued Date : 12-Jan-2015 12:55 PM
Account Reference : IMPACC (IV)/ dl822003/ DELHI/ DL-DLH
Unique Doc. Reference : SUBIN-DL82200309630522127835N
Purchased by : IGDTUW NEW DELHI
Description of Document : Article Others
Property Description : Not Applicable
Consideration Price (Rs.) : 0
(Zero)
First Party : IGDTUW NEW DELHI
Second Party : ELPIS INNOVATION
Stamp Duty Paid By : ELPIS INNOVATION
Stamp Duty Amount(Rs.) : 100
(One Hundred only)



-----Please write or type below this line-----

Original GPA is submitted for Application No. 156/DEL/2015

Rashmi Tyagi

Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

THE PATENTS ACT, 1970
GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi, (IN/PA-1594) Indian, of the address #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh – 201007**, India, jointly and severally, to act on our behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and

We request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of **January 2015**



(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY
Head of Department
Computer Science Engineering
Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

FORM 1				(FOR OFFICE USE ONLY)	
THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT (See section 7, 54 and 135 and sub-rule (I) of rule 20)					
		Application No.			
		Filing Date:			
		Amount of Fees Paid			
		CBR No.			
		Signature:			
1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ()		PCT-NP ()	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN		INDIAN	INDIA	House No.	N/A
				Street	KASHMERE GATE
				City	NEW DELHI
				State	DELHI
				Country	INDIA
				Pin Code	110006
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity ()	Startup ()	Others (✓)	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	
If "No", furnish the details of the inventor(s)					
Name in Full		Nationality	Country of Residence	Address of the Inventor	

REDDY S. Ramanarayana	INDIAN	INDIA	House No.	N/A
			Street	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
SHAREEF Zeenat	INDIAN	INDIA	House No.	N/A
			Street	PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
KALIDINDI Ramaprasada Raju	INDIAN	INDIA	House No.	Professor, Department of Computer Science and Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India
			Street	NA
			City	Bhimavarm
			State	Andhra Pradesh
			Country	India
			Pin Code	534204
KANUMURI Chalapathiraju	INDIAN	INDIA	House No.	Assistant Professor, Department of Electronics and Communication Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India
			Street	NA
			City	Bhimavarm

			State	Andhra Pradesh
			Country	India
			Pin Code	534204
PENMETSA Venkata Gopala Raju	INDIAN	INDIA	House No.	Associate Professor, Department of Computer Science and Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India
			Street	NA
			City	Bhimavarm
			State	Andhra Pradesh
			Country	India
			Pin Code	534204
MATHUKUMALLI Bala Krishna Prasad	INDIAN	INDIA	House No.	NA
			Street	22616 Shining Harness Street Clarksburg, Maryland - 20871, USA
			City	NA
			State	Maryland
			Country	USA
			Pin Code	20871
5. TITLE OF THE INVENTION				
AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM				
6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	1594		
	Name	RASHMI TYAGI		
	Mobile No.	9968284766		
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	RASHMI TYAGI		
	Postal Address	250, Street No: 06, New Colony Karhera, Moham Nagar, Ghaziabad, Uttar Pradesh - 201007, India		
	Mobile No.	9968284766		
	Fax No.	N/A		
	E-mail ID	rashmi.tyagi@hotmail.com		
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION				

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention	IPC (as classified in the convention country)
N/A	N/A	N/A	N/A	N/A	N/A

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)

International application number	International filing date
N/A	N/A

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION

Original (first) application No.	Date of filing of original (first) application
N/A	N/A

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT

Main application/patent No.: N/A	Date of filing of main application: N/A
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12. DECLARATIONS

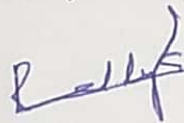
(i) Declaration by the inventor(s)

(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 20.08.2020

(b) Signature(s):



(c) Name(s): **REDDY S. Ramanarayana**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **SHAREEF Zeenat**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **KALIDINDI Ramaprasada Raju**

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention	IPC (as classified in the convention country)
N/A	N/A	N/A	N/A	N/A	N/A

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)

International application number	International filing date
N/A	N/A

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION

Original (first) application No.	Date of filing of original (first) application
N/A	N/A

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT

Main application/patent No.: N/A	Date of filing of main application: N/A
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(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

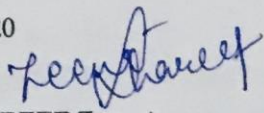
I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **REDDY S. Ramanarayana**

(a) Date: 20.08.2020

(b) Signature(s): 

(c) Name(s): **SHAREEF Zeenat**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **KALIDINDI Ramaprasada Raju**

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention	IPC (as classified in the convention country)
N/A	N/A	N/A	N/A	N/A	N/A

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)

International application number	International filing date
N/A	N/A

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION

Original (first) application No.	Date of filing of original (first) application
N/A	N/A

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT

Main application/patent No.: N/A	Date of filing of main application: N/A
----------------------------------	---

12. DECLARATIONS

(i) Declaration by the inventor(s)

(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **REDDY S. Ramanarayana**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **SHAREEF Zeenat**

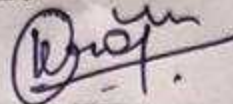
(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **KALIDINDI Ramaprasada Raju**

(a) Date: 20.08.2020

(b) Signature(s):



(c) Name(s): **KANUMURI Chalapathiraju**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **PENMETSA Venkata Gopala Raju**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **MATHUKUMALLI Bala Krishna Prasad**

(ii) Declaration by the applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

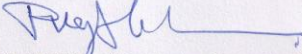
- I am/ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- I am/we are the true & first inventor(s).
- I am/we are the assignee or legal representative of true & first inventor(s).
- The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).
- I/We claim the priority from the above mentioned application(s) filed in convention

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **KANUMURI Chalapathiraju**

(a) Date: 20.08.2020

(b) Signature(s): 

(c) Name(s): **PENMETSA Venkata Gopala Raju**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **MATHUKUMALLI Bala Krishna Prasad**

(ii) Declaration by the applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- I am/ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- I am/we are the true & first inventor(s).
- I am/we are the assignee or legal representative of true & first inventor(s).
- The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).
- I/We claim the priority from the above mentioned application(s) filed in convention

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **KANUMURI Chalapathiraju**

(a) Date: 20.08.2020

(b) Signature(s):

(c) Name(s): **PENMETSA Venkata Gopala Raju**

(a) Date: 20.08.2020

(b) Signature(s): 

(c) Name(s): **MATHUKUMALLI Bala Krishna Prasad**

(ii) Declaration by the applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- I am/ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- I am/we are the true & first inventor(s).
- I am/we are the assignee or legal representative of true & first inventor(s).
- The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).
- I/We claim the priority from the above mentioned application(s) filed in convention

country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.

- My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.
- The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph- 11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ Provisional Specification#	No. of pages: 10	8,000	
No. of Claim(s)	No. of claims and No. of pages: N/A		
Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 & No. of pages: 02		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

Total fee Rs. 8,000 through Online payment gateway Date 18/05/2016 on ICICI Bank.

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this 20th day of August 2020.

Signature: 

Name: **RASHMI TYAGI (IN/PA-1594)**

To,

The Controller of Patents

The Patent Office, at New Delhi

Note: -

- * Repeat boxes in case of more than one entry.
- * To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
- * Tick (✓)/cross (✗) whichever is applicable/not applicable in declaration in paragraph- 12.
- * Name of the inventor and applicant should be given in full, family name in the beginning.
- * Strike out the portion which is/are not applicable.
- * For fee: See "First Schedule".

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification particularly describes the invention and the manner in which it is to be performed.

WE CLAIM

1. A system (100) for monitoring and controlling physico-chemical parameters of water for aquaculture comprising:
 - a plurality of floating sensor node (11) including one or more sensor for measuring water parameters;
 - an actuator node (12) for regulating one or more water condition;
 - a base station (101) wirelessly coupled to at least one floating sensor node (11) and actuator node (12) comprising a processor for processing measured parameter from each sensor node (11), a memory for storing measured parameters, and a transceiver for communicating with sensor node (11) and transmitting collected parameters to a remote monitoring unit (102); and
 - a remote monitoring unit (102) wirelessly coupled to the base station (101) for monitoring and issuing an alert or notification to a specific user upon breach of predefined threshold value of one or more parameter;wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions.

2. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the physico-chemical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.

3. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is low power self-sustained node either chargeable by battery or solar energy.

4. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is floating in water in a predetermined optimal path for collecting one or more parameter.
5. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the sensor node (11) is controlled remotely by user without going into the water and further consists of a GPS module for providing location of the particular sensor node (11).
6. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) also send a control signal to the actuator node (12) upon breach of a predefined threshold value for regulating the water conditions by turning ON or OFF the heaters, feeders, inflators, etc.
7. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the remote monitoring unit (102) stores the measured parameters received from the base station (101), perform analysis and provides statistical information to the user.
8. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1,, wherein base station (101) communicates with sensor node (11) and actuator node (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
9. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the transceiver

transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance communication technologies.

10. The system (100) for monitoring and controlling physico-chemical parameters of water as claimed in claim 1, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters remotely.

Dated this 18th day of May 2017

Rashmi Tyagi

(RASHMI TYAGI)

IN/PA-1594

AGENT FOR APPLICANT

Doc No. 27449
28/03/2018

RT: NA-201611017103/2016

March 28, 2018

To,
The Controller of Patents
The Patent Office, at New Delhi



SUB: SUBMISSION OF FORM-5 IN ORIGINAL

Dear Sir,

**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 201611017103
e-Filed: May 18, 2016
Title: Aqua-Parameters Real Time Monitoring and Controlling System**

We are submitting herewith Form-5 duly endorsed by additional inventors for patent application number **201611017103** titled "**Aqua-Parameters Real Time Monitoring and Controlling System**" e-filed on May 18, 2016 for grant of patent.

Enclosures:

1. Form-5 (Original-duly endorsed by additional inventors)

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi
Rashmi Tyagi (IN/PA-1594)

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 9968284766

Email: rashmi.tyagi@hotmail.com

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FORM 5

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENT RULES, 2003

DECLARATION AS TO INVENTORSHIP

[See Section 10 (6) and rule 13 (6)]



- 1. NAME OF APPLICANT(S):** **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of address Kashmere Gate, New Delhi-110006, India


hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered **201611017103** dated **18.05.2016** are:-

2. INVENTORS(S)

- (a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India
- (a) NAME : **SHAREEF Zeenat**
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India


3. STATEMENT (to be signed by additional inventor(s) not mentioned in the application form)


I/We assent to the invention referred to in the above declaration, being included in the complete specification file in pursuance of the stated application.


- (a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and Engineering,

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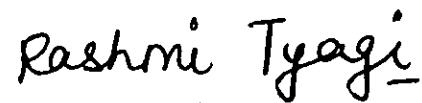
SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and Communication Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSA Venkata Gopala Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department, SRKR Engineering College, Bhimavaram, -534204, Andhra Pradesh, India

(a) NAME : **Bala Krishna Prasad Mathukumalli**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland - 20871, USA

Dated this _____ day of _____ 2016



Name: RASHMI TYAGI (IN/PA-1594)

AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

IPO DELHI 02-04-2018 10:51

FORM 18
THE PATENTS ACT, 1970
(39 OF 1970)
&
The Patents Rules, 2003
REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
[See section 11B and rule 20(4)(ii), 24B(1)(i)]

1. APPLICANT

- a. **NAME:** INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
- b. **NATIONALITY:** INDIAN
- c. **ADDRESS:** KASHMERE GATE, NEW DELHI-110006, INDIA

2. Statement in case of request for examination made by the applicants

We hereby request that our application for patent no. **201611017103** filed on **18th May, 2016** for the invention titled "**AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM**" shall be examined under sections 12 and 13 of the Act.

3. ADDRESS FOR SERVICE:

250, Street No. 06, New Colony Karhera,
Mohan Nagar, Ghaziabad,
Uttar Pradesh – 201007, India

Mobile No.: +91-9968284766

E-mail: rashmi@elpisinnovation.com

Dated 26th day of August, 2017

Rashmi Tyagi

RASHMI TYAGI (IN/PA-1594)
(AGENT FOR APPLICANT)

To,
The Controller of Patents
The Patent office, at New Delhi

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENT RULES, 2003
DECLARATION AS TO INVENTORSHIP
[See Section 10 (6) and rule 13 (6)]

1. NAME OF APPLICANT(S): **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN** of address Kashmere Gate, New Delhi-110006, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of my/our application numbered 201611017103 dated 18.05.2016 are:-


2. INVENTORS(S)

(a) NAME : **REDDY S. Ramanarayana**
(b) NATIONALITY : Indian
(c) ADDRESS : HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

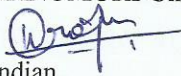
(a) NAME : **SHAREEF Zeenat**
(b) NATIONALITY : Indian
(c) ADDRESS : PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi-110006, India

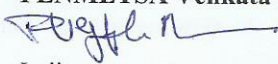
3. STATEMENT (to be signed by additional inventor(s) not mentioned in the application form)

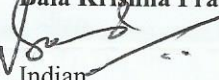
I/We assent to the invention referred to in the above declaration, being included in the complete specification file in pursuance of the stated application.

(a) NAME : **KALIDINDI Ramaprasada Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Professor, Department of Computer Science and Engineering,

SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **KANUMURI Chalapathiraju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Assistant Professor, Department of Electronics and Communication Engineering, SRKR Engineering College, Bhimavarm-534204, Andhra Pradesh, India

(a) NAME : **PENMETSA Venkata Gopala Raju**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : Associate Professor, Mechanical Engineering Department, SRKR Engineering College, Bhimavaram, -534204, Andhra Pradesh, India

(a) NAME : **Bala Krishna Prasad Mathukumalli**
(b) SIGNATURE : 
(c) NATIONALITY : Indian
(d) ADDRESS : 22616 Shining Harness Street Clarksburg, Maryland - 20871, USA

Dated this 18th day of May 2016

Name: **RASHMI TYAGI (IN/PA-1594)**
AGENT FOR APPLICANT

To,
The Controller of Patents
The Patent Office, at New Delhi

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification describes the invention and the manner in which it is to be performed.

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING **SYSTEM**

FIELD OF THE INVENTION

5 The present invention relates to the field of remote real time monitoring, storage and analysis of water parameters for aquaculture. More particularly, the invention relates to an integrated system for real time remote monitoring and controlling of aqua-parameters.

10 BACKGROUND OF THE INVENTION

In most of the cases the monitoring of water parameters is performed manually after taking water samples in field tests and chemically performing experiments to analyze the quality of water. This process is time consuming and lengthy. A lot of energy, time and money are wasted
15 in this process. Also real time monitoring of water parameters is not possible in manual process of water quality measurement.

In the work of prior art in the field of integrating internet of things into the aquaculture industry, there is lack of cloud environment and decision
20 support system. Also generally one or two water parameters are measured in these systems for transmission. These devices don't have GPS capabilities for locating the sensor nodes placed on the ponds. For mobile access, there is lack of smartphone mobile application for viewing the measured readings while on move. Having sensors and actuators in
25 the same node hampers the efficient functioning of the node.

Therefore, the current invention aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture.

SUMMARY OF THE INVENTION

5 An object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver and a remote monitoring unit (102) wirelessly coupled to the base station (101).

10 An another object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory coupled to the processor for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively and a remote monitoring unit (102) for processing the measured parameters and issuing a notification to a user's device (103).

20 A furthermore object of the present invention provides a system for enabling remote analysis and correction of a water parameters required to control for fish farmer's needs, through a real time self-correcting and automated system that incorporates balancing technology.

25 A furthermore object of the present invention provides a water contamination detection system.

30 A furthermore object of the present invention provides a custom built mobile application supporting multiple local languages, that has been integrated in the system.

A furthermore object of the present invention provides a decision support system designed to integrate the domain knowledge and provide the right information to the right people at right time. The mobile application connects to the decision support system and displays the parameters to the users as per need.

A furthermore object of the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention;

FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention. The system (100) of present invention comprises a base station (101), remote monitoring system (102) and user's device (103). The base station (101) communicates with sensor nodes (11) which
15 include multiple sensors to measure water parameters such as water temperature, pH, salinity, specific conductance, turbidity and dissolved oxygen. The sensor node (11) further comprises a GPS to provide location within the ponds or agriculture land and the sensor nodes (11) are designed to float within the water for easy monitoring of water parameters.

20 The base station (101) includes a processor, a memory module coupled to the processor, and transceiver (not shown). The transceiver wirelessly communicates with the sensors nodes (11) and collects data about different measured water parameters and stores in into base station memory (not shown). The base station (101) communicates with sensors
25 nodes (11) and actuator nodes (12) (explained later) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies. Further, base station (101) also sends this parametric information to the remote monitoring unit (102) also named as central monitoring station (102). The remote monitoring unit
30 (102) receives measured data from different base stations (101) and analyses it. The remote monitoring unit (102) or central monitoring station

includes a decision support system designed to integrate the domain knowledge and process the measured information and user's details to provide the right information to right people at right time. The remote monitoring unit (102) monitors and issues an alert or notification to a specific user in case of violating of any predefined threshold value of a parameter. The remote monitoring unit based on the measured parameters also send control signal for issuing the control command to the floating actuator (12) for regulating the water conditions by turning on/off the heaters, feeders, inflators, etc.

5

10

According to an embodiment of the present invention remote monitoring unit (102) communicates with the base station (101) and the user's device (103) using GSM/UMTS/LTE communication and other long distance communication technologies.

15

The system (100) of the present invention monitors and controls the water parameters in real time. A user of a mobile device can easily control and monitors the water parameter from a remote location. The user's mobile device (103) comprises an application to provide access to the remote/central monitoring station. The mobile application connects to the decision support system and displays the parameters to the users as per need. Thus the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

20

25

The integrated system of the present invention has many novel features such as the system (100) of the present invention has GPS capability on sensor node. The system also has decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their

30

requirements and eliminating other irrelevant data. The system of the present invention has provision to integrate other sensors such as for monitoring the growth and diseases of the fishery farms. The system of the present invention also has provision to remotely control the placement of the node and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

The basic components of the system (100) of present invention are herein described in details:

- 10 A. Sensor node (11): The sensor node is provided for measuring the physical, chemical and biological parameters of water such as but not limited to water temperature, dissolved oxygen, turbidity, pH, nitrate and carbonate, viral and algae growth and regular monitoring of water parameters. It also consists of a wireless communication module for sending the measured data to a nearby base station (101) at regular intervals. The sensor nodes of the present invention are low power self-sustained nodes either chargeable by battery or solar energy. In the present invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.
- 15
- 20
- 25 B. Base Station (101): It consists of a transceiver which receives measured data from sensor nodes of a particular location and transfers it to a central monitoring unit (102) via wireless mode. This base station act as receiver for the laid node data and as a controller for the actuators (12).

30

5 C. Central Monitoring Unit (102): This is the decision making unit of the entire system (100) of the present invention. It receives the measured data from base station (101) for storing it in the database, analyzing and providing statistical graphs for the user. It contains algorithm and logic to make decisions at critical conditions and send the control signal accordingly. In case of any discrepancy, control signal is passed from the central monitoring unit (102) to the actuator node (12) through the base station (101).

10 D. Actuator node (12): It consists of actuators which are turned on/off when a control signal is received from the central monitoring unit (102) via the base station (101). If the measured value crosses the threshold limit, then a control signal is sent to the actuator node through the base station to regulate the water conditions by turning
15 on/off such as but not limited to heaters, feeders, inflators.

E. Software Application: The software application is provided for installation on the user's smart device (103) through which the user can log into the central monitoring unit data and view or perform
20 analysis of the data while on move. The user may also report any comment from their device through software application to the monitoring unit (102).

The integrated system of the present invention offers numerous
25 advantages such as the system (100) of the present invention provides real time monitoring of the water parameters and storing data in cloud for remote access of said parameters on the user's smart device through an application. The system (100) provides regulation of the water parameters by turning on/off the actuators (12) when needed. Further, the system
30 (100) of the present invention provides creation of a Knowledge base with

fishery department for further research and provides advisement in water conditions well in advance so as to avoid losses to the farmers.

5 FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling of aqua-parameters according to a preferred embodiment of the present invention. The present invention provides an integrated system (200) for remotely monitoring & controlling of multiple aqua-parameters. In the present invention, the floating sensor nodes (21) are placed in the water of multiple sites for measuring various physical, 10 chemical & biological parameters of water. The data measured by these sensors is transferred to the base station (201) through wireless communication module and the location of each sensor node is provided by the GPS module integrated in the sensor node (21). The base station (201) further transmits the received data to a remotely located central monitoring unit (202) by a wireless transceiver mode. The central 15 monitoring unit (202) on receiving measured data from multiple base stations stores the data, performs analysis and provides statistical graphs and upon detection of any critical condition or threshold breach of any measured parameter transmits a control signal to the respective base station (201) wherein, the base stations (201) sends the control signal received from central monitoring unit (202) to the actuator nodes (22) for regulating the water conditions by turning on/off such as but not limited to heaters, feeders, inflators. The user can log in to the central monitoring unit (202) through a software application installed on the user's smart 20 device (203) for viewing or performing analysis of the measured parameters while on move. The user may also report any comment from their device through software application to the monitoring unit (202).

30 In the present invention a "smart device," as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory

capability. Examples of smart devices, these teachings not being limited to only these examples, mobile phones, smart mobile phones, tablets, digital personal assistants, and laptops, etc.

5 The “software application” or “app” or “mobile application” or “application” can be available for download or installation on a user smart device from the provider of integrated system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided to download the app. In an embodiment, the software
10 application can be initialized when a user first time uses the integrated system of the present invention. After the “software application” has been downloaded, the application can be installed on the smart device in an executable format. The executable form of the application permits the user to access embodiments of the invention via an electronic resource, such
15 as a mobile phone "app" or website.

WE CLAIM

1. A water parameters monitoring system (100) for aquaculture needs comprising:
 - 5 a floating sensor node (11) including sensors for measuring water parameters;
 - a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver; and
 - 10 a remote monitoring unit (102) wirelessly coupled to the base station (101).

2. A water parameters monitoring system (100) for aquaculture needs comprising:
 - 15 a floating sensor node (11) including sensors for measuring water parameters;
 - a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory module coupled to the processor, for storing received
 - 20 measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively; and
 - a remote monitoring unit (102) for processing the measured parameters and issuing notification to a user's device (103).
 - 25

3. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, comprises actuator nodes (12) for regulating the water parameters.

- 30 4. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 3, wherein the actuators (12) are

controlled using control signal received from the remote monitoring unit (102).

- 5 5. The water parameters monitoring system (100) for aquaculture needs claimed in claim 2, wherein the floating sensor node (11) includes one or more sensors for measuring chemical and physical parameters of water.
- 10 6. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 5, wherein the chemical and/or physical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.
- 15 7. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein a notification is sent to the user's device (103) when measured parameters breach a threshold value.
- 20 8. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein base station (101) communicates with sensor nodes (11) and actuator nodes (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
- 25 9. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance
30 communication technologies.

10. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters.

5

Dated this 18th day of May 2017

Rashmi Tyagi

(RASHMI TYAGI)

AGENT FOR APPLICANT

10

ABSTRACT

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

The present invention relates to an integrated system (100) for remote monitoring of multiple parameters of water for aquaculture. The system of the present invention comprises of a floating sensor nodes (11) consisting of multiple sensors to measure water parameters, a base station (101) for transferring the measured parameters received from sensor node (11) of a particular site to a remote unit, a remote monitoring unit (102) for receiving data from multiple base stations (101) for storing, analysis and alerting, a software application to access the real time parameters data on smart device (103) of user and an actuator node (12) for regulation of the water parameters based on measured data. The sensor node (11) also consists of an integrated GPS to provide location of each sensor node and a communication module for transmitting the measured data to base station.

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
COMPLETE SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND
CONTROLLING SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification describes the invention and the manner in which it is to be performed.

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

FIELD OF THE INVENTION

5 The present invention relates to the field of remote real time monitoring, storage and analysis of water parameters for aquaculture. More particularly, the invention relates to an integrated system for real time remote monitoring and controlling of aqua-parameters.

10 BACKGROUND OF THE INVENTION

In most of the cases the monitoring of water parameters is performed manually after taking water samples in field tests and chemically performing experiments to analyze the quality of water. This process is time consuming and lengthy. A lot of energy, time and money are wasted
15 in this process. Also real time monitoring of water parameters is not possible in manual process of water quality measurement.

In the work of prior art in the field of integrating internet of things into the aquaculture industry, there is lack of cloud environment and decision
20 support system. Also generally one or two water parameters are measured in these systems for transmission. These devices don't have GPS capabilities for locating the sensor nodes placed on the ponds. For mobile access, there is lack of smartphone mobile application for viewing the measured readings while on move. Having sensors and actuators in
25 the same node hampers the efficient functioning of the node.

Therefore, the current invention aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture.

SUMMARY OF THE INVENTION

5 An object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver and a remote monitoring unit (102) wirelessly coupled to the base station (101).

10 An another object of the present invention provides a water parameter(s) monitoring system (100) for aquaculture needs comprising a floating sensor node (11) which includes sensors for measuring water parameters, a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory coupled to the processor for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively and a remote monitoring unit (102) for processing the measured parameters and issuing a notification to a user's device (103).

20 A furthermore object of the present invention provides a system for enabling remote analysis and correction of a water parameters required to control for fish farmer's needs, through a real time self-correcting and automated system that incorporates balancing technology.

25 A furthermore object of the present invention provides a water contamination detection system.

30 A furthermore object of the present invention provides a custom built mobile application supporting multiple local languages, that has been integrated in the system.

A furthermore object of the present invention provides a decision support system designed to integrate the domain knowledge and provide the right information to the right people at right time. The mobile application connects to the decision support system and displays the parameters to the users as per need.

A furthermore object of the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention;

FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified
5 in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

10 FIG. 1 illustrates the architecture of the system (100) for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention. The system (100) of present invention comprises a base station (101), remote monitoring system (102) and user's device (103). The base station (101) communicates with sensor nodes (11) which
15 include multiple sensors to measure water parameters such as water temperature, pH, salinity, specific conductance, turbidity and dissolved oxygen. The sensor node (11) further comprises a GPS to provide location within the ponds or agriculture land and the sensor nodes (11) are designed to float within the water for easy monitoring of water parameters.

20 The base station (101) includes a processor, a memory module coupled to the processor, and transceiver (not shown). The transceiver wirelessly communicates with the sensors nodes (11) and collects data about different measured water parameters and stores in into base station memory (not shown). The base station (101) communicates with sensors
25 nodes (11) and actuator nodes (12) (explained later) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies. Further, base station (101) also sends this parametric information to the remote monitoring unit (102) also named as central monitoring station (102). The remote monitoring unit
30 (102) receives measured data from different base stations (101) and analyses it. The remote monitoring unit (102) or central monitoring station

includes a decision support system designed to integrate the domain knowledge and process the measured information and user's details to provide the right information to right people at right time. The remote monitoring unit (102) monitors and issues an alert or notification to a specific user in case of violating of any predefined threshold value of a parameter. The remote monitoring unit based on the measured parameters also send control signal for issuing the control command to the floating actuator (12) for regulating the water conditions by turning on/off the heaters, feeders, inflators, etc.

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According to an embodiment of the present invention remote monitoring unit (102) communicates with the base station (101) and the user's device (103) using GSM/UMTS/LTE communication and other long distance communication technologies.

15

The system (100) of the present invention monitors and controls the water parameters in real time. A user of a mobile device can easily control and monitors the water parameter from a remote location. The user's mobile device (103) comprises an application to provide access to the remote/central monitoring station. The mobile application connects to the decision support system and displays the parameters to the users as per need. Thus the present invention provides a complete integrated system with wireless sensor network for data collection, remote monitoring and decision making in the domain of aquaculture.

20

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The integrated system of the present invention has many novel features such as the system (100) of the present invention has GPS capability on sensor node. The system also has decision support system with knowledge base for providing right information at right place to right people for example, sending only selective and informative data to the researchers, fish cultivation agency and the farmers as per their

30

requirements and eliminating other irrelevant data. The system of the present invention has provision to integrate other sensors such as for monitoring the growth and diseases of the fishery farms. The system of the present invention also has provision to remotely control the placement of the node and dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

The basic components of the system (100) of present invention are herein described in details:

10 A. Sensor node (11): The sensor node is provided for measuring the physical, chemical and biological parameters of water such as but not limited to water temperature, dissolved oxygen, turbidity, pH, nitrate and carbonate, viral and algae growth and regular monitoring of water parameters. It also consists of a wireless communication module for sending the measured data to a nearby base station (101) at regular intervals. The sensor nodes of the present invention are low power self-sustained nodes either chargeable by battery or solar energy. In the present invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.

25 B. Base Station (101): It consists of a transceiver which receives measured data from sensor nodes of a particular location and transfers it to a central monitoring unit (102) via wireless mode. This base station act as receiver for the laid node data and as a controller for the actuators (12).

30

5 C. Central Monitoring Unit (102): This is the decision making unit of the entire system (100) of the present invention. It receives the measured data from base station (101) for storing it in the database, analyzing and providing statistical graphs for the user. It contains algorithm and logic to make decisions at critical conditions and send the control signal accordingly. In case of any discrepancy, control signal is passed from the central monitoring unit (102) to the actuator node (12) through the base station (101).

10 D. Actuator node (12): It consists of actuators which are turned on/off when a control signal is received from the central monitoring unit (102) via the base station (101). If the measured value crosses the threshold limit, then a control signal is sent to the actuator node through the base station to regulate the water conditions by turning
15 on/off such as but not limited to heaters, feeders, inflators.

E. Software Application: The software application is provided for installation on the user's smart device (103) through which the user can log into the central monitoring unit data and view or perform
20 analysis of the data while on move. The user may also report any comment from their device through software application to the monitoring unit (102).

The integrated system of the present invention offers numerous
25 advantages such as the system (100) of the present invention provides real time monitoring of the water parameters and storing data in cloud for remote access of said parameters on the user's smart device through an application. The system (100) provides regulation of the water parameters by turning on/off the actuators (12) when needed. Further, the system
30 (100) of the present invention provides creation of a Knowledge base with

fishery department for further research and provides advisories in water conditions well in advance so as to avoid losses to the farmers.

5 FIG. 2 illustrates the working flowchart of the integrated system (200) for monitoring and controlling of aqua-parameters according to a preferred embodiment of the present invention. The present invention provides an integrated system (200) for remotely monitoring & controlling of multiple aqua-parameters. In the present invention, the floating sensor nodes (21) are placed in the water of multiple sites for measuring various physical, 10 chemical & biological parameters of water. The data measured by these sensors is transferred to the base station (201) through wireless communication module and the location of each sensor node is provided by the GPS module integrated in the sensor node (21). The base station (201) further transmits the received data to a remotely located central monitoring unit (202) by a wireless transceiver mode. The central 15 monitoring unit (202) on receiving measured data from multiple base stations stores the data, performs analysis and provides statistical graphs and upon detection of any critical condition or threshold breach of any measured parameter transmits a control signal to the respective base station (201) wherein, the base stations (201) sends the control signal received from central monitoring unit (202) to the actuator nodes (22) for regulating the water conditions by turning on/off such as but not limited to heaters, feeders, inflators. The user can log in to the central monitoring unit (202) through a software application installed on the user's smart 20 device (203) for viewing or performing analysis of the measured parameters while on move. The user may also report any comment from their device through software application to the monitoring unit (202).

30 In the present invention a "smart device," as used herein, refers to a device capable of executing applications, and which is portable. In one instance, the computing device has one or more processors and memory

capability. Examples of smart devices, these teachings not being limited to only these examples, mobile phones, smart mobile phones, tablets, digital personal assistants, and laptops, etc.

5 The “software application” or “app” or “mobile application” or “application” can be available for download or installation on a user smart device from the provider of integrated system described herein, for example from the provider's web site, or through a mobile store application or a link or code can be provided to download the app. In an embodiment, the software
10 application can be initialized when a user first time uses the integrated system of the present invention. After the “software application” has been downloaded, the application can be installed on the smart device in an executable format. The executable form of the application permits the user to access embodiments of the invention via an electronic resource, such
15 as a mobile phone "app" or website.

WE CLAIM

1. A water parameters monitoring system (100) for aquaculture needs comprising:
- 5 a floating sensor node (11) including sensors for measuring water parameters;
- a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a memory, a transceiver and a processor coupled the memory and the transceiver; and
- 10 a remote monitoring unit (102) wirelessly coupled to the base station (101).
2. A water parameters monitoring system (100) for aquaculture needs comprising:
- 15 a floating sensor node (11) including sensors for measuring water parameters;
- a base station (101) wirelessly coupled to at least one floating sensor node (11), comprising a processor, a memory module coupled to the processor, for storing received measured parameters and a transceiver coupled to the processor for transmitting and receiving the measured parameters and a control signal respectively; and
- 20 a remote monitoring unit (102) for processing the measured parameters and issuing notification to a user's device (103).
- 25
3. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, comprises actuator nodes (12) for regulating the water parameters.
- 30
4. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 3, wherein the actuators (12) are

controlled using control signal received from the remote monitoring unit (102).

- 5 5. The water parameters monitoring system (100) for aquaculture needs claimed in claim 2, wherein the floating sensor node (11) includes one or more sensors for measuring chemical and physical parameters of water.
- 10 6. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 5, wherein the chemical and/or physical parameters are selected from the group comprising water temperature, pH, salinity, turbidity, specific conductance and dissolved oxygen.
- 15 7. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein a notification is sent to the user's device (103) when measured parameters breach a threshold value.
- 20 8. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein base station (101) communicates with sensor nodes (11) and actuator nodes (12) using Bluetooth low energy (BLE), ZigBee, Z-Wave, and low power Wi-Fi and other short distance communication technologies.
- 25 9. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the transceiver transmits the measured parameters to the remote monitoring unit (102) using GSM/UMTS/LTE communication and other long distance
30 communication technologies.

10. The water parameters monitoring system (100) for aquaculture needs as claimed in claim 2, wherein the user's device (103) includes a multiple language supporting application for controlling and monitoring water parameters.

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Dated this 18th day of May 2017

Rashmi Tyagi

(RASHMI TYAGI)

AGENT FOR APPLICANT

10

ABSTRACT

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

The present invention relates to an integrated system (100) for remote monitoring of multiple parameters of water for aquaculture. The system of the present invention comprises of a floating sensor nodes (11) consisting of multiple sensors to measure water parameters, a base station (101) for transferring the measured parameters received from sensor node (11) of a particular site to a remote unit, a remote monitoring unit (102) for receiving data from multiple base stations (101) for storing, analysis and alerting, a software application to access the real time parameters data on smart device (103) of user and an actuator node (12) for regulation of the water parameters based on measured data. The sensor node (11) also consists of an integrated GPS to provide location of each sensor node and a communication module for transmitting the measured data to base station.

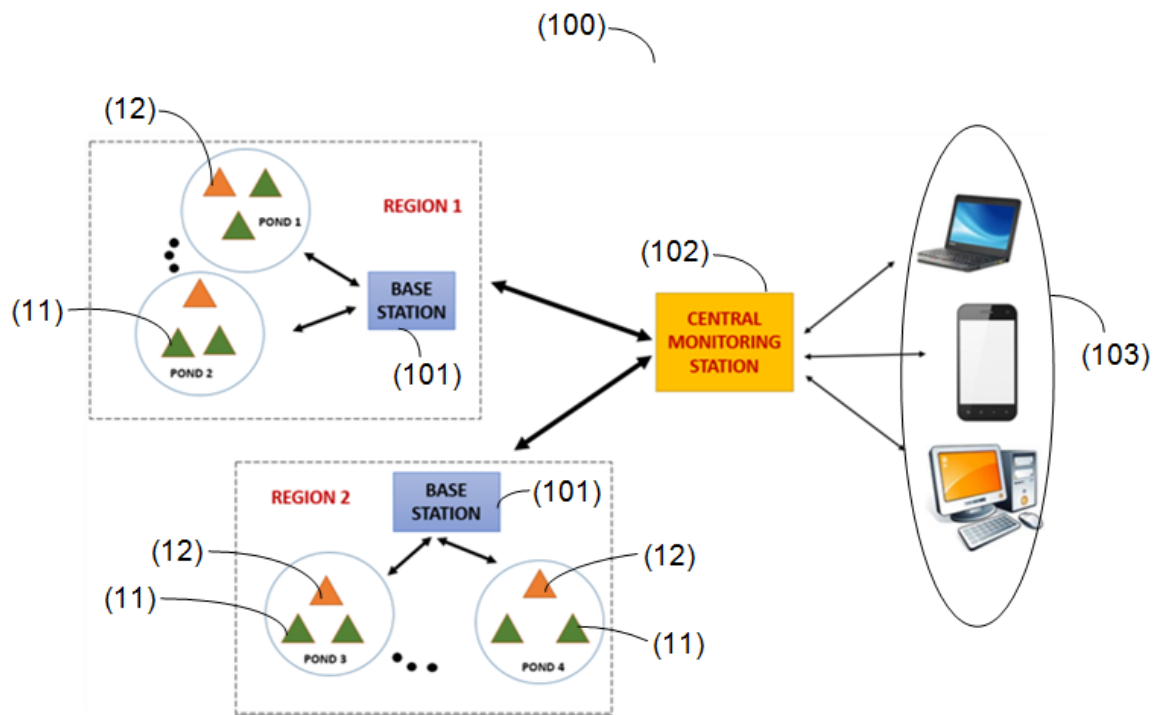


FIG. 1

RASHMI TYAGI
AGENT FOR APPLICANT

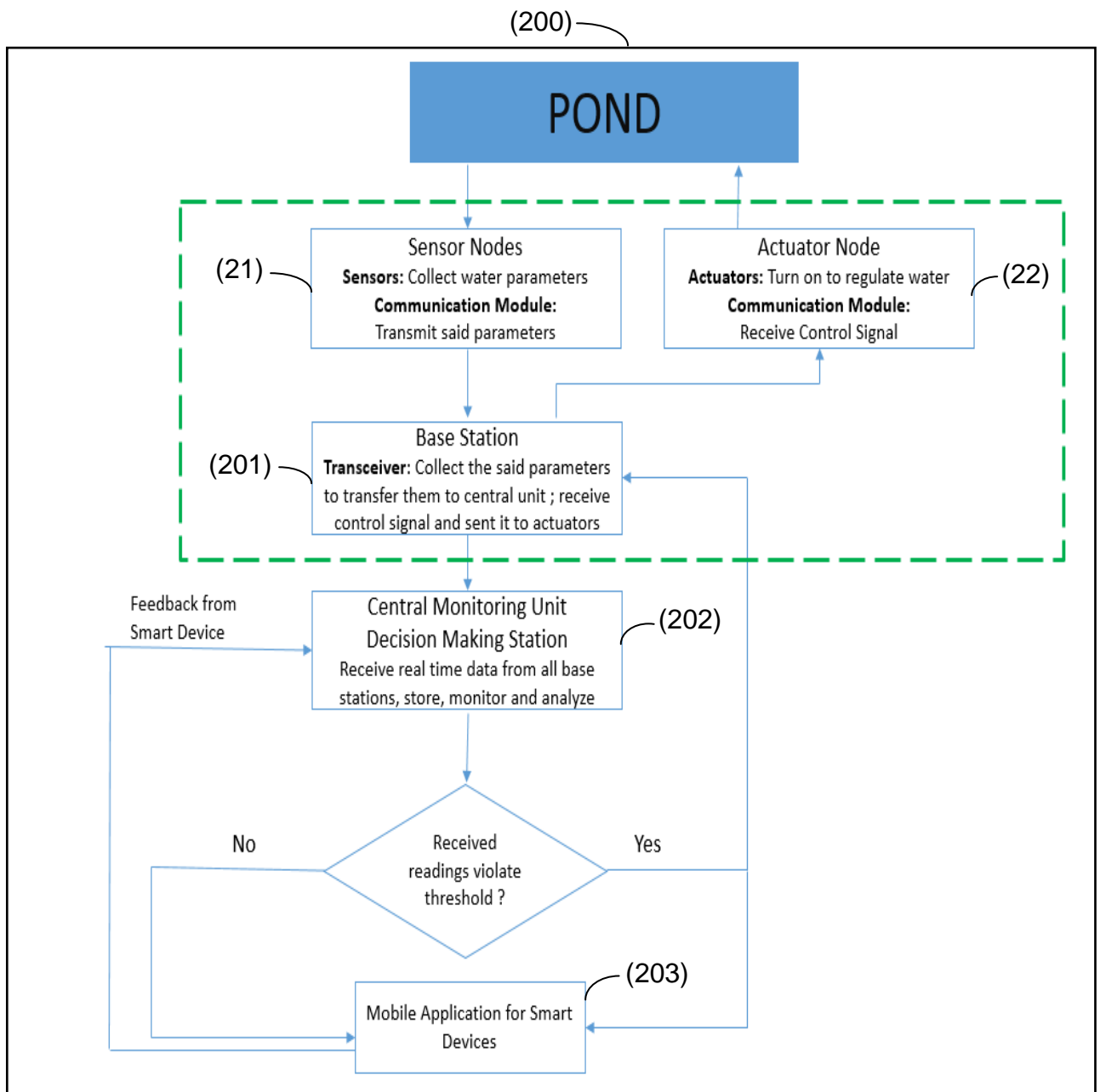


FIG. 2

RASHMI TYAGI
AGENT FOR APPLICANT

FORM 3

THE PATENTS ACT, 1970

(39 of 1970)

and

THE PATENTS RULES, 2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).		I/We <u>Indira Gandhi Delhi Technical University for Women</u> , Indian, of address <u>Kashmere Gate, New Delhi – 110006, India</u> hereby declare:			
2. Name, address and nationality of the joint applicant.		(i) that I/We have not made any application for the same/substantially the same invention titled “Aqua-Parameters Real Time Monitoring and Controlling System” outside India Or (ii) that I/We who have made this application No. <u>N/A</u> dated <u>N/A</u> alone/jointly with <u>N/A</u> , made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:			
Name of the country	Date of Application	Application No.	Status of the application	Date of publication	Date of grant
N/A					
3. Name and address of the assignee		(iii) that the rights in the application(s) has/have been assigned to <u>None</u> that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application.			

	Dated this 02nd day of June 2016
4. To be signed by the applicant or his authorized registered patent agent.	Signature
5. Name of the natural person who has signed.	RASHMI TYAGI Agent for Applicant (IN/PA-1594).
	To The Controller of Patents, The Patent Office, at New Delhi.
Note.- Strike out whichever is not applicable;	



El: RT: NA-201611017103

May 30, 2016

To,
The Controller of Patents
The Patent Office, at New Delhi

SUB: SUBMISSION GENERAL POWER OF AUTHORITY (GPA) COPY, FORM-1 & FORM-3 IN ORIGINAL

Dear Sir,

**Re: Indira Gandhi Delhi Technical University for Women
Indian Patent Application No.: 2016
e-Filed: May 18, 201611017103
Title: Aqua-Parameters Real Time Monitoring and Controlling System**

We are submitting herewith copy of General Power or Authority and Form-1 & Form-3 in original for provisional Patent application number **201611017103** titled "**Aqua-Parameters Real Time Monitoring and Controlling System**" e-filed on May 18, 2016 for grant of patent.

Enclosures:

1. General Power of Authority (copy) [for original refer to our letter El: RT: 156/DEL/2015 dated Dec 02, 2015 filed in respect of application number 156/DEL/2015]
2. Form-1 (Original)
3. Form-3 (Original) *Rashmi Tyagi*

It is respectfully requested to accept and take the aforesaid document on record.

Thanking you,

Sincerely Yours,

Rashmi Tyagi
Rashmi Tyagi (IN/PA-1594)

250, Street No. 06, New Colony Kerhera,
Mohan Nagar, Ghaziabad, Uttar Pradesh-201007

Contact: 9968284766

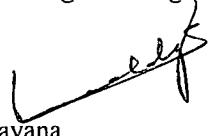
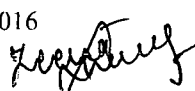
Email: rashmi.tyagi@hotmail.com

IPO DELHI 01-06-2016 15:14



FORM 1				(FOR OFFICE USE ONLY)	
THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003					
APPLICATION FOR GRANT OF PATENT					
(See section 7, 54 and 135 and sub-rule (1) of rule 20)					
				Application No.	
				Filing Date:	
				Amount of Fees Paid	
				CBR No.	
				Signature:	
1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ()		PCT-NP ()	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN		INDIAN	INDIA	House No.	N/A
				Street	KASHMERE GATE
				City	NEW DELHI
				State	DELHI
				Country	INDIA
				Pin Code	110006
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity ()	Startup ()	Others (✓)	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	
If "No", furnish the details of the inventor(s)					
Name in Full		Nationality	Country of	Address of the Inventor	

		Residence		
REDDY S. Ramanarayana	INDIAN	INDIA	House No.	N/A
			Street	HOD, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
SHAREEF Zeenat	INDIAN	INDIA	House No.	N/A
			Street	PhD Scholar, Department of CSE, Indira Gandhi Delhi Technical University for Women, Kashmere Gate
			City	New Delhi
			State	Delhi
			Country	India
			Pin Code	110006
5. TITLE OF THE INVENTION				
AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM				
6. AUTHORISED REGISTERED PATENT AGENT(S)		IN/PA No.	1594	
		Name	RASHMI TYAGI	
		Mobile No.	9968284766	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA		Name	RASHMI TYAGI	
		Postal Address	250, STREET NO: 06, NEW COLONY KARHERA, MOHAN NAGAR, GHAZIABAD, UTTAR PRADESH - 201007, INDIA	
		Telephone No.	N/A	
		Mobile No.	9968284766	
		Fax No.	N/A	
		E-mail ID	RASHMI.TYAGI@HOTMAIL.COM	
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION				

Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention	IPC (as classified in the convention country)
N/A	N/A	N/A	N/A	N/A	N/A
9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)					
International application number			International filing date		
N/A			N/A		
10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION					
Original (first) application No.			Date of filing of original (first) application		
N/A			N/A		
11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT					
Main application/patent No.: N/A			Date of filing of main application: N/A		
12. DECLARATIONS					
(i) Declaration by the inventor(s)					
<p>(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).</p> <p>±/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.</p> <p>(a) Date: 18.05.2016</p> <p>(b) Signature(s): </p> <p>(c) Name(s): REDDY S. Ramanarayana</p> <p>(a) Date: 18.05.2016</p> <p>(b) Signature(s): </p> <p>(c) Name(s): SHAREEF Zeenat</p>					
(ii) Declaration by the applicant(s) in the convention country					
<p>(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)</p>					

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- ~~I am~~ We are in possession of the above-mentioned invention.
- The provisional/complete specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- ~~I am~~/we are the true & first inventor(s).
- ~~I am~~/we are the assignee or legal representative of true & first inventor(s).
- The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).
- I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.
- The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph- 11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete / Provisional Specification#	No. of pages: 10	8,000	
No. of Claim(s)	No. of claims and No. of pages: N/A		

Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 & No. of pages: 02		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

Total fee Rs. 8,000 through Online payment gateway Date 18/05/2016 on ICICI Bank.

~~I~~We hereby declare that to the best of ~~my~~/our knowledge, information and belief the fact and matters stated herein are correct and ~~I~~We request that a patent may be granted to ~~me~~/us for the said invention.

Dated this 18th day of May 2016.

Signature: Rashmi Tyagi

Name: RASHMI TYAGI

To,

The Controller of Patents

The Patent Office, at New Delhi

Note: -

- * Repeat boxes in case of more than one entry.
- * To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
- * Tick (✓)/cross (✗) whichever is applicable/not applicable in declaration in paragraph- 12.
- * Name of the inventor and applicant should be given in full, family name in the beginning.
- * Strike out the portion which is/are not applicable.
- * For fee: See "First Schedule".



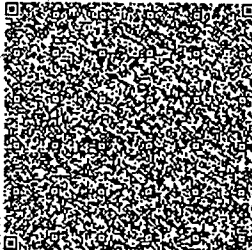
सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

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Certificate Issued Date	: 12-Jan-2015 12:55 PM
Account Reference	: IMPACC (IV)/ dl822003/ DELHI/ DL-DLH
Unique Doc. Reference	: SUBIN-DL DL82200309630522127835N
Purchased by	: IGDTUW NEW DELHI
Description of Document	: Article Others
Property Description	: Not Applicable
Consideration Price (Rs.)	: 0 (Zero)
First Party	: IGDTUW NEW DELHI
Second Party	: ELPIS INNOVATION
Stamp Duty Paid By	: ELPIS INNOVATION
Stamp Duty Amount(Rs.)	: 100 (One Hundred only)



.....Please write or type below this line.....

THE PATENT ACT, 1970 GENERAL POWER OF AUTHORITY

We, **INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN**, Indian, of Kashmere Gate, New Delhi - 110006, India, hereby authorise and appoint **Rashmi Tyagi**, Indian, of **Elpis Innovation** of the address of correspondence #250, Street No. 06, New Colony Kerhera, Mohan Nagar, Ghaziabad, Uttar Pradesh - 201007, India, jointly and severally, to act on our

Statutory Alert: 01-06-2016 15:14

1. The authenticity of this Stamp Certificate should be verified at "www.shclsestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

behalf as our agent for securing from the Government of India in our name the grant of patent under the above-mentioned Act or any corresponding Act which may come into force in respect of inventions and in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith or incidental thereto and in all matters and proceedings subsequent to the grant of any patent including the amendment thereof or of the application, specification or any other document filed in respect thereof, the renewal thereof, the restoration thereof, the registration and recordal of any licence, mortgage, assignment or transfer of other interest in respect thereof, the recordal of changes in our name, address or address for service and the filing of statements of working in respect thereof and in general to perform all acts and take such actions as the said agent(s) may in their discretion deem necessary or expedient in the discharge of their duties including the appointment of a substitute or substitutes, and we request that all notices, requisitions and communications relating to the matters identified herein be sent to such agent(s) at above address unless otherwise specified.

We hereby confirm and ratify previous acts, if any, done by the said agent(s) in respect of the said matters or proceedings.

We hereby revoke all previous authorisations, if any, made by us in respect of the said matters or proceedings.

Dated this 17th day of January 2015

(Signature, Stamp)

Dr. S. Ramanarayana Reddy

HoD, CSE, IGDTUW

Dr. S.R.N. REDDY

Head of Department

Computer Science Engineering

Indira Gandhi Delhi Technical University for Women
Kashmere Gate, Delhi-110006

To
The Controller of Patents,
The Patent Office, at New Delhi

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION
(Section 10 & Rule 13)

**“AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING
SYSTEM”**

**INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
INDIAN
KASHMERE GATE, NEW DELHI-110006, INDIA**

The following specification describes the invention.

5 **FIELD OF THE INVENTION**

The present invention relates to the field of remote real time monitoring, storage and analysis of water parameters for aquaculture. More particularly, the invention relates to an integrated system for real time remote monitoring and controlling of aqua-parameters.

10

BACKGROUND OF THE INVENTION

In most of the cases the monitoring of water parameters is performed manually after taking water samples in field tests and chemically performing experiments to analyze the quality of water. This process is time consuming and lengthy. A lot of energy, time and money are wasted in this process. Also real time monitoring of water parameters is not possible in manual process of water quality measurement.

In the work of prior art in the field of integrating internet of things into the aquaculture industry, there is lack of cloud environment and decision support system. Also generally one or two water parameters are measured in these systems for transmission. These devices don't have GPS capabilities for locating the sensor nodes placed on the ponds. For mobile access, there is lack of smartphone mobile application for viewing the measured readings while on move. Having sensors and actuators in the same node hampers the efficient functioning of the node.

Therefore, the current invention aims to solve these shortcomings by providing a smart and efficient framework for monitoring water parameters for aquaculture.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

10 FIG. 1 illustrates the basic architecture of the integrated system for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention;

15 FIG. 2 illustrates the working flowchart of the integrated system for monitoring and controlling aqua-parameters according to a preferred embodiment of the present invention.

5 **DESCRIPTION**

The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain
10 more clearly the present invention to the ordinarily skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

The present invention provides an integrated system for remote monitoring of
15 physical, chemical and biological parameters of water for aquaculture. The system of the present invention as illustrated in FIG. 1 comprises of a sensor node consisting of multiple sensors to measure water parameters, a GPS to provide sensor node location, a communication module for transmitting the measured data to base station, a remote monitoring unit for receiving measured
20 data from multiple base stations, a software application to access the real time data on smart device of user and an actuator node for regulation of the water parameters based on measured data.

**The integrated system of the present invention has following novelty over
25 the existing prior art:**

1. It has GPS capability on sensor node
2. The system has decision support system with knowledge base for providing right information at right place to right people. Sending only selective and informative data to the researchers, fish cultivation agency
30 and the farmers as per their requirements and eliminating other irrelevant data.
3. The system has provision to integrate other sensors for monitoring the growth and diseases of the fishery farms.
4. It has provision to remotely control the placement of the node and
35 dynamic data collection by floating the node in the water at predetermined or optimal path/track through a proposed algorithm.

5 **The basic components of the present invention are herein described in details:**

10 A. Sensor node: A sensor node is provided for measuring the physical, chemical and biological parameters of water such as but not limited to water temperature, dissolved oxygen, turbidity, pH, nitrate and carbonate, viral and algae growth and regular monitoring of water parameters. It also consists of a wireless communication module for sending the measured data to a nearby base station at regular intervals. The sensor nodes of the present invention are low power self-sustained nodes either chargeable by battery or solar energy. In the present invention the sensor node are designed for floating in water and collects data in predetermined algorithm so as to cover an optimal path. The nodes are controlled remotely by the user without going into the water and further consist of a GPS module for providing location of the particular sensor node.

20 B. Base Station: It consists of a transceiver which receives measured data from sensor nodes of a particular location and transfers it to a central monitoring unit via wireless mode. This base station act as receiver for the laid node data and as a controller for the actuators.

25 C. Central Monitoring Unit: This is the decision making unit of the entire system. It receives the measured data from base station for storing it in the database, analyzing and providing statistical graphs for the user. It contains algorithm and logic to make decisions at critical conditions and send the control signal accordingly. In case of any discrepancy, control signal is passed from the central monitoring unit to the actuator node through the base station.

30 D. Software Application: The software application is provided for installation on the user smart device through which the user can log in to the central monitoring unit data and view or perform analysis of the data while on move. The user may also report any comment from their device through software application to the monitoring unit.

5 E. Actuator node: It consists of actuators which are turned on/off when a
control signal is received from the central monitoring unit via the base
station. If the measured value crosses the threshold limit, then a control
signal is sent to the actuator node through the base station to regulate the
water conditions by turning on/off such as but not limited to heaters,
10 feeders, inflators.

The integrated system of the present invention offers the following advantages:

- 15 1. The system provides real time monitoring of the water parameters and
storing data in cloud for remote access.
2. It allows remote access of the said parameters on the smart device
through an application.
3. It provides regulation of the water parameters by turning on/off the
actuators when needed.
- 20 4. The system of the present invention provides creation of a Knowledge
base with fishery department for further research.
5. It provides adversity in water conditions well in advance so as to avoid
losses to the farmers.

25 According to a preferred embodiment of the present invention as depicted in FIG.
2, the present invention provides an integrated system for remotely monitoring &
controlling of multiple aqua-parameters. In the present invention the floating
sensor nodes are placed in the water of multiple sites for measuring various
physical, chemical & biological parameters of water. The data measured by these
30 sensors is transferred to the base station through wireless communication
module and the location of each sensor node is provided by the GPS module
integrated in the sensor node. The base station further transmits the received
data to a remotely located central monitoring unit by a wireless mode. The central
monitoring unit on receiving measured data from multiple base stations stores the
35 data, performs analysis and provides statistical graphs and upon detection of any
critical condition or threshold breach of any measured parameter transmits a
control signal to the respective base station wherein the base stations sends the
control signal received from central monitoring unit to the actuator nodes for

5 regulating the water conditions by turning on/off such as but not limited to
heaters, feeders, inflators. The user can log in to the central monitoring unit
through a software application installed on the user's smart device for viewing or
performing analysis of the measured parameters while on move. The user may
also report any comment from their device through software application to the
10 monitoring unit.

In the present invention a "smart device," as used herein, refers to a device
capable of executing applications, and which is portable. In one instance, the
computing device has one or more processors and memory capability. Examples
15 of smart devices, these teachings not being limited to only these examples,
mobile phones, smart mobile phones, tablets, digital personal assistants, and
laptops, etc.

The "software application" or "app" or "mobile application" can be available for
20 download or installation on a user smart device from the provider of integrated
system described herein, for example from the provider's web site, or through a
mobile store application or a link or code can be provided to download the app. In
an embodiment, the software application can be initialized when a user first time
uses the integrated system of the present invention. After the "software
25 application" has been downloaded, the application can be installed on the smart
device in an executable format. The executable form of the application permits
the user to access embodiments of the invention via an electronic resource, such
as a mobile phone "app" or website.

30

ABSTRACT

AQUA-PARAMETERS REAL TIME MONITORING AND CONTROLLING SYSTEM

The present invention relates to an integrated system for remote monitoring of multiple parameters of water for aquaculture. The system of the present invention comprises of a floating sensor node consisting of multiple sensors to measure water parameters, a base station for transferring the measured parameters received from sensor node of a particular site to a remote unit, a remote monitoring unit for receiving data from multiple base stations for storing, analysis and alerting, a software application to access the real time parameters data on smart device of user and an actuator node for regulation of the water parameters based on measured data. The sensor node also consists of an integrated GPS to provide location of each sensor node and a communication module for transmitting the measured data to base station.

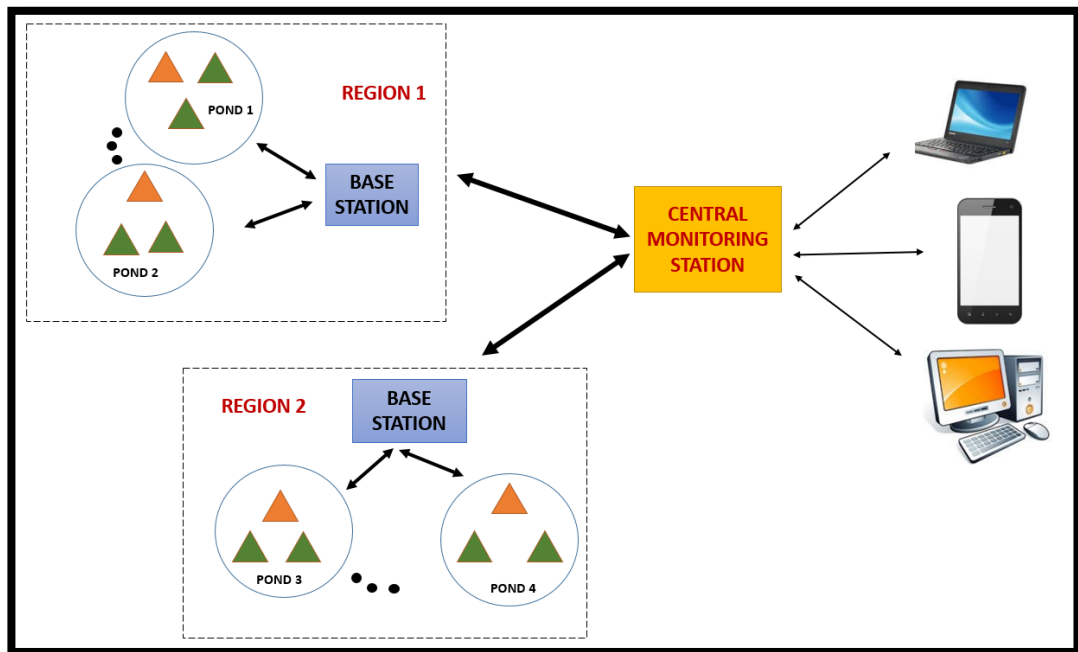


FIG. 1

RASHMI TYAGI
AGENT FOR APPLICANT

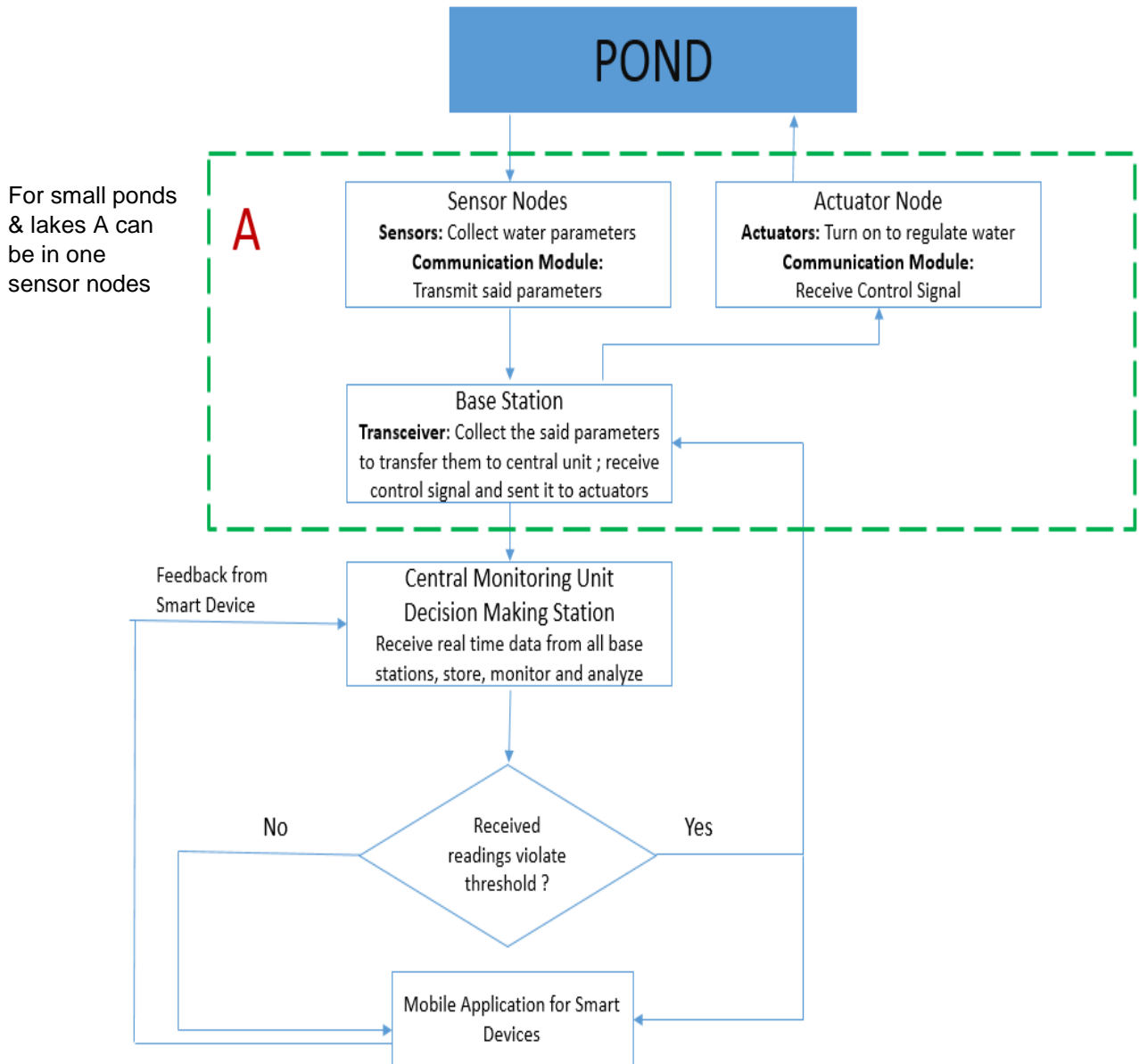


FIG. 2

RASHMI TYAGI
AGENT FOR APPLICANT



**INTELLECTUAL
PROPERTY INDIA**

एकस्व/PATENTS|अभिकल्प/DESIGNS|
व्यापार चिह्न/TRADE MARKS|भौगोलिक
उपदर्शन/GEOGRAPHICAL INDICATIONS



सत्यमेव जयते

**भारत सरकार
GOVERNMENT OF INDIA**

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बौद्धिक सम्पदा भवन / I.P.O. BUILDING
प्लॉट नं. 32/ PLOT NO. 32
सेक्टर -14/ SECTOR 14, द्वारका/ DWARKA
नई दिल्ली/NEW DELHI -110078
दूरभाष /Tel. No. : 011-25300200
फ़ैक्स /Fax : 011-28034301/02/15
ई मेल /Email : delhi-patent@nic.in
वेबसाइट /Website: <http://ipindia.nic.in>

सं.संख्या/Ref.No /आवेदन संख्या/Application No/ 201611017103

दिनांक/Date of Dispatch/Email: 25/02/2020

सेवा में,/To

RASHMI TYAGI,

250, STREET NO. 06, NEW COLONY KARHERA, MOHAN NAGAR, GHAZIABAD, UTTAR PRADESH -
201007, INDIA

Email : RASHMI.TYAGI@HOTMAIL.COM,RASHMI@ELPISINNOVATION.COM

विषय: एकस्व अधिनियम, 1970 की धारा 12 व 13 तथा एकस्व नियम, 2003 के अधीन परीक्षण रिपोर्ट

Subject: Examination report under sections 12 & 13 of the Patents Act, 1970 and the Patents Rules, 2003.

- उपर्युक्त आवेदन के संदर्भ में परीक्षण रिपोर्ट (अर्थात, एकस्व नियम, 2003 (यथा संशोधित) के नियम 24-ख(3) में विनिर्दिष्ट आपत्तियों का प्रथम कथन) इसके साथ संलग्न है। यह रिपोर्ट परीक्षण हेतु अनुरोध दिनांक 29/08/2017 के उत्तर में जारी की गयी है। परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि (अर्थात, इस रिपोर्ट में लगाई गयी सभी आवश्यकताओं के अनुपालन की अवधि) आवेदक को आपत्तियों का प्रथम कथन जारी होने की तिथि से छः माह है।
Please find enclosed herewith an Examination Report (i.e. a first statement of objections as specified in Rule 24-B(3) of The Patents Rules, 2003 (as amended)) in respect of above-mentioned application. This report is issued with reference to a request for examination dated 29/08/2017. The last date for filing a response to the Examination Report (i.e. a period to comply with all the requirements raised in this examination report) is six months from the date on which the first statement of objections is issued to the Applicant.
- यदि रिपोर्ट के अंतर्गत लगाई गयी आवश्यकताओं का अनुपालन एकस्व नियम, 2003 (यथा संशोधित) के नियम 24 ख(5) में विनिर्दिष्ट अवधि के भीतर अंदर अनुपालन नहीं किया गया तो एकस्व अधिनियम 1970 की धारा 21(1) के अधीन वर्तमान आवेदन को परित्यक्त माना जाएगा।
The instant application shall be deemed to have been abandoned under Section 21(1) of The Patents Act, 1970, unless all the requirements raised in this report are complied with in the period as specified in Rule 24-B (5) of The Patents Rules, 2003 (as amended).
- आपका ध्यान एकस्व नियम, 2003 के नियम 24 ख(6) के प्रावधानों की ओर भी आमंत्रित किया जाता है।
Your attention is also invited to the provisions of Rule 24-B (6) of the Patents Rules 2003.
- आपको सलाह दी जाती है कि शीघ्र निपटान हेतु अपना उत्तर शीघ्र प्रस्तुत करें।
You are advised to file the reply at the earliest for early disposal.

Shahid Anwar

नियंत्रक पेटेंट/ Controller of Patents

संलग्न/Enclosed: अपरोक्त अनुसार/As above

टिप्पणी: यह इलेक्ट्रॉनिक रूप से उत्पन्न रिपोर्ट है।

NOTE: This is an electronically generated report.

सभी पत्राचार नियंत्रक एकस्व को उपरोक्त पते पर भेजा जाये।

All communications should be sent to the Controller of Patents at the above mentioned address.

परीक्षण रिपोर्ट / Examination Report

आवेदन संख्या /Application Number	201611017103
दाखिल करने की तिथि /Date of Filing	18/05/2016
पूर्विका दिनांक /Date of Priority	--
पीसीटी अंतर्राष्ट्रीय आवेदन की संख्या व दिनांक / PCT International Application No. & Date	--
आवेदक /Applicant	INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN
परीक्षण हेतु अनुरोध की संख्या व दिनांक /Request for Examination No. & Date	R20171025435 29/08/2017
प्रकाशन की तिथि /Date of Publication	09/02/2018

इस परीक्षण रिपोर्ट के चार भाग हैं, अर्थात रिपोर्ट का सारांश, विस्तृत तकनीकी रिपोर्ट, औपचारिक आवश्यकताएँ तथा रिकॉर्ड में दस्तावेज़ / This examination report consists of four parts, namely summary of the report, detailed technical report, formal requirements and documents on record.

भाग -1: रिपोर्ट का सारांश

PART-I: SUMMARY OF THE REPORT

क्र. सं. /Sl. No.	अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ /Requirements under the Act	दावों की संख्या /Claim Numbers	टिप्पणी /Remarks
1.	धारा 2(1)(ग) के तहत आविष्कार /Invention u/s 2(1)(g)	नवीनता /Novelty	दावे /Claims: हाँ /Yes
		आविष्कारी कदम / Inventive step	दावे /Claims: 1-10 हाँ /Yes
		औद्योगिक उपयोगिता /Industrial Applicability	दावे /Claims: 1-10 हाँ /Yes
			दावे /Claims: हाँ /Yes
2.	धारा 3 के अधीन पेटेंट-अयोग्यता (यदि हाँ, खंड 3(क-त) /Non-patentability u/s 3 (if yes, specify section3(a-p))	दावे /Claims: 1-10	हाँ /Yes k
		दावे /Claims:	नहीं /No
3.	धारा 4 के अधीन पेटेंट-अयोग्यता /Non-patentability u/s 4	दावे /Claims:	हाँ /Yes
		दावे /Claims: 1-10	नहीं /No
4.	धारा 10 (5) के अधीन आविष्कार की एकलता /Unity of invention u/s 10 (5)	दावे /Claims: 1-10	हाँ /Yes
		दावे /Claims:	नहीं /No
5.	धारा 10(4) के अधीन प्रकटन की दक्षता (हाँ/नहीं निर्दिष्ट करें) /Sufficiency of disclosure u/s 10 (4) (Specify Yes/No)	yes	
6.	[धारा 10(5) व 10(4) (ग)] के अधीन दावे /Claims [u/s 10(5) & 10(4) (c)]	स्पष्टता/ संक्षिप्तता /Clarity / Conciseness	दावे /Claims: हाँ /Yes
		विवरण द्वारा समर्थित /Supported by description	दावे /Claims: 1-10 हाँ /Yes
			दावे /Claims: हाँ /Yes
			दावे /Claims: 10 नहीं /No

भाग -II विस्तृत तकनीकी रिपोर्ट

PART-II: DETAILED TECHNICAL REPORT

क. उद्धरित दस्तावेजों की सूची /A.List of documents cited:

(क) पेटेंट साहित्य / (a). Patent Literature :

क्र. सं. / SI.no	दस्तावेजों का विवरण /Details of documents	प्रकाशन तिथि(दिन/माह/वर्ष) / Publication date	उद्धरित दस्तावेज का प्रासंगिक विवरण (पृष्ठ व अनुच्छेद संख्या) / Relevant description (page and paragraph no.) of cited document	उद्धरित दस्तावेज के प्रासंगिक दावे / Relevant claims of cited document	अभिकथित आविष्कार के दावे /Claims of alleged invention
1	D1: US20050172910A1	11/08/2015	Paragraph 0004,0010,0034-0044, 0054	claims 1,10,14	1-10
2	D2: CN105516323A	20/04/2016	Paragraph 0005,0009, 0012-0024, 0032-0042		1-10
3	D3: WO2014125419A4	09/10/2014	Paragraph 0006,0013-0018, 0030-0036		1-10

(ख) गैर-पेटेंट साहित्य / (b). Non-patent literature

कोई दस्तावेज उद्धृत नहीं है / No Document Cited

ख. अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियां /B. Detailed observations on the requirements under the Act:

(1).नवीनता / NOVELTY:

(I) ऊपर उद्धरित दस्तावेज के संदर्भ (1-10) में दिये गए प्रकटन के पूर्वानुमान को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-10) में नवीनता की कमी है /

Claim(s) (1-10) lack(s) novelty, being anticipated in view of disclosure in the document cited above under reference D1 for the following reasons:

D1:- US20050172910A1 pub date:- 11/08/2005

Subject matter of claims 1-10 does not constitute an invention under section 2(1)(j) of the Patents Act, 1970 (as amended) because it is not novel in view of D1.

Reference mentioned in parenthesis with respect to cited documents,

1. Independent claim 1:- A water parameters monitoring system for aquaculture needs comprising: a floating sensor node including sensors for measuring water parameters (See D1, Paragraph 0010 and claim 14, clearly mentioning a plurality of sensors for measuring various parameter); a base station wirelessly coupled to at least one floating sensor node (See D1, paragraph 0039, it is describing about input/output data can be sent through telemetry communication means such as RF frequencies, optical frequencies, IR frequencies, ultrasonic frequencies, magnetic effects, Bluetooth) comprising a memory, a transceiver and a processor coupled the memory and the transceiver (see D1, paragraph 0040, describing about how processor processes the data); and a remote monitoring unit wirelessly coupled to the base station (See D1, paragraph 0041, describing about remote monitoring station). All the features can be found in document D1, hence it is not novel in the view of document D1.

2. Independent claim 2:- Additional feature mentioned in Independent claim 2 are "issuing notification to a user's device" (See D1, paragraph 0054, describing about sending notification), "generating control signal" (See D1, paragraph 0040, clearly describing the after analysis by the processor, it may send the control signal to the aqua

system control devices for the dynamically control of parameter) are described in document D1. Hence, it is not novel in the view of D1.

3. Dependent claim's features like "monitoring of various parameters" (See D1, paragraph 0004), regulate the water parameters (See D1, paragraph 0041), uses of control signals (See D1, claim1) also available in document D1. Hence all dependent claims are also not novel in the view of D1.

(2). आविष्कारी कदम / INVENTIVE STEP:

(I) ऊपर उद्धरित दस्तावेज़(जों) के संदर्भ D1, D2, D3 में स्पष्ट अध्यापन(नों) को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-10) में आविष्कारी कदम की कमी है

Claim(s) (1-10) lack(s) inventive step, being obvious in view of teaching (s) of cited document(s) above under reference D1, D2, D3 for the following reasons:

(A)

D2:- CN105516323A, Pub date:- 20/04/2016

D3:- WO2014125419A4 Pub date:- 09/10/2014

Without prejudice to other objections, if applicant argue about the novelty of the invention, then subject matter of claims 1-10 does not constitute an invention under section 2(1)(j) of the Patents Act, 1970 (as amended) because it is not inventive in the view of D2 and D3.

Reference mentioned in parenthesis with respect to cited documents,

1. Independent claim 1:- A water parameters monitoring system for aquaculture needs comprising: a floating sensor node including sensors for measuring water parameters (See D2, paragraph 0009, which describes a sensor module which is having plurality of sensor for measuring various parameters); a base station wirelessly coupled to at least one floating sensor node (See D3, paragraph 0033) , comprising a memory (See D3, paragraph 0030, describing about storing of data at regular interval so can be understood it as a memory) , a transceiver and a processor coupled the memory (See D3, paragraph 0032, describes about sensor's data is processed) and the transceiver (See D3, paragraph 0035); and a remote monitoring unit wirelessly coupled to the base station (See D2, paragraph 0033). So, after combining the feature of D2 and D3 ,it is obvious for the person skilled in art to reach the present invention. Hence, s it is not inventive in the view of D1 and D2.

2. Independent claim 2:- Additional feature mentioned in Independent claim 2 are "issuing notification to a user's device" (See D3, paragraph 0030 ,which describes about sending an alert through various communication means), "generating control signal" (See D2, paragraph 0032, which describing about sending control signal to control the various parameters) also found in document D2 and D3. After combining the feature ,it is obvious for the person skilled in the art, hence it is not inventive in the view of D2 and D3.

3. Dependent claim's features like "regulate the water parameters" (see D2, paragraph 0032), measured parameters breach a threshold value (See D3, paragraph 0035), multiple language supporting application (See D3, paragraph 0034) can be found in the document D2 and D3 and after combining features of D2 and D3 it is obvious for the person skilled in the art, hence it is not inventive in the view of D2 and D3.

(B)

You are requested to give reply containing comprehensive differences between the features of documents D1, D2 and D3 (in tabular form for each feature with its functionalities) with the instant application, the applicant should also:-

1. -indicate the difference between the subject-matter of the claims vis-a-vis the prior art and its significance concerning novelty and inventive step,

2. -identify a problem present in the state of the art, not solvable therein in an obvious manner but solved by and derivable from parts of the originally filed application, which should be stated; and

3. -explain why the proposed independent claims comprise all features essential for the inventive solution of this problem.

4. -specifically, clarify each distinct feature of your invention with respect to components/features of the prior art.

The argumentation in favor of the inventive step should only be based on features, which are actually contained in the independent claim or claims. The application may not be amended in such a way that it contains subject matter, which extends beyond the content of the application as filed.

(3).पेटेंट अयोग्यता /NON PATENTABILITY:

(I) निम्नलिखित कारणों से धारा 3 के खंड (k) के प्रावधान के तहत दावा(वे) (1-10) सांविधिक रूप से पेटेंट योग्य नहीं हैं /
Claim(s) (1-10) are statutorily non-patentable under the provision of clause (k) of Section 3 for the following reasons:

1. Without prejudice to other objections, "Multiple languages supporting application software" claimed in claim 10 is a group of computer programming instructions, which is nothing but a computer program per se. Hence the subject matter of claim 10 is not patentable under section 3(k) of The Patents Act, 1970.

2. The physical constructional features shall be numbered in the apparatus/system claims and the inventive constructional feature shall be incorporated as a characterized portion of the independent claims, in order to define the alleged invention clearly and sufficiently. As such the claims fall U/S 2(1) (j), 10(4) & 3(k) of The Indian Patent Act 1970.

(4).प्रकटन की दक्षता /SUFFICIENCY OF DISCLOSURE:

(I) दावा(वे) 10 विनिर्देश में प्रकट विषय पर आधारित नहीं है अथवा निम्नलिखित कारणों से विनिर्देश में प्रकटन द्वारा समर्थित नहीं है।
Claim(s)'10' are not fairly based on the matter disclosed in the specification or not supported by the disclosure in the specification for the following reasons:

Without prejudice to other objections, "Multiple language supporting application software" claimed in claim 10 is not properly supported by description or drawing that what type of programming is being done to make that application and what algorithm has been used. It should be fully and particularly described in the complete specification as per section 10(4) of the Patents Act, 1970 (as amended), so that it would be sufficient to enable a person in India possessing average skill and average knowledge of the art to which the invention relates to work the invention and to obtain the results claimed for the invention.

(5).स्पष्टता एवं संक्षिप्तता /CLARITY AND CONCISENESS:

(I) दावा(वे) 1-10 के संबंध में स्पष्ट रूप से परीभाषित नहीं हैं।
Claim(s) 1-10 are not clearly worded in respect of:

Without prejudice to other objections,

1. The claims 1 and 2 lack conciseness because they have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. Hence, one independent claim for apparatus may be drafted and other essential feature may be included in principal claim and remaining features may be drafted dependent on principal independent claim. Hence, multiple independent claims should be deleted/ reworded in order to make invention clear and concise and if any new technical feature has been disclosed in the stated claims, and then it should be incorporated in principle claim. More than one independent claim with single inventive concept only in exceptional,

specifically defined cases will be allowable like transmitter-receiver, coding -decoding, these are interlinking with each other. In the present application none of the cases apply and thus multiple independent claims should be deleted/ reworded in order to make invention clear and concise and if any new technical feature has been disclosed in the stated claims, and then it should be incorporated in principle claim.

2. In absence of characterizing of novel/ inventive features in independent claim1 and independent claim2, the subject matter of claims not seems to be clear u/s 10(5) of The Patent Act 1970 and u/r 13(4) of The Patent Rule 2003 .The independent claim should be cast in the two part form where appropriate, with those features known in combination from the prior art and being placed in the preamble and the remaining features being included in the characterizing part. Hence comply with this requirement but within the well defined boundary and scope of the specification disclosed.

(6).अन्य आवश्यकताएँ /OTHERS REQUIREMENTS:

(I)

1. In case the applicant decides to amend the claims subsequent to this report then while amending the specification the following care shall be taken:- (a) The applicant is required to clearly identify/mark the amendments carried out (if any) in a separate copy (from the originally filed set at the time of filing); irrespective of either they concern amendments by addition, correction, replacement or deletion or any amendments in the specification; The applicant should bring the description into conformity with the amended claims. (b) Care should be taken during the revision, especially of the introductory portion & any statements of problem or advantage etc., not to add any subject matter, which extends beyond the content of the application as originally filed. The applicant is requested to effect the amendments by filing replacement pages for only those pages, which have been amended. If any correction is made in any page of the specification that page should be freshly typed and filed in duplicate; The applicant shall undertake that, "In amended pages of specification & drawings, there is no addition of matter or increase in the scope of invention". While filing any amendment, the applicant shall be noted that any addition of new matter into description & claims are not allowed under section 59 of The Patents Act, as amended. While filing the reply, amended claims should be submitted in line with the originally filed claims by strictly adhering to section 59 of The Patents Act, 1970 as amended.

2. Reference numerals should be supplemented in parenthesis to enhance the intelligibility of Claims and clearly define the scope of the invention, in accordance with section 10(4)(c) of The Patents Act 1970 as amended by the Patents (Amendment) Act 2005.

भाग – III: औपचारिक आवश्यकताएँ /PART-III: FORMAL REQUIREMENTS

आपत्तियां /Objections	टिप्पणी /Remarks
Endorsement by /Assignment from Inventor	1. The requirement of sec.7(2) (proof of right) from additional inventors has not been met within the prescribed period as mentioned in the Act. Hence, appropriate Proof of right should be filed accompanied by an appropriate petition.
Date and Signature of Applicant	All necessary Forms 1,2,3,5, 18, drawing pages & last page of claims should be signed by applicants/or applicant's agent originally in a prescribed format. (Name of the agent with original signature and IN/PA no.)
Statement & Under Taking (Form 3 Details)	1. Updated form-3 should be filed with the petition, if applicable. 2. Annexure to form-3 should be filed in the prescribed manner, (i.e with form-3), the only annexure to form-3 is not allowable).

Form 13	<p>1. since, there is an addition of 3 inventors, so separate form 13 for every inventor should be filed in a prescribed manner (with supporting documentation).</p> <p>2. Form 5 has not been submitted within prescribed period as per section 10(6) and rule 13(6). so, it should be filed with the necessary petition along with form 4 in the prescribed manner.</p>
Power of Attorney (Whether GPA, SPA, Stamped, requisite fee etc.)	<p>1. Copy of GPA filed should be clear.</p> <p>2. As per Rule 135(2) of the Patents Rules, 2003 (as amended), any document relating to any proceeding or matter under the Patents Act or Rules shall be addressed upon a patent agent so authorized by the applicant. Further, as per the Patents Act and Rules, the patent agent, who is to be a citizen of India as provided under Section 126(1) of the Act is only authorized to practice before the Controller of Patents as per Section 127(a) of the Act and not any law firm /company in which he/she works. In fact, as per Section 129(2) of the Patents Act, no company or other bodies corporate shall practice as a patent agent in India. In this regard, prescribed Form 26- Para 2 thus, clearly provides to mention the name, address, and nationality of authorized patent agents and not names and addresses of their law firm s/companies. Therefore, you are required to file a fresh PA/GPA in the name of the agent without mentioning the name of the firm they belong to and the application no./nos. should be mentioned for which it is made in the prescribed format as per rule 135(1) of the Patent Rules, 2016 (as amended). Further, the stamp value which is used in PA/GPA should be given as per the provision of the Indian Stamp Act, 1899 (2 of 1899).</p> <p>3. A list of all the applications for which GPA is filed should be submitted.</p>
Registered Agent as per Patent Agent Register	<p>The agent who is currently dealing with the application should positively submit the patent agent number, along with relevant details for verification of the credibility of the agent as required by Chapter XXI of the Indian Patents Act. Also, it must be ensured that Form-1, Form-3, Form-5, and all other related documents are duly signed by that registered patent agent, clearly indicating Name, Patent agent number, and Date as in register of a patent agent.</p>
Other Deficiencies	<p>1. Preamble in Form 2 of complete specification should be written as per prescribed format.</p> <p>2. Form-5 should be submitted as per section 10(6) and rule 13(6) with the necessary petition along with form 4 in the prescribed manner as it was not submitted within stipulated time.</p> <p>3. Since, there is an addition of 4 inventors, so supporting document having consent of both earlier inventors should be filed along with Form 5 and addition of inventor should be done in a prescribed manner. Updated Form 1 should be submitted.</p> <p>4. Note that this Examination is done on the basis of electronically uploaded documents in the e-module only. You may verify all documents as filed are uploaded electronically or not, and bring to the notice of the concerned discrepancies if any.</p>

भाग-IV: रिकॉर्ड में दस्तावेज़ /PART-IV: DOCUMENTS ON RECORD

निम्नलिखित दस्तावेज़ों के आधार पर यह परीक्षण रिपोर्ट तैयार की गयी है

The examination report has been prepared based on the following documents:

कार्यसूची तिथि / Docket Date	कार्यसूची संख्या /Docket Number	प्रविष्टि संख्या विवरण /Entry Number Description
---------------------------------	------------------------------------	--

THE PATENT OFFICE

18 May 2016	18216	1-New Application For Patent With Provisional /Complete Specification
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
01 Jun 2016	21127	OTHERS(NON CASH)
02 Jun 2016	21541	3-Statement & Undertaking - Form 3
18 May 2017	32534	2-Complete After Provisional Specification - Form 2 Check For No. OF Pages & Claims
10 Jul 2017	43611	5-Declaration As To Inventorship - Form 5
29 Aug 2017	54068	28(i)-Request For Examination After 18 months Publication - Form 18
28 Mar 2018	27449	OTHERS(NON CASH)
28 Mar 2018	27449	OTHERS(NON CASH)

नियंत्रक का नाम /Name of the Controller: [Shahid Anwar](#)

नियंत्रक स्थान /Controller Location: [Kolkata](#)

टिप्पणी: परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि / Note: Last date for filing response to the Examination Report:
25/08/2020



Office of the Controller General of Patents, Designs & Trade Marks
 Department of Industrial Policy & Promotion,
 Ministry of Commerce & Industry,
 Government of India

सत्यमेव जयते

(<http://ipindia.nic.in/index.htm>)



(<http://ipindia.nic.in/index.htm>)

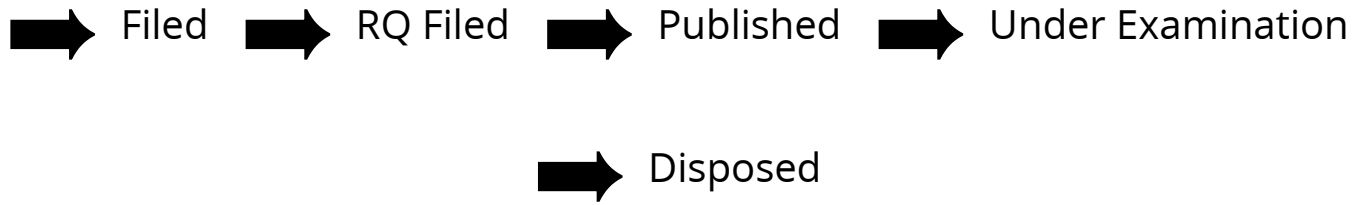
Application Details

APPLICATION NUMBER	201611035281
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	14/10/2016
APPLICANT NAME	INDIAN INSTITUTE OF TECHNOLOGY, DELHI
TITLE OF INVENTION	POLYMER TUBES FOR MANUFACTURING STENTS
FIELD OF INVENTION	MECHANICAL ENGINEERING
E-MAIL (As Per Record)	iprdel@lakshmisri.com
ADDITIONAL-EMAIL (As Per Record)	malathi.l@lakshmisri.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	14/10/2016
PUBLICATION DATE (U/S 11A)	20/04/2018
REPLY TO FER DATE	24/02/2021

Application Status

APPLICATION STATUS	Reply Filed. Application in amended examination
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[View Documents](#)



In case of any discrepancy in status, kindly contact ipo-helpdesk@nic.in



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एकस्व/PATENTS|अभिकल्प/DESIGNS|
व्यापार चिह्न/TRADE MARKS|भौगोलिक
उपदर्शन/GEOGRAPHICAL INDICATIONS



सत्यमेव जयते
भारत सरकार
GOVERNMENT OF INDIA

एकस्व कार्यालय /THE PATENT OFFICE
बौद्धिक सम्पदा भवन / I.P.O. BUILDING
प्लॉट नं. 32/ PLOT NO. 32
सेक्टर -14/ SECTOR 14, द्वारका/ DWARKA
नई दिल्ली/NEW DELHI -110078
दूरभाष /Tel. No. : 011-25300200
फ़ैक्स /Fax : 011-28034301/02/15
ई मेल /Email : delhi-patent@nic.in
वेबसाइट /Website: <http://ipindia.nic.in>

सं.संख्या/Ref.No /आवेदन संख्या/Application No/ 201611035281

दिनांक/Date of Dispatch/Email: 01/09/2020

सेवा में,/To

DR. MALATHI LAKSHMI KUMARAN,
C/O LAKSHMI KUMARAN & SRIDHARAN, B6/10, Safdarjung Enclave New Delhi 110029 India
Email : iprdel@lakshmisri.com, malathi.l@lakshmisri.com

विषय: एकस्व अधिनियम, 1970 की धारा 12 व 13 तथा एकस्व नियम, 2003 के अधीन परीक्षण रिपोर्ट

Subject: Examination report under sections 12 & 13 of the Patents Act, 1970 and the Patents Rules, 2003.

1. उपर्युक्त आवेदन के संदर्भ में परीक्षण रिपोर्ट (अर्थात, एकस्व नियम, 2003 (यथा संशोधित) के नियम 24-ख(3) में विनिर्दिष्ट आपत्तियों का प्रथम कथन) इसके साथ संलग्न है। यह रिपोर्ट परीक्षण हेतु अनुरोध दिनांक 14/10/2016 के उत्तर में जारी की गयी है। परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि (अर्थात, इस रिपोर्ट में लगाई गयी सभी आवश्यकताओं के अनुपालन की अवधि) आवेदक को आपत्तियों का प्रथम कथन जारी होने की तिथि से छः माह है।

Please find enclosed herewith an Examination Report (i.e. a first statement of objections as specified in Rule 24-B(3) of The Patents Rules, 2003 (as amended)) in respect of above-mentioned application. This report is issued with reference to a request for examination dated 14/10/2016. The last date for filing a response to the Examination Report (i.e. a period to comply with all the requirements raised in this examination report) is six months from the date on which the first statement of objections is issued to the Applicant.

2. यदि रिपोर्ट के अंतर्गत लगाई गयी आवश्यकताओं का अनुपालन एकस्व नियम, 2003 (यथा संशोधित) के नियम 24 ख(5) में विनिर्दिष्ट अवधि के भीतर अंदर अनुपालन नहीं किया गया तो एकस्व अधिनियम 1970 की धारा 21(1) के अधीन वर्तमान आवेदन को परित्यक्त माना जाएगा।
The instant application shall be deemed to have been abandoned under Section 21(1) of The Patents Act, 1970, unless all the requirements raised in this report are complied with in the period as specified in Rule 24-B (5) of The Patents Rules, 2003 (as amended).
3. आपका ध्यान एकस्व नियम, 2003 के नियम 24 ख(6) के प्रावधानों की ओर भी आमंत्रित किया जाता है।
Your attention is also invited to the provisions of Rule 24-B (6) of the Patents Rules 2003.
4. आपको सलाह दी जाती है कि शीघ्र निपटान हेतु अपना उत्तर शीघ्र प्रस्तुत करें।
You are advised to file the reply at the earliest for early disposal.

Deep Prakash Gupt
नियंत्रक पेटेंट/ Controller of Patents

संलग्न/Enclosed: अपरोक्त अनुसार/As above

टिप्पणी: यह इलेक्ट्रॉनिक रूप से उत्पन्न रिपोर्ट है।

NOTE: This is an electronically generated report.

सभी पत्राचार नियंत्रक एकस्व को उपरोक्त पते पर भेजा जाये।

All communications should be sent to the Controller of Patents at the above mentioned address.

परीक्षण रिपोर्ट / Examination Report

आवेदन संख्या /Application Number	201611035281
दाखिल करने की तिथि /Date of Filing	14/10/2016
पूर्विका दिनांक /Date of Priority	--
पीसीटी अंतर्राष्ट्रीय आवेदन की संख्या व दिनांक / PCT International Application No. & Date	--
आवेदक /Applicant	INDIAN INSTITUTE OF TECHNOLOGY, DELHI
परीक्षण हेतु अनुरोध की संख्या व दिनांक /Request for Examination No. & Date	R20161029692 14/10/2016
प्रकाशन की तिथि /Date of Publication	20/04/2018

इस परीक्षण रिपोर्ट के चार भाग हैं, अर्थात् रिपोर्ट का सारांश, विस्तृत तकनीकी रिपोर्ट, औपचारिक आवश्यकताएँ तथा रिकॉर्ड में दस्तावेज़ / This examination report consists of four parts, namely summary of the report, detailed technical report, formal requirements and documents on record.

भाग -1: रिपोर्ट का सारांश

PART-I: SUMMARY OF THE REPORT

क्र. सं. /Sl. No.	अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियाँ /Requirements under the Act	दावों की संख्या /Claim Numbers	टिप्पणी /Remarks
1.	धारा 2(1)(ग) के तहत आविष्कार /Invention u/s 2(1)(j)	नवीनता /Novelty	दावे /Claims: 1-11 हाँ /Yes
		आविष्कारी कदम / Inventive step	दावे /Claims: हाँ /Yes
		औद्योगिक उपयोगिता /Industrial Applicability	दावे /Claims: 1-11 हाँ /Yes
			दावे /Claims: नहीं /No
2.	धारा 3 के अधीन पेटेंट-अयोग्यता (यदि हाँ, खंड 3(क-त) /Non-patentability u/s 3 (if yes, specify section3(a-p))	दावे /Claims: हाँ /Yes	
3.	धारा 4 के अधीन पेटेंट-अयोग्यता /Non-patentability u/s 4	दावे /Claims: हाँ /Yes	
4.	धारा 10 (5) के अधीन आविष्कार की एकलता /Unity of invention u/s 10 (5)	दावे /Claims: हाँ /Yes	
5.	धारा 10(4) के अधीन प्रकटन की दक्षता (हाँ/नहीं निर्दिष्ट करें) /Sufficiency of disclosure u/s 10 (4) (Specify Yes/No)	yes	
6.	[धारा 10(5) व 10(4) (ग)] के अधीन दावे /Claims [u/s 10(5) & 10(4) (c)]	स्पष्टता/ संक्षिप्तता /Clarity / Conciseness	दावे /Claims: 1-11 हाँ /Yes
		परिभाषिकता /Definitive	दावे /Claims: हाँ /Yes
		विवरण द्वारा समर्थित /Supported by description	दावे /Claims: 1-11 हाँ /Yes
		क्षेत्र /Scope	दावे /Claims: 1-11 हाँ /Yes

PART-II: DETAILED TECHNICAL REPORT

क. उद्धरित दस्तावेजों की सूची /A.List of documents cited:

(क) पेटेंट साहित्य / (a). Patent Literature :

क्र. सं. / Sl.no	दस्तावेजों का विवरण /Details of documents	प्रकाशन तिथि(दिन/माह/वर्ष) / Publication date	उद्धरित दस्तावेज का प्रासंगिक विवरण (पृष्ठ व अनुच्छेद संख्या) / Relevant description (page and paragraph no.) of cited document	उद्धरित दस्तावेज के प्रासंगिक दावे / Relevant claims of cited document	अभिकथित आविष्कार के दावे /Claims of alleged invention
1	D1: US8444688B2	21/05/2013	(See the whole document)		1-11
2	D2:EP1477130B1	10/08/2011	(See the whole document)		1-11
3	D3:US2008097591A1	24/04/2008	(See the whole document)		1-11
4	D4:US9265638B2	23/02/2016	(See the whole document)		1-11

(ख) गैर-पेटेंट साहित्य /(b).Non-patent literature

कोई दस्तावेज उद्धृत नहीं है /No Document Cited

ख. अधिनियम के तहत आवश्यकताओं पर विस्तृत टिप्पणियां /B. Detailed observations on the requirements under the Act:

(1).आविष्कारी कदम / INVENTIVE STEP:

(I) ऊपर उद्धरित दस्तावेज(जों) के संदर्भ D1-D4 में स्पष्ट अध्यापन(नों) को ध्यान में रखते हुए, निम्नलिखित कारणों से दावा(वों) (1-11) में आविष्कारी कदम की कमी है

Claim(s) (1-11) lack(s) inventive step, being obvious in view of teaching (s) of cited document(s) above under reference D1-D4 for the following reasons:

D1(US8444688B2) Covered stents with degradable barbs.

D1 teaches a removable stent for providing reinforcement to a selected region of a selected body lumen including a resilient cylindrical layer, including at least one bioresorbable extrusion exterior from the resilient cylindrical layer for resisting migration of the removable stent when the removable stent is positioned in the selected region of the selected body lumen. The present invention also includes a temporary implantable endoprosthesis which includes a tubular, radially compressible and axially flexible structure, including at least one bioresorbable extrusion exterior from the resilient cylindrical layer for resisting migration of the removable stent when the removable stent is positioned in the selected region of the selected body lumen. After delivery device 801 has been assembled and is ready for use, the hydrophilic coating is wetted with physiological saline solution by injecting the solution through extension tube 807, past proximal tube 804 and into the space between inner

wall 1001 and outer wall 1002 of the double-walled section of hose 901. Excess fluid exits from the hole 902 formed toward the distal end of the double-walled section of hose 901 (See the whole document)

D2(EP1477130B1) Flexible segmented stents.

D2 teaches A balloon expandable segmented stent (10) comprising a plurality of aligned, generally annular and radially expandable stent segments (12), segments (12) adjacent one another being interconnected by a plurality of interconnector elements (14) of a plastically reformable polymeric material and the segments are of a metal material to provide flexible yet constrained relative motions between the stent segments (12), wherein the stent segments (12) are coated with a polymeric material and the interconnector elements (14) are fused to the polymeric coating. the interconnector elements (14) are made of biodegradable material selected from the group consisting of polycaprolactone, polyglycolic acid and polylactic acid. (See the whole document)

D3(US2008097591A1) Drug-delivery endovascular stent and method of use.

D3 teaches an improvement in drug-eluting stents, and method of their making are disclosed. The surface of a metal stent is roughened to have a surface roughness of at least about 20 μin (0.5 μm) and a surface roughness range of between about 300-700 μin (7.5-17.5 μm). The roughened stent surface is covered with a polymer-free coating of a limus drug, to a coating thickness greater than the range of surface roughness of the roughened stent surface. (See the whole document)

D4(US9265638B2) One-piece stent implanter.

D4 teaches a one-piece stent implanter, including a front handle and a rear handle; the front end of the front handle is provided with an outer pipe whose top is flexibly connected with a cautery tip, the outer pipe is internally provided with a middle pipe and a stent; the rear handle includes a stainless steel pipe for supporting and an inner pipe positioned in the stainless steel pipe, the top of the inner pipe is fixedly connected to the cautery tip; one end of the middle pipe is mutually touched and connected with one end of the stent, while the other end of the middle pipe is mutually connected with the stainless steel pipe; one end of the stent is close to the cautery tip, with a certain gap kept; when the front handle is retreated along the stainless steel pipe, the outer pipe simultaneously retreats and separates from the cautery tip, positions of the middle pipe and the rear handle remain unchanged, and the stent is automatically released. The invention wherein the stent can be directly implanted into a nidus organ incised and an access from the outside to the nidus organ is established, so that other medical apparatuses and instruments can be continuingly used for removal (including other surgeries) of infectious agents or necrotic tissues, thus increasing comprehensiveness of surgeries and avoiding patients from suffering from repeated operations. (See the whole document)

By combining the documents D1 to D4, a person skilled in the art can solve the problem as disclosed in the present invention. Hence the subject matter of claims 1 to 11 of the present invention cannot be considered to be inventive in the combination of cited documents. In view of the cited documents, Invention claimed in claims lacking inventive step and does not comply with under section 2(1) (ja) of The Patents Act, 1970.

(2). आविष्कार की एकलता /UNITY OF INVENTION:

(I) दावा(वों) 1-11 में आविष्कार की एकलता की कमी है क्योंकि दावे किसी एक आविष्कार या आविष्कारों का समूह जो मिलकर एक आविष्कारी संकल्पना की संरचना करें उससे संबंधित नहीं हैं। Claim(s) 1-11 lack(s) unity of invention as the claims do not relate to a single invention or to a group of inventions linked so as to form a single inventive concept:

1. The present invention does not complied with section 10 (5) of the Patent act, 1970. In the present alleged invention, claims 1-5 defines about "An extrusion assembly", claim 6 defines "A polymer tube manufactured using an extrusion assembly" and claims set 7-11 define about "A slotted tube assembly". Hence it does not complied with concept of single inventive concept of the patent application.

(II) इस आवेदन का दावा (के दावे) सह-लंबित आवेदन संख्या के दावे के परस्पर विरोध में है।
Claim(s) of the instant application conflict(s) with claim(s) of co-pending application no.

(4). प्रकटन की दक्षता /SUFFICIENCY OF DISCLOSURE:

(5). परिभाषिकता /DEFINITIVENESS:

(I) दावा(ते) 1-11 निम्नलिखित कारणों से आविष्कार को पर्याप्त रूप से परिभाषित नहीं करता(ते) हैं

Claim(s) 1-11 do not sufficiently define the invention for the reasons as follows:

1. The phrase "any of the preceding claims" in the dependent claims is not definitive.
2. The phrase "further comprising" shall be removed as it is very unclear to define the scope of the invention with the broader claims drafted in such fashion.
3. The use of terms: "plurality", "predetermined", "less than or equal to" and "at least"; make the claims too broad and vague. The claims are indefinite, too broad and do not define the scope of the invention.
4. Claims 1 and 7 define a plurality of distinct inventions. The various definitions of the subject matter make it difficult to determine the matter for which protection is being sought. Thus the claims as a whole are not clear and not concise, and the requirement of section 10(5) of the Act is not met. Hence claims should be amended in such a manner that amended claim will consist one independent claim per category (product or process) including all essential features of the invention followed by the dependent claims as appropriate and claims should be linked in such a way that they form a single inventive concept.

(6). अन्य आवश्यकताएँ /OTHERS REQUIREMENTS:

(I)

1. Reference numerals should be incorporated in the claims for more intelligibility.
2. Independent/ Principal Claims have to be duly characterized in order to delineate the inventive part from the known features.
3. In case the applicant decides to amend the claims subsequent to this report, the same shall be drafted afresh to include the technical advancement over the prior art cited in FER as required u/s 2(1)(j) of the Patent's Act. Please indicate in the response communication the support for such amendments claims in the original specification, as required u/s 10(4) of the Act. Care shall be taken that requirement section 59 (1) of the Act is also met. Please provide an additional copy of marked up amendments (highlighting the amendments) where ever applicable.
4. At the end of the claim specification applicant/agent signature with date shall be provided.
5. Amendments if any should be in compliance with section 59(1) of The Patents Act, 1970.
6. Claim 6 defines the use of the invention. it shall be deleted.
7. claim 10 is broad in nature. it shall be reworded.

भाग – III: औपचारिक आवश्यकताएँ /PART-III: FORMAL REQUIREMENTS

आपत्तियां /Objections	टिप्पणी /Remarks
Time line of Application	<ol style="list-style-type: none"> 1. Details regarding the search and/or examination report including claims of the application allowed, as referred to in Rule 12(3) of the Patent Rule, 2003, in respect of same or substantially the same invention filed in all the major Patent offices along with appropriate translation where applicable, should be submitted within a period of Six months from the date of receipt of this communication as provided under section 8(2) of the Indian Patents Act. 2. Latest status of foreign filing particulars, if any, should be communicated to this office at the

THE PATENT OFFICE

	<p>earliest. Details regarding application for Patents which may be filed outside India from time to time for the same or substantially the same invention mentioned in form-3 appears incomplete & hence the same should be furnished within Six months from the date of filing of the said application under clauses (a) & (b) of sub-section (1) of section 8 and rule 12(1) & 12(2) of Indian Patent Act & Rules 2003.</p>
Format of Drawings	<p>1. Application number & name of the applicant should be mentioned at the left-hand side top corner of each drawing sheets. Similarly, the total number of sheets & sheet numbers should be mentioned at right-hand side top corner of each drawing sheet. Each drawing sheet should be signed by the applicant/agent at the right-hand side bottom corner of each drawing sheet & the name of signatory should be mentioned below the signature. Drawings shall be sufficiently large to show the invention clearly and dimensions shall not be marked on the drawings. Figures of drawings shall be serially numbered as well as the elements of figures shall be marked with reference numerals. Then these Figures and elements of figures shall be referred in description while describing them. No descriptive matters shall appear on the drawings except in the flow diagrams (Refer rule 15 of The Patent Rules 2003 (as amended)).</p>
Other Deficiencies	<p>1. Applicant/agent signature with Name of the Signatory shall be provided on all forms. 2. Patent Application number shall be stated at the left-hand side top corner of each drawing sheet, in form 3, form 18 and form 5. 3. A separate list of reference numeral with corresponding components of the claimed invention may be provided in separate sheet.</p>

भाग-IV: रिकॉर्ड में दस्तावेज़ /PART-IV: DOCUMENTS ON RECORD

निम्नलिखित दस्तावेज़ों के आधार पर यह परीक्षण रिपोर्ट तैयार की गयी है

The examination report has been prepared based on the following documents:

कार्यसूची तिथि / Docket Date	कार्यसूची संख्या /Docket Number	प्रविष्टि संख्या विवरण /Entry Number Description
14 Oct 2016	49184	1-New Application For Patent With Provisional /Complete Specification
14 Oct 2016	49184	28(i)-Request For Examination After 18 months Publication - Form 18
07 Dec 2016	60126	45-Form Of Authorisation Of Patent Agent - Form 26
07 Dec 2016	60126	Miscellaneous - Form 30
09 Dec 2016	60753	OTHERS(NON CASH)
09 Dec 2016	60753	OTHERS(NON CASH)
09 Dec 2016	60753	OTHERS(NON CASH)
09 Dec 2016	60753	OTHERS(NON CASH)

नियंत्रक का नाम /Name of the Controller: **Deep Prakash Gupt**

नियंत्रक स्थान /Controller Location: **Chennai**

टिप्पणी: परीक्षण रिपोर्ट का उत्तर दाखिल करने की अंतिम तिथि / Note: Last date for filing response to the Examination Report: **01/03/2021**

We claim:

1. An extrusion assembly (100) comprising:

an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

5 an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

10 a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) comprises a plurality of through holes extending from inner surface of the slotted tube (106) to outer surface of the slotted
15 tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.

20 2. The extrusion assembly (100) as claimed in claim 1, wherein the extrusion assembly (100) comprises:

a sizing die (116) having an adjustable opening, wherein the sizing die (116) is to modulate, through the adjustable opening, size parameters of the polymer tube;

25 a water bath (118) coupled to the sizing die, wherein the water bath (118) comprises a container to store water, and wherein the water bath (118) is to allow the polymer tube through it for cooling and hardening the polymer tube;

a plurality of rollers (120) to rotate in a predetermined direction to apply a pulling axial force on the polymer tube extruded out of the annular die (104), wherein the polymer tube passes the sizing die and the water bath to reach the rollers
30 (120).

3. The extrusion assembly (100) as claimed in claim 2, wherein the plurality of rollers (120) comprises at least two rollers for applying the pulling force to the polymer tube.

4. The extrusion assembly (100) as claimed in claim 1, wherein the plurality of
5 through holes is distributed in a predefined arrangement on the outer surface of the slotted tube (106).

5. The extrusion assembly (100) as claimed in claim 3, wherein the predefined arrangement is a spiral arrangement.

6. The extrusion assembly (100) as claimed in claim 1, wherein the polymer melt is
10 of a polymer material including at least one of Polylactic Acid (PLA), Poly Hydroxy Alkanoate (PHA), Polycaprolactone (PCL), and Polyglycolic Acid (PGA).

7. The extrusion assembly (100) as claimed in claim 1, wherein the diameter of the slotted tube (106) is about 1.5-2.0 millimeter (mm).

Dated this 14th day of October 2016

15

GAURAV GUPTA

IN/PA-2234

AGENT FOR THE APPLICANT

To

20 **The Controller of Patents**

The Patent Office at New Delhi

~~1~~We claim:

1. An extrusion assembly (100) comprising:

an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

5 an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

10 a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) ~~further~~ comprises a plurality of through holes extending from inner surface of the slotted tube (106) to outer surface of the
15 slotted tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.

20 2. The extrusion assembly (100) as claimed in claim 1, ~~further~~ wherein the extrusion assembly (100) comprises:

a sizing die (116) having an adjustable opening, wherein the sizing die (116) is to modulate, through the adjustable opening, size parameters of the polymer tube;

25 a water bath (118) coupled to the sizing die, wherein the water bath (118) comprises a container to store water, and wherein the water bath (118) is to allow the polymer tube through it for cooling and hardening the polymer tube;

a plurality of rollers (120) to rotate in a predetermined direction to apply a pulling axial force on the polymer tube extruded out of the annular die (104), wherein the polymer tube passes the sizing die and the water bath to reach the rollers
30 (120).

3. The extrusion assembly (100) as claimed in claim 2, wherein the plurality of rollers (120) comprises at least two rollers for applying the pulling force to the polymer tube.

4. The extrusion assembly (100) as claimed in claim 1, wherein the plurality of through holes is distributed in a predefined arrangement on the outer surface of the slotted tube (106).

5. The extrusion assembly (100) as claimed in claim 3, wherein the predefined arrangement is a spiral arrangement.

~~6. A polymer tube manufactured using an extrusion assembly as claimed in any one of the preceding claims.~~

~~7. A slotted tube assembly comprising:~~

~~an annular die having a first end, a second end, and a circular opening, wherein the annular die is to pass, through the circular opening, a polymer melt for extrusion into a polymer tube;~~

~~a slotted tube having its one end coupled to the annular die such that a portion of the slotted tube is surrounded by the annular die and the slotted tube is coaxially aligned with the circular opening of the annular die, wherein the slotted tube further comprises a plurality of through holes extending from inner surface of the slotted tube to outer surface of the slotted tube; and~~

~~an air inlet coupled to the slotted tube to provide a flow of pressurized air into the slotted tube, wherein the slotted tube is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.~~

~~8. The slotted tube assembly as claimed in claim 6, wherein the plurality of through holes are distributed in a predefined arrangement on the outer surface of the slotted tube.~~

~~9. The slotted tube assembly as claimed in claim 7, wherein the predefined arrangement is a spiral arrangement.~~

~~106.~~ The ~~slotted tube assembly~~ extrusion assembly (100) as claimed in claim ~~6~~1, wherein the polymer melt is of a polymer material including at least one of

Polylactic Acid (PLA), Poly Hydroxy Alkanoate (PHA), Polycaprolactone (PCL), and Polyglycolic Acid (PGA).

~~117~~. The ~~slotted tube assembly~~ extrusion assembly (100) as claimed in claim ~~61~~, wherein the diameter of the slotted tube (106) is about 1.5-2.0 millimeter (mm).



REPLY TO THE EXAMINATION REPORT

24 February 2021

The Controller of Patents,
The Patent Office,
IPO Building,
Plot No. 32, Sector 14, Dwarka
New Delhi-110078,
India

KIND ATTN: Shri. Deep Prakash Gupta, Controller of Patents

Re: Indian Patent Application No. 201611035281 dated 14 October 2016

Applicant(s) : INDIAN INSTITUTE OF TECHNOLOGY, DELHI
TITLE : POLYMER TUBES FOR MANUFACTURING STENTS
Our Ref. : PD021609IN-SC

Dear Sir,

This is further to the First Examination Report (FER) issued on 01 September 2020 in respect of the above patent application. The Applicant hereby submits response to all the objections of the FER. The 6-month due date to put the application in order for grant is 01 March 2021.

RESPONSE TO THE FER

Summary of Amendments:

1) Claims 1 to 11 were pending at the time of receiving the FER. The Applicant has deleted the pending claims 6, 7, 8, and 9. The Applicant has further amended and renumbered the remaining claims as claims 1 to 7. The Applicant submits herewith amended and renumbered claims 1 to 7 and asserts that no new subject matter has been added as a result of the amendments. The Applicant submits that amended and renumbered claims 1 to 7 are in compliance with the provisions of The Patents Act, 1970.

Response to Objections raised under Part II of the Report:

Objection (1): Inventive step

2) The Controller has objected to pending claims (1 to 11) for lacking inventive step when considered in light of the cited references D1: US8444688B2, D2: EP1477130B1, D3: US2008097591A1, and D4: US9265638B2.

Inventive Step:

3) The Applicant submits that amended and renumbered claims 1 to 7, submitted herewith, involve an inventive step over the cited documents D1 to D4, because of the reasons given in following paragraphs.

4) The claimed subject matter relates to an extrusion assembly. The extrusion assembly comprises an extruder having an outlet with a specific diameter. The extruder is to release through the outlet a polymer melt. The extrusion assembly also comprises an annular die having a first end, a second end and a circular opening, coaxially coupled to the extruder. The diameter of the annular die is less than or equal to the specific diameter and the annular die is in fluid communication with the extruder such that the annular die is to pass the polymer melt for extrusion into a polymer tube. The extrusion assembly further comprises a slotted tube having its one end coupled to the annular die such that a portion of the slotted tube is surrounded by the annular die and the slotted tube is coaxially aligned with the circular opening of the annular die. The slotted tube comprises a plurality of through

holes extending from inner surface of the slotted tube to outer surface of the slotted tube. Furthermore, an air inlet is coupled to the slotted tube to provide a flow of pressurized air into the slotted tube. The slotted tube is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.

5) The Applicant thus submits that the claimed subject matter provides efficient extrusion of polymer tubes for stent application using a continuous single-step biaxial expansion setup. The biaxial expansion in the continuous single-step prevents use of additional resources and devices, and makes the overall process cost efficient. Further, the extrusion assembly prevents contamination of the polymer tubes and reduces wastage of the expensive polymer material. The claimed subject matter thereby allows fabrication of a biaxially expanded polymer tubes in a single step and enhances mechanical performance of the fabricated polymer tubes. Based on the above, the Applicant submits that the claimed subject matter includes a technical advance.

6) The Applicant asserts that the cited documents D1 to D4 do not disclose the claimed extrusion assembly of the present subject matter as described in the as-filed specification.

7) D1, D2, D3, and D4 either alone or in combination, do not disclose the inventive features of the subject matter as claimed in amended independent claim 1.

8) The Applicant submits that the cited reference D1 is directed at a removable stent for providing reinforcement to a selected region of a selected body lumen. The removable stent comprises a resilient cylindrical layer and at least one bioresorbable extrusion exterior from the resilient cylindrical layer for resisting migration of the removable stent when the removable stent is positioned in the selected region of the selected body lumen. D1 discloses a temporary implantable endoprosthesis which includes a tubular, radially compressible and axially flexible structure, including at least one bioresorbable extrusion exterior from the resilient cylindrical layer for resisting migration of the removable stent when the removable stent is positioned in the selected region of the selected body lumen. (Refer Abstract of D1).

9) The cited document D1 however nowhere discloses or suggests:

“an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) comprises a plurality of through holes extending from inner surface of the slotted tube (106) to outer surface of the slotted tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.”, as recited in amended independent claim 1.

10) The cited document D1 discusses a removable metallic stent and preventing the stent migration after deployment with the help of the barbs. In contrast, the present invention is about the single step continuous biaxial expanded extrusion process of polymeric tubes for stent (Bioresorbable or non-removable stents) application. The removable stent disclosed in the cited document D1 is metallic with just one layer of bioresorbable polymer for drug delivery purposes. However, in the present invention the entire stent consists of bioresorbable polymeric material.

11) In the present invention, the polymer tubes are fabricated by using the novel and inventive extrusion process and the process of fabrication, as recited in amended independent claim 1. The cited document D1 however nowhere discusses or teaches a fabricated method for the braids used for stent fabrication. D1 discloses a knitted or braided stent, however the present invention discloses a Femtosecond laser-cut stent. The cited document D1 deals with the removable stents' improved fixation characteristics with the help of barbs. On the contrary, there are no fixation

characteristics discussed or reported in the present invention. The present invention discusses that the mechanical properties of the biaxially expanded bioresorbable tubes are enhanced by using the novel extrusion method, as recited in amended independent claim 1. However, there are no details about the mechanical properties of the above said stents in the cited document D1. Therefore, D1 nowhere discloses the inventive features of claimed subject matter and nowhere addresses the technical problem being solved by the claimed subject matter.

12) The Applicant submits that the cited reference D2 relates to a multiple interconnected stents or stent segments, the interconnections comprised of lengths of a plastic material. D2 discloses that the stents are made up of hybrid material, i.e., a combination of metallic and polymeric material. Further, D2 describes the use of different materials in the stent for its connector and other parts, but D2 fails to disclose fabrication process of the stent tubing.

13) However, the cited document D2 nowhere discloses or suggests:

“an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) comprises a plurality of through holes extending from inner surface of the slotted tube (106) to outer surface of the slotted tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.”, as recited in amended independent claim 1.

14) The cited document D2 thus nowhere teaches or suggest a novel extrusion process of polymeric tubes for stent application using the continuous single-step biaxial expansion setup, as recited in amended independent claim 1. D2 teaches using a different material for the stent connector and stent i.e., polymer (deformable) material for the stent connector and metallic self-expanding material for the stent. In contrast, the present invention discloses fabricating the entire tube using polymer or polymer blend with no use of metallic or self-expanding material. The stent disclosed in the cited document D2 is of closed type design. The present invention however nowhere discusses such design as it is a polymer tube manufacturing method. D2 thus provides no teaching on a novel extrusion process of polymeric tubes for stent application using the continuous single-step biaxial expansion setup. Therefore, D2 nowhere discloses the inventive features of claimed subject matter and nowhere addresses the technical problem being solved by the claimed subject matter.

15) The Applicant submits that the cited reference D3 is directed to improve the drug-eluting metallic stent by changing the surface roughness of the stent. The stent disclosed in D3 has just one layer of polymer for drug-eluting function. However, D3 fails to disclose a method of fabricating the polymer tubes for the stent application.

16) The cited document D3 nowhere discloses or suggests:

“an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) comprises a plurality of through holes

extending from inner surface of the slotted tube (106) to outer surface of the slotted tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.”, as recited in amended independent claim 1.

17) According to the cited document D3, the surface roughness of the stent was increased. D3 discloses that different methods such as abrading, laser etching, peening were used for changing the surface roughness. However, the present invention does not mention surface roughness and there are no changes in surface roughness. Therefore, D3 nowhere discloses the inventive features of claimed subject matter and nowhere addresses the technical problem being solved by the claimed subject matter.

18) The Applicant submits that the cited reference D4 relates to a one-piece stent implanter including a front handle and a rear handle. D4 discloses that the front end of the front handle is provided with an outer pipe whose top is flexibly connected with a cautery tip. The outer pipe is internally provided with a middle pipe and a stent. The rear handle disclosed in D4 includes a stainless-steel pipe for supporting and an inner pipe positioned in the stainless-steel pipe. The top of the inner pipe is fixedly connected to the cautery tip.

19) The cited document D4 discloses that one end of the middle pipe is mutually touched and connected with one end of the stent, while the other end of the middle pipe is mutually connected with the stainless-steel pipe. According to D4, one end of the stent is close to the cautery tip, with a certain gap kept. Further, when the front handle is retreated along the stainless-steel pipe, the outer pipe simultaneously retreats and separates from the cautery tip, positions of the middle pipe and the rear handle remain unchanged, and the stent is automatically released. The stent disclosed in D4 is directly implanted into a nidus organ incised and an access from the outside to the nidus organ is established. (Refer Abstract of D4)

20) However, the cited document D4 nowhere discloses or suggests:

“an extruder (102) having an outlet (112) with a specific diameter, wherein the extruder (102) is to release through the outlet a polymer melt;

an annular die (104) having a first end, a second end and a circular opening, coaxially coupled to the extruder (102), wherein diameter of the annular die (104) is less than or equal to the specific diameter, and wherein the annular die (104) is in fluid communication with the extruder (102) such that the annular die (104) is to pass the polymer melt for extrusion into a polymer tube;

a slotted tube (106) having its one end coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104) and the slotted tube (106) is coaxially aligned with the circular opening of the annular die (104), wherein the slotted tube (106) comprises a plurality of through holes extending from inner surface of the slotted tube (106) to outer surface of the slotted tube (106); and

an air inlet (114) coupled to the slotted tube (106) to provide a flow of pressurized air into the slotted tube (106), wherein the slotted tube (106) is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.”, as recited in amended independent claim 1.

21) The cited document D4 recites one stent implanter device used to implant the stent at the deployment site. However, the cited document D4 nowhere teaches or suggest a novel extrusion process of polymeric tubes for stent application using the continuous single-step biaxial expansion setup. D4 discusses the invention of a one-piece stent implanter, in contrast the present invention is about one step extrusion of biaxially expanded polymeric tubes. D4 is directed to the implantation of the stent, however the present invention discusses fabrication of polymeric tube for stent application. In the cited document D4, the stent carrying device is used for implantation. On the contrary, in the present invention, the stent is made by cutting the tube using femtosecond laser cutting. The device disclosed in the cited document D4 has a variable cross-section, however the manufactured tube of the present invention has a uniform cross-section. Therefore, D4 nowhere discloses the inventive features of claimed subject matter and nowhere addresses the technical problem being solved by the claimed subject matter.

22) As discussed above, none of the cited documents D1 to D4 describe the subject matter as claimed in amended independent claim 1. In light of the differences as discussed, a person skilled in the art would not be in position to adapt or modify the teachings of D1 to D4 (taken either alone or in combination with each other) to arrive at the solution of the claimed subject matter. Therefore, the subject matter as claimed in amended independent claim 1 involves an inventive step over D1 to D4. Further, amended and renumbered dependent claims (2 to 7) are also inventive over D1 to D4, at least by virtue of their dependence on amended independent claim 1. Therefore, the objection related to inventive step is addressed.

Objection (2): Unity of Invention

23) In response to the present objection, the Applicant has deleted claims 6 to 9. The Applicant submits that amended and renumbered claims 1 to 7 include one independent claim 1 directed to an extrusion assembly. The Applicant submits that amended and renumbered claims 1 to 7 are tied together with a common inventive step as **explained in the Objection (1): Inventive step above** and therefore clearly determines the matter for which protection is sought and clearly establishes the extent of the protection. The Applicant thus submits that amended and renumbered claims, submitted herewith, relate to a single group of invention and form a single inventive concept for satisfying requirement for unity of invention as per Section 10(5) of The Patents Act, 1970. In light of this, the Applicant requests the Controller to withdraw the present objection.

Objection (5): Definitiveness

24) (1) The Applicant submits that amended and renumbered claims, submitted herewith, do not include the phrase “one of the preceding claims”. In light of this, the Applicant requests the Controller to withdraw the present objection.

25) (2) In response to the present objection, the Applicant has amended the term “further comprising” by deleting the term “further”, wherever applicable. The Applicant has retained the term “comprising”, since the word “comprising” does not restrict the scope of the claims and usage of such a word is neither restricted by The

Patents Act nor by the (Manual of Patent Office Practice and Procedure) MPPP. In fact, clause 05.03.16 (p) clearly states that “The transition phrase may be words or phrases such as: comprising of/including/consisting of/ consisting essentially of”. The Controller is thereby requested to withdraw the present objection.

26) (3) The Applicant submits that the phrase “plurality” recited in amended claims 1, 2, 3, and 4 relates to multiple through holes and a plurality of rollers as described in Paragraphs [0016], [0022], [0024], [0025] and also shown in Fig. 2(a), Fig. 2(b), Fig. 2(c), and Fig. 2(d) of the as-filed complete specification. The Applicant asserts that it has been clearly explained in the claim that slotted tube includes a plurality of through holes to supply the pressurized air to the polymer tube passing over the slotted tube and the extrusion assembly includes a plurality of rollers for simultaneously pulling the polymer tube passing over the slotted tube. Thus, need of having the plurality of through holes and plurality of rollers is clearly indicated in the claim.

27) The Applicant further submits that the phrase “predetermined” recited in amended claim 2 recites position of multiple rollers. The multiple rollers are positioned after the water bath to rotate and pull the polymer tube after the polymer tube is passed through the water bath, as described in Paragraph [0025] of the as-filed description. Therefore, the Applicant has retained the phrase “predetermined” used in amended claim 2.

28) Furthermore, the Applicant further submits that the phrases “less than or equal to”, and “at least” have a well-recognized meaning and are in use in general practice for the same meaning. Therefore, the Applicant has retained the phrases “less than or equal to” and “at least” used in the claims. In light of this, the Applicant requests the Controller to withdraw the present objections.

29) (4) The Applicant has explained under **Objection (2): Unity of Invention** that amended and renumbered claims 1 to 7 form a single inventive concept for satisfying requirement for unity of invention. The Controller is thereby requested to withdraw the present objection.

Objection (6): Other Requirements

30) (1) The Applicant submits herewith amended claims including the reference numerals, in parenthesis, wherever applicable. The Controller is thereby requested to withdraw the present objection.

31) (2) The Applicant states that introducing the characterized portion would require unduly complex claim wording and would render the claims difficult to understand. Hence, the Applicant has retained the independent claims in the one-part format which clearly and succinctly defines the claimed subject matter and submits that the novelty and the inventive step is exhibited by a combination of the features recited in the independent claim(s). In light of this, the Applicant requests the Controller to withdraw the present objection.

32) (3) The Applicant submits that amended and renumbered claims 1 to 7, submitted herewith, include technical advancement over the prior art as required u/s 2(1)(j) of the Patents Act **as explained in relation to Objection (1): Inventive step above**. The Applicant submits herewith a marked-up copy of amended and renumbered claims. The Applicant has made clarificatory amendments and not carried out substantial amendments in the claims. The Applicant also submits that no new subject matter has been added thereby meeting the requirements of Section 59(1) of The Indian Patents Act. In addition, the Applicant submits herewith marked up copy of amended claims. The Controller is thereby requested to withdraw the present objections.

33) (4) The Applicant submits that the last page of the as-filed claims (as a part of Form 2) bears the digital signature of the agent of the Applicant, whose name is indicated on the last page of the as-filed claims and mentions the date. The Applicant further submits that the last page of the amended claims in clean version, submitted herewith, is digitally signed by the agent of the Applicant, whose name is indicated on the last page of the as-filed claims and including the date. In view of the above, the Controller is kindly requested to consider the amended claims submitted with the response for the grant and withdraw the present objection.

34) (5) The Applicant submits that amended claims, submitted herewith, are in compliance with Section 59(1) of The Patents Act, 1970. The Controller is thereby requested to withdraw the present objection.

35) (6) In response to the present objection, the Applicant has deleted pending claim 6. The Controller is thereby requested to withdraw the present objection.

36) (7) The Applicant submits that amended and renumbered dependent claim 6 (corresponding to the original claim 10) recites that the polymer melt is made of the polymer material which includes Polylactic acid (PLA), Poly Hydroxy Alkanoate (PHA), Polycaprolactone (PCL), and Polyglycolic acid (PGA), as clearly described in Paragraph [0026] of the as-filed description. The Applicant thus submits that amended and renumbered dependent claim 6 is elaborating the features of amended independent claim 1 and is read with the features of amended independent claim 1. Thus, clearly defining the scope of invention as per Section 10(4)(c) of The Patents Act. The Controller is thereby requested to withdraw the present objection.

Part III: Formal Requirements

Time line of Application

37) (1) The Applicant submits that no foreign application corresponding to the present application has been filed. Thus, Section 8(2) details are not provided for the present application. The Controller is thereby requested to withdraw the present objection.

38) (2) The Applicant submits that no foreign application corresponding to the present application has been filed. Thus, updated Form 3 submission is not required for the present application. The Controller is thereby requested to withdraw the present objection.

Format of Drawings

39) The Applicant submits that the application number for an Indian patent application is issued after the filing of said Indian patent application and therefore the application number is not available during filing for the Applicant to mention it in each drawing sheet. The Applicant asserts that Rule 15 and other Rules of the Patents Rules nowhere indicate that the Indian patent application number should be mentioned in drawing sheets. The Applicant further submits that the as-filed drawings bear the name of the Applicant at left-hand top corner of each drawing

sheet, the name of the agent of the Applicant at right-hand bottom corner of each drawing sheet, and the total number of sheets, and the consecutive number of each drawing sheet at right-hand top corner of each drawing sheet as per Rule 15 of the Patent Rules. The as-filed drawings have been e-filed, therefore bear digital signature the agent of the Applicant, whose name is indicated on each drawing sheet.

40) The Applicant asserts that the as-filed drawings are sufficiently large and show the invention clearly and dimensions are not marked on the drawings. The Applicant further submits that figures of drawings are serially numbered as well as the elements of figures are marked with the reference numerals, wherever necessary. The Applicant also submits that figures and elements of figures are referred in the description while describing them. Furthermore, the Applicant submits that the as-filed drawings do not include any descriptive matter. Thus, no amendment is required in this regard. The Controller is thereby requested to withdraw the present objection.

Other Deficiencies

41) (1) The Applicant submits that the as-filed Form 3, the as-filed Form 5, the as-filed Form 18, the last page of the as-filed claims and each drawing sheet (as a part of Form 2), and the as-filed Form 26 indicate the name of the agent/Applicant (as applicable and at appropriate place). The Applicant further submits that the above-mentioned Forms have been e-filed, therefore bear the digital signature of the agent of the Applicant, whose name is indicated in the respective Forms. The as-filed Form 26 includes the ink signature of the Applicant. The Applicant submits herewith fresh Form 1 bearing the name of the agent of the Applicant and the digital signature of the agent of the Applicant. The Controller is thereby requested to withdraw the present objection.

42) (2) This objection has been addressed above under Paragraph 39 of the present document. The Applicant submits that the as-filed Form 3, the as-filed Form 5, and the as-filed Form 18 have been filed at the time of filing the Indian patent application. The Applicant further submits that the application number for an Indian patent application is issued after the filing of said Indian patent application and

therefore the application number is not available during filing for the Applicant to mention it in the above-mentioned Forms. Nevertheless, the Applicant submits herewith fresh copies of Form 3, Form 5, and Form 18 including the Indian patent application number. The Controller is thereby requested to withdraw the present requirement.

43) (3) The Applicant submits herewith a separate list of reference numerals with corresponding components of the claimed invention on a separate sheet. The Controller is thereby requested to withdraw the present objection.

PRAYER

It is therefore prayed that:

- (a) the objections may be dropped;
- (b) the application may be favorably considered for early grant; and
- (c) a personal hearing may be granted in the event of any outstanding issue.

Dated: 24 February 2021

GAURAV GUPTA
IN/PA-2234
OF LAKSHMIKUMARAN AND SRIDHARAN
AGENT FOR THE APPLICANT

To
The Controller of Patents
The Patent Office, at New Delhi

Enclosures:

1. Amended claims (clean version)
2. Amended claims (marked-up version)

3. Fresh Form 1
4. Fresh Form 3
5. Fresh Form 5
6. Fresh Form 18
7. List of reference numerals

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & The Patents Rules, 2003 APPLICATION FOR GRANT OF PATENT [See section 7,54 & 135 and sub- rule (1) of rule 20]				(FOR OFFICE USE ONLY)			
				Application No.:			
				Filing Date:			
				Amount of Fee Paid:			
				CBR No:			
				Signature:			
1. APPLICANT'S REFERENCE/ IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)							
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]							
Ordinary (<input checked="" type="checkbox"/>)			Convention (<input checked="" type="checkbox"/>)			PCT-NP (<input checked="" type="checkbox"/>)	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()		
3A. APPLICANT(S)							
Name in Full		Nationality		Country of Residence		Address of the Applicant	
INDIAN INSTITUTE OF TECHNOLOGY, DELHI		Indian		India		Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016 India	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]							
Natural Person (<input checked="" type="checkbox"/>)				Other than Natural Person			

Small Entity (<input checked="" type="checkbox"/>)		Startup (<input checked="" type="checkbox"/>)	Others (<input checked="" type="checkbox"/>)
4. INVENTOR(S) [Please tick (✓) at the appropriate category]			
Are all the inventor(s) same as the applicant(s) named above?		Yes ()	No (<input checked="" type="checkbox"/>)
If "No", furnish the details of the inventor(s)			
Name in Full	Nationality	Country of Residence	Address of the Inventor
BHATNAGAR, Naresh	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016 India
BHATI, Pooja	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016 India
5. TITLE OF THE INVENTION			
POLYMER TUBES FOR MANUFACTURING STENTS			
6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	IN/PA-2234	
	Name	GAURAV GUPTA	
	Mobile No.	7011250699	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	LAKSHMI KUMARAN & SRIDHARAN	
	Postal Address	B6/10, Safdarjung Enclave New Delhi 110029 India	
	Telephone No.	(91) 11 41299800	
	Mobile No.	7011250699	

		Fax No.	(91) 11 26197578		
		E-mail ID	iprdel@lakshmisri.com		
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION : N/A					
Country	Application Number	Filing Date	Name of Applicant	Title of Invention	IPC (as classified in the convention country)
Nil	Nil	Nil	Nil	Nil	
9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT) : N/A					
International Application No.			International filing date as allotted by the receiving office		
Nil			Nil		
10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION : N/A					
Original (First) Application No.			Date of filing of Original (First) Application		
Nil			Nil		
11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT: N/A					
Main Application/Patent No.			Date of filing of Main Application		
Nil			Nil		
12. DECLARATIONS					
<p>(i) Declaration by the Inventor(s)</p> <p>(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).</p> <p>I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.</p>					

Name	Signature	Date
BHATNAGAR, Naresh		
BHATI, Pooja		

(ii) Declaration by the Applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the Applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

Name	Signature	Date

(iii) Declaration by the Applicant(s)

I/We the applicant(s) hereby declare that

- I am /We are in possession of the above mentioned invention.
- Complete Specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of patent to me/us.
- I am / we are the true & first Inventors.
- I am / we are the assignee or legal representative of true & first Inventors.

- The application or each of applications, particulars of which are given in Paragraph-8 was the first application in convention country / countries in respect of my/our invention(s).
- I / We claim priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention has been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- My/our application in India is based on International application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on N/A under section 16 of the Act.
- The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ Provisional specification (Description Part)#	No. of pages of Description : 15		
Claim(s)	No. of claims : 11 No. of pages : 3		
Abstract	No. of pages : 1		
Drawing(s)	No. of drawings : 5 No. of pages : 5		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

- (b) Complete Specification (~~in conformation with the International application/as amended before the IPEA, as applicable (2 copies).~~)
- (c) ~~Sequence listing in electronic form~~
- (d) Drawings (~~in conformation with the International application / as amended before the IPEA, as applicable (2 copies).~~)
- (e) ~~Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.~~
- (f) ~~Translation of priority document/Specification/International Search Report /International Preliminary Report on Patentability.~~
- (g) Statement and undertaking on FORM-3
- (h) Declaration of Inventorship on FORM-5
- (i) Power of Authority
- (j)

Total fee ₹9600 in Cash/ Banker's Cheque /Bank Draft /Electronic - Online Net banking Transfer.

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Date: 14 October 2016

Signature:

Name: **GAURAV GUPTA**
IN/PA-2234
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 3
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See section 8, rule 12)

We, **INDIAN INSTITUTE OF TECHNOLOGY, DELHI** of **Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India**, hereby declare that we who have made this Application No. 201611035281 dated 14 October 2016 alone, made for the same/substantially same invention application(s) for patent in the other countries, the particulars of which are given below:

Name of Country	Date of Application.	Application No	Status of the Application	Date of Publication	Date of Grant
NIL	NIL	NIL	NIL	NIL	NIL

that the rights in the application(s) has/have been assigned to none;

that we undertake that up to the date of grant of the patent, by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application.

Dated this 24 February 2021

Signature:

GAURAV GUPTA
IN/PA-2234
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
DECLARATION AS TO INVENTORSHIP
(See section 10(6) and rule 13(6))

1. APPLICANT(S)

NAME	NATIONALITY	ADDRESS
INDIAN INSTITUTE OF TECHNOLOGY, DELHI	Indian	Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of our application numbered 201611035281 dated 14 October 2016 is/are

2. INVENTOR(S)

NAME	NATIONALITY	ADDRESS
BHATNAGAR, Naresh	Indian	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India
BHATI, Pooja	Indian	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India

3. DECLARATION TO BE GIVEN WHEN THE APPLICATION IN INDIA IS FILED BY THE APPLICANT(S) IN THE CONVENTION COUNTRY:-

I/We the applicant(s) in the convention country hereby declare that our right to apply for a patent in India is by way of assignment from the true and first inventor(s).

Dated this 14 October 2016

Signature:

Name: **GAURAV GUPTA**
IN/PA-2234
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 18 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 REQUEST/EXPRESS REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT <i>[See section 11B and rule 20(4)(ii),</i> <i>24B(1)(i)]</i>		(FOR OFFICE USE ONLY) RQ No.: Filing Date: Amount of Fees Paid: CBR No.: Signature:
1. APPLICANT(S)/OTHER INTERESTED PERSON:		
NAME	NATIONALITY	ADDRESS
INDIAN INSTITUTE OF TECHNOLOGY, DELHI	Indian	Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India
<i>(d) Date of publication of the application under section 11A...20 April 2018</i>		
2. Statement in case of request for examination made by the applicant(s)		
We, hereby request that our application for patent No. 201611035281 filed on 14 October 2016 for the invention titled POLYMER TUBES FOR MANUFACTURING STENTS shall be examined under sections 12 and 13 of the Act.		
3. Statement in case of request for examination made by any other interested person		
NOT APPLICABLE		
4. ADDRESS FOR SERVICE		
LAKSHMIKUMARAN & SRIDHARAN B6/10, Safdarjung Enclave New Delhi 110029 India Telephone No.: (91) 11 41299800 Fax No: (91) 11 26197578 Email: iprdel@lakshmisri.com		
Dated 14 October 2016		
Signature:		
Name: GAURAV GUPTA IN/PA-2234 OF LAKSHMI KUMARAN & SRIDHARAN AGENT FOR THE APPLICANT(S) To,		

The Controller of Patents
The Patent Office at New Delhi

LIST OF REFERENCE NUMERALS

- 100 – Extrusion assembly
- 102 – Extruder
- 5 104 – Annular die
- 106 – Slotted tube
- 108 – Hopper
- 110 – Extruder screw
- 112 – Outlet
- 10 114 – Air inlet
- 116 – Sizing die
- 118 – Water bath
- 120 – Plurality of rollers



09 December 2016

The Controller of Patents,
The Patent Office,
Intellectual Property Office Building,
Plot No.32, Sector 14, Dwarka,
New Delhi 110075
India



Sub: Submission of Proof of Right

Re: Indian Patent Application No. 201611035281 dated 14 October 2016

Applicant(s) : INDIAN INSTITUTE OF TECHNOLOGY, DELHI
Title : POLYMER TUBES FOR MANUFACTURING STENTS
Our Ref : PD021609IN-SC

Dear Sirs,

We have the honour to submit herewith the under mentioned documents in connection with the above identified Indian Patent Application.

1. Proof of Right - Duly executed Form 1 by the Inventors (A copy has been e-filed on 07/12/2016)

The Controller is respectfully requested to take the above on record.

Yours faithfully,

MALATHI LAKSHMIKUMARAN
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT

Encl: As Above



09 December 2016

The Controller of Patents,
The Patent Office,
Intellectual Property Office Building,
Plot No.32, Sector 14, Dwarka,
New Delhi 110075
India



Sub: Submission of Power of Authorisation

Re: Indian Patent Application No. 201611035281 dated 14 October 2016

Applicant(s) : INDIAN INSTITUTE OF TECHNOLOGY, DELHI
Title : POLYMER TUBES FOR MANUFACTURING STENTS
Our Ref : PD021609IN-SC

Dear Sirs,

We have the honour to submit herewith the under mentioned documents in connection with the above identified Indian Patent Application.

1. Power of Authorisation - Original Form 26 (Copy of form 26 was E-filed on 07th December 2016)

The Controller is respectfully requested to take the above on record.

Yours faithfully,

MALATHI LAKSHMIKUMARAN
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT

Encl: As Above



FORM 1				(FOR OFFICE USE ONLY)	
THE PATENTS ACT, 1970 (39 of 1970) & The Patents Rules, 2003 APPLICATION FOR GRANT OF PATENT [See section 7,54 & 135 and sub- rule (1) of rule 20]					
		Application No.:			
		Filing Date:			
		Amount of Fee Paid:			
		CBR No:			
		Signature:			
1. APPLICANT'S REFERENCE/ IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary- <input checked="" type="checkbox"/>		Convention- <input checked="" type="checkbox"/>		PCT-NP- <input checked="" type="checkbox"/>	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
INDIAN INSTITUTE OF TECHNOLOGY, DELHI		Indian	India	Indian Institute of Technology, Delhi Hauz Khas, New Delhi-110016, India	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person <input checked="" type="checkbox"/>		Other than Natural Person			

	Small Entity (<input checked="" type="checkbox"/>)	Startup (<input checked="" type="checkbox"/>)	Others (<input checked="" type="checkbox"/>)
4. INVENTOR(S) [Please tick (✓) at the appropriate category]			
Are all the inventor(s) same as the applicant(s) named above?	Yes ()		No (<input checked="" type="checkbox"/>)
If "No", furnish the details of the inventor(s)			
Name in Full	Nationality	Country of Residence	Address of the Inventor
BHATNAGAR, Naresh	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India
BHATI, Pooja	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India
5. TITLE OF THE INVENTION			
POLYMER TUBES FOR MANUFACTURING STENTS			
6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	IN/PA-1433	
	Name	MALATHI LAKSHMIKUMARAN	
	Mobile No.	98 183 01173	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	LAKSHMI KUMARAN & SRIDHARAN	
	Postal Address	B6/10, Safdarjung Enclave New Delhi 110029 India	
	Telephone No.	(91) 11 41299800	
	Mobile No.	98 183 01173	
	Fax No.	(91) 11 26197578	

E-mail ID

iprdel@lakshmisri.com

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION : N/A

Country	Application Number	Filing Date	Name of Applicant	Title of Invention	IPC (as classified in the convention country)
Nil	Nil	Nil	Nil	Nil	

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT) : N/A

International Application No.	International filing date as allotted by the receiving office
Nil	Nil

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION : N/A

Original (First) Application No.	Date of filing of Original (First) Application
Nil	Nil

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT: N/A

Main Application/Patent No.	Date of filing of Main Application
Nil	Nil

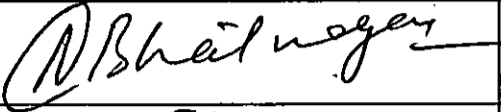
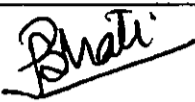
12. DECLARATIONS

(i) Declaration by the Inventor(s)

(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

Name	Signature	Date

BHATNAGAR, Naresh		21/10/2016
BHATI, Pooja		21/10/2016

(ii) Declaration by the Applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the Applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(iii) Declaration by the Applicant(s)

I/We the applicant(s) hereby declare that

- I am /We are in possession of the above mentioned invention.
- Complete Specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of patent to me/us.
- I am / we are the true & first Inventors.
- I am / we are the assignee or legal representative of true & first Inventors.
- The application or each of applications, particulars of which are given in Paragraph-8 was the first application in convention country / countries in respect of my/our invention(s).
- I / We claim priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention has been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- My/our application in India is based on International application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on N/A under section 16 of the Act.

The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ Provisional specification (Description Part)#	No. of pages of Description : 15		
Claim(s)	No. of claims : 11 No. of pages : 3		
Abstract	No. of pages : 1		
Drawing(s)	No. of drawings : 5 No. of pages : 5		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

- (b) Complete Specification (~~in conformation with the International application/as amended before the IPEA, as applicable (2 copies).~~)
- (c) ~~Sequence listing in electronic form~~
- (d) Drawings (~~in conformation with the International application / as amended before the IPEA, as applicable (2 copies).~~)
- (e) ~~Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.~~
- (f) ~~Translation of priority document/Specification/International Search Report /International Preliminary Report on Patentability.~~
- (g) Statement and undertaking on FORM-3
- (h) Declaration of Inventorship on FORM-5
- (i) Power of Authority – Already filed

Total fee **Rs9,600/-** in Cash/ Banker's Cheque /Bank Draft bearing No Date on HDFC BANK LTD. Bank.

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Date: 14 October 2016

Signature:



Name: MALATHI LAKSHMIKUMARAN
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi



सत्यमेव जयते

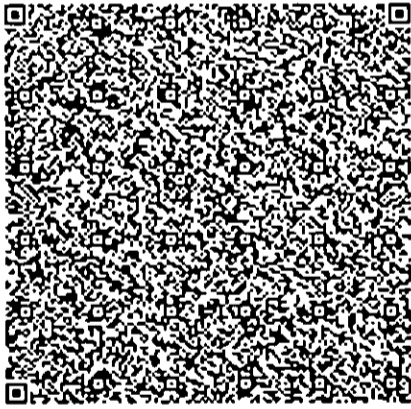
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Government of National Capital Territory of Delhi

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Certificate No. : IN-DL254582080089660
Certificate Issued Date : 02-Dec-2016 12:40 PM
Account Reference : IMPACC (IV)/ dl796803/ DELHI/ DL-DLH
Unique Doc. Reference : SUBIN-DL796803512291024662340
Purchased by : INDIAN INSTITUTE OF TECHNOLOGY DELHI
Description of Document : Article 48 Power of attorney -SPA
Property Description : Not Applicable
Consideration Price (Rs.) : 0
(Zero)
First Party : INDIAN INSTITUTE OF TECHNOLOGY DELHI
Second Party : VARADACHARI LAKSHMIKUMARAN
Stamp Duty Paid By : INDIAN INSTITUTE OF TECHNOLOGY DELHI
Stamp Duty Amount(Rs.) : 100
(One Hundred only)



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Malavika

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Form 26

The Patents Act, 1970

(39 of 1970) &

The Patents Rules, 2003

**FORM FOR AUTHORISATION OF A PATENT AGENT/OR ANY PERSON IN
A MATTER OR PROCEEDING UNDER THE ACT**

[See sections 127 and 132; rule 135]

We, **INDIAN INSTITUTE OF TECHNOLOGY DELHI** of Indian Institute of Technology, Delhi, Hauz Khas, New Delhi 110 016, India, hereby authorise Varadachari Lakshmikumar, R. Parthasarathy, Malathi Lakshmikumar, Damodar Pandharinath Vaidya, L. Badri Narayanan, Konpal Rae, T. Srinivasan, Prashant Phillips, Jaya Pandeya, Ankur Garg, Raghav Sarada, Gaurav Gupta and Prosenjit Chattopadhyay Advocates / Patent Agents of LAKSHMIKUMARAN & SRIDHARAN, having their Head Office at B-6/10, Safdarjung Enclave, New Delhi-110 029, India, and having branch Offices at (i) 2, Wallace Garden, 2nd Street, Chennai-600 006, India and (ii) 404 - 406 (4th Floor), World Trade Center, Brigade Gateway Campus, 26/1, Dr. Rajkumar Road, Malleswaram West, Bangalore - 560055, India (iii) 2nd Floor, B&C Wing, Cnergy IT Park, Appa Saheb Marathe Marg, Prabhadevi, Mumbai-400025, India (iv) 2nd Floor, Kanak Building, 41 Chowringhee Road, Kolkata-700071, India, to act on our behalf and do all acts, deeds and things in connection with and incidental to filing and prosecution of Indian Application No: **201611035281** before the Controller of Patents or the Government of India; and other related activities including opposition proceedings, the grant of letters patent, renewals, filing of statements of working, filing of amendments, registrations of any license, mortgage, assignment transfer or other interest in respect thereof, restoration of patent, or change in name, address or address for service and in general to do all acts or things (including appointment of a substitute or substitutes) as the said Agent(s) may deem necessary or expedient and request that all notices, requisitions and communications relating thereto may be sent to such person at the above address unless otherwise specified.

We hereby revoke all previous authorisations, if any made, in respect of same matter or proceeding.

We hereby assent to the action already taken by the said persons in the above matters.

Dated: _____

Signature: _____

Name: **प्रो. बोध राज महता**
संकायाध्यक्ष (अनुसंधान एवं विकास)
भारतीय प्रौद्योगिकी संस्थान दिल्ली
हौज खास, नई दिल्ली-110016

Designation: **Prof. Bodh Raj Mehta**
Dean (Research & Development)
Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110016

Authorised Signatory

INDIAN INSTITUTE OF TECHNOLOGY DELHI

(Official Seal, if any)

To
The Controller of Patents,
The Patent Office at New Delhi

Lakshmi Kumaran

& Sridharan

A T T O R N E E Y S



B-6/10, Safdarjung Enclave,
New Delhi - 110 029, India.
O: +91(11) 46063300 / 3301
F: +91 (11) 46063398 / 3399
E: iprdel@lakshmisri.com
W: www.lakshmisri.com

07 December 2016

The Controller of Patents,
The Patent Office,
Intellectual Property Office Building,
Plot No.32, Sector 14, Dwarka,
New Delhi 110075
India

Sub: Submission of Power of Authorisation

Re: Indian Patent Application No. 201611035281 dated 14 October 2016

Applicant(s) : INDIAN INSTITUTE OF TECHNOLOGY, DELHI

Title : POLYMER TUBES FOR MANUFACTURING STENTS

Our Ref : PD021609IN-SC

Dear Sirs,

We have the honour to submit herewith the under mentioned documents in connection with the above identified Indian Patent Application.

1. Power of Authorisation - Form 26 (Original will be filed via hard copy to IPO)

The Controller is respectfully requested to take the above on record.

Yours faithfully,

**MALATHI LAKSHMIKUMARAN
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT**

Encl: As Above

Mumbai

O: +91 (22) 24914382/84/86

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Bangalore

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F: +91 (80) 22371759

E: lsblr@lakshmisri.com

Chennai

O: +91 (44) 28334700 / 01 / 02

F: +91 (44) 28334702

E: lsmds@lakshmisri.com

Hyderabad

O: +91 (40) 23234924 / 25

F: +91(40) 23234826

E: lshyd@lakshmisri.com

Ahmedabad

O: +91 (79) 40014500

F: +91 (79) 40014599

E: lsahd@lakshmisri.com



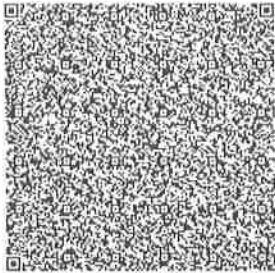
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Government of National Capital Territory of Delhi

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Certificate No.	: IN-DL254582080089660
Certificate Issued Date	: 02-Dec-2016 12:40 PM
Account Reference	: IMPACC (IV)/ dl796803/ DELHI/ DL-DLH
Unique Doc. Reference	: SUBIN-DL796803512291024662340
Purchased by	: INDIAN INSTITUTE OF TECHNOLOGY DELHI
Description of Document	: Article 48 Power of attorney -SPA
Property Description	: Not Applicable
Consideration Price (Rs.)	: 0 (Zero)
First Party	: INDIAN INSTITUTE OF TECHNOLOGY DELHI
Second Party	: VARADACHARI LAKSHMIKUMARAN
Stamp Duty Paid By	: INDIAN INSTITUTE OF TECHNOLOGY DELHI
Stamp Duty Amount(Rs.)	: 100 (One Hundred only)



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2. The onus of checking the legitimacy is on the users of the certificate.
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Form 26

The Patents Act, 1970

(39 of 1970) &

The Patents Rules, 2003

**FORM FOR AUTHORISATION OF A PATENT AGENT/OR ANY PERSON IN
A MATTER OR PROCEEDING UNDER THE ACT**

[See sections 127 and 132; rule 135]

We, **INDIAN INSTITUTE OF TECHNOLOGY DELHI of Indian Institute of Technology, Delhi, Hauz Khas, New Delhi 110 016, India**, hereby authorise Varadachari Lakshmikumaran, R. Parthasarathy, Malathi Lakshmikumaran, Damodar Pandharinath Vaidya, L. Badri Narayanan, Konpal Rae, T. Srinivasan, Prashant Phillips, Jaya Pandeya, Ankur Garg, Raghav Sarada, Gaurav Gupta and Prosenjit Chattopadhyay Advocates / Patent Agents of LAKSHMIKUMARAN & SRIDHARAN, having their Head Office at B-6/10, Safdarjung Enclave, New Delhi-110 029, India, and having branch Offices at (i) 2, Wallace Garden, 2nd Street, Chennai-600 006, India and (ii) 404 - 406 (4th Floor), World Trade Center, Brigade Gateway Campus, 26/1, Dr. Rajkumar Road, Malleswaram West, Bangalore - 560055, India (iii) 2nd Floor, B&C Wing, Cnergy IT Park, Appa Saheb Marathe Marg, Prabhadevi, Mumbai-400025, India (iv) 2nd Floor, Kanak Building, 41 Chowringhee Road, Kolkata-700071, India, to act on our behalf and do all acts, deeds and things in connection with and incidental to filing and prosecution of Indian Application No: **201611035281** before the Controller of Patents or the Government of India, and other related activities including opposition proceedings, the grant of letters patent, renewals, filing of statements of working, filing of amendments, registrations of any license, mortgage, assignment transfer or other interest in respect thereof, restoration of patent, or change in name, address or address for service and in general to do all acts or things (including appointment of a substitute or substitutes) as the said Agent(s) may deem necessary or expedient and request that all notices, requisitions and communications relating thereto may be sent to such person at the above address unless otherwise specified.

We hereby revoke all previous authorisations, if any made, in respect of same matter or proceeding.

We hereby assent to the action already taken by the said persons in the above matters.

Dated: _____

Signature: _____

Name: प्रो. बोध राज महता
संकायाध्यक्ष (अनुसंधान एवं विकास)
भारतीय प्रौद्योगिकी संस्थान दिल्ली
हौज खास, नई दिल्ली-110016

Designation: Prof. Bodh Raj Mehta
Dean (Research & Development)
Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110016

Authorised Signatory

INDIAN INSTITUTE OF TECHNOLOGY DELHI

(Official Seal, if any)

To
The Controller of Patents,
The Patent Office at New Delhi

Lakshmi Kumaran & Sridharan

A T T O R N E E Y S



B-6/10, Safdarjung Enclave,
New Delhi - 110 029, India.
O: +91(11) 46063300 / 3301
F: +91 (11) 46063398 / 3399
E: iprdel@lakshmisri.com
W: www.lakshmisri.com

07 December 2016

The Controller of Patents,
The Patent Office,
Intellectual Property Office Building,
Plot No.32, Sector 14, Dwarka,
New Delhi 110075
India

Sub: Submission of Proof of Right

Re: Indian Patent Application No. 201611035281 dated 14 October 2016

Applicant(s) : INDIAN INSTITUTE OF TECHNOLOGY, DELHI
Title : POLYMER TUBES FOR MANUFACTURING STENTS
Our Ref : PD021609IN-SC

Dear Sirs,

We have the honour to submit herewith the under mentioned documents in connection with the above identified Indian Patent Application.

1. Proof of Right - Duly executed Form 1 by the Inventors (Original will be filed via hard copy to IPO)

The Controller is respectfully requested to take the above on record.

Yours faithfully,

**MALATHI LAKSHMIKUMARAN
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT**

Encl: As Above

FORM 1				(FOR OFFICE USE ONLY)	
THE PATENTS ACT, 1970 (39 of 1970) & The Patents Rules, 2003 APPLICATION FOR GRANT OF PATENT [See section 7,54 & 135 and sub- rule (1) of rule 20]					
		Application No.:			
		Filing Date:			
		Amount of Fee Paid:			
		CBR No:			
		Signature:			
1. APPLICANT'S REFERENCE/ IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (<input checked="" type="checkbox"/>)		Convention (<input checked="" type="checkbox"/>)		PCT-NP (<input checked="" type="checkbox"/>)	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
INDIAN INSTITUTE OF TECHNOLOGY, DELHI		Indian	India	Indian Institute of Technology, Delhi Hauz Khas, New Delhi-110016, India	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person (<input checked="" type="checkbox"/>)		Other than Natural Person			

		Small Entity (<input checked="" type="checkbox"/>)	Startup (<input checked="" type="checkbox"/>)	Others (<input checked="" type="checkbox"/>)
4. INVENTOR(S) [Please tick (✓) at the appropriate category]				
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (<input checked="" type="checkbox"/>)
If "No", furnish the details of the inventor(s)				
Name in Full	Nationality	Country of Residence	Address of the Inventor	
BHATNAGAR, Naresh	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India	
BHATI, Pooja	Indian	India	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India	
5. TITLE OF THE INVENTION				
POLYMER TUBES FOR MANUFACTURING STENTS				
6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	IN/PA-1433		
	Name	MALATHI LAKSHMIKUMARAN		
	Mobile No.	98 183 01173		
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	LAKSHMI KUMARAN & SRIDHARAN		
	Postal Address	B6/10, Safdarjung Enclave New Delhi 110029 India		
	Telephone No.	(91) 11 41299800		
	Mobile No.	98 183 01173		
	Fax No.	(91) 11 26197578		

		E-mail ID	iprdel@lakshmisri.com		
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION : N/A					
Country	Application Number	Filing Date	Name of Applicant	Title of Invention	IPC (as classified in the convention country)
Nil	Nil	Nil	Nil	Nil	
9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT) : N/A					
International Application No.			International filing date as allotted by the receiving office		
Nil			Nil		
10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION : N/A					
Original (First) Application No.			Date of filing of Original (First) Application		
Nil			Nil		
11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT: N/A					
Main Application/Patent No.			Date of filing of Main Application		
Nil			Nil		
12. DECLARATIONS					
<p>(i) Declaration by the Inventor(s) (In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period). I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.</p>					
Name		Signature		Date	

BHATNAGAR, Naresh	<i>N. Bhatnagar</i>	21/10/2016
BHATI, Pooja	<i>Bhati</i>	21/10/2016

(ii) Declaration by the Applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the Applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(iii) Declaration by the Applicant(s)

I/We the applicant(s) hereby declare that

- I am /We are in possession of the above mentioned invention.
- Complete Specification relating to the invention is filed with this application.
- The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- There is no lawful ground of objection(s) to the grant of patent to me/us.
- I am / we are the true & first Inventors.
- I am / we are the assignee or legal representative of true & first Inventors.
- The application or each of applications, particulars of which are given in Paragraph-8 was the first application in convention country / countries in respect of my/our invention(s).
- I / We claim priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention has been made in a convention country before that date by me/us or by any person from which I/We derive the title.
- My/our application in India is based on International application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- The application is divided out of my/our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on N/A under section 16 of the Act.

The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ Provisional specification (Description Part)#	No. of pages of Description : 15		
Claim(s)	No. of claims : 11 No. of pages : 3		
Abstract	No. of pages : 1		
Drawing(s)	No. of drawings : 5 No. of pages : 5		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

- (b) Complete Specification (~~in conformation with the International application/as amended before the IPEA, as applicable (2-copies).~~)
- (c) Sequence listing in electronic form
- (d) Drawings (~~in conformation with the International application / as amended before the IPEA, as applicable (2-copies).~~)
- (e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.
- (f) Translation of priority document/Specification/International Search Report /International Preliminary Report on Patentability.
- (g) Statement and undertaking on FORM-3
- (h) Declaration of Inventorship on FORM-5
- (i) Power of Authority – Already filed

Total fee Rs9,600/- in Cash/ Banker's Cheque /Bank Draft bearing No **Date** **on HDFC BANK LTD. Bank.**

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Date: 14 October 2016

Signature:

Name: **MALATHI LAKSHMIKUMARAN**
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 2

THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

COMPLETE SPECIFICATION
(See section 10, rule 13)

1. Title of the invention: POLYMER TUBES FOR MANUFACTURING STENTS

2. Applicant(s)

NAME	NATIONALITY	ADDRESS
INDIAN INSTITUTE OF TECHNOLOGY, DELHI	Indian	Indian Institute of Technology, Delhi Hauz Khas, New Delhi- 110016, India

3. Preamble to the description

COMPLETE SPECIFICATION

The following specification describes the invention and the manner in which it is to be performed.

TECHNICAL FIELD

[0001] The present subject matter, in general, relates to manufacturing of
5 stents and, in particular, to extrusion of polymer tubes for manufacturing of stents
from these tubes.

BACKGROUND

[0002] Stents are widely used medical devices that are implanted within
10 ducts and blood vessels in a patient's body to open and heal narrowed arteries and
constrictive lumen. Stents include a tube like structure with a crimped portion that
is generally coated with a drug. The tube like structure of the stents may be
manufactured using different materials, such as metals, and bioresorbable polymer
material, and may have different characteristics and affect on a human body based
15 on the material used. For example, metallic stents having metallic tube like
structures are permanent in nature and once implanted in the blood vessel or duct
of the patient's body, remain in the duct for the rest of the patient's life. The
presence of metal may prevent the blood vessel from having its natural
characteristics, such as natural variation in vascular tone. However, bioresorbable
20 polymeric stents, after having implanted into the patient's body, are resorbed on
its own in the patient's body after a time span through hydrolysis.

[0003] The tube like structure of the bioresorbable polymeric stents,
referred to as a polymer tube, is generally manufactured through an extrusion
process. The polymer tube is extruded in such a manner that the polymer tube
25 attains mechanical and physical properties, such as radial stiffness, to bear
pressure and load when implanted within the patient's body. The mechanical and
physical properties of the polymer tube also depend upon design and material of
the polymer tube used during the extrusion process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit of a reference number identifies the figure in which the reference number first appears. The same
5 numbers are used throughout the figures to reference the same elements.

[0005] FIG. 1 illustrates an extrusion assembly, in accordance with an implementation of the present subject matter;

[0006] FIG. 2(a) illustrates a slotted tube, in accordance with an implementation of the present subject matter;

10 [0007] FIG. 2(b) illustrates a slotted tube, in accordance with an implementation of the present subject matter;

[0008] FIG. 2(c) illustrates a slotted tube, in accordance with an implementation of the present subject matter;

15 [0009] FIG. 2(d) illustrates a slotted tube, in accordance with an implementation of the present subject matter.

DETAILED DESCRIPTION

[0010] Generally, stents are manufactured from tubes that are obtained through an extrusion process. In the extrusion process, a molten form of a
20 polymer material is passed through a die opening to obtain a polymer tube. The polymer tube is then pulled in a longitudinal direction, at a certain temperature and strain, through rollers. The pulling of the polymer tube in the longitudinal direction stretches the polymer tube longitudinally and provides physical property of bearing longitudinal stress to the polymer tube. After completion of the process
25 of extruding and pulling the polymer tube, the polymer tube is subjected to blow molding wherein the polymer tube is radially expanded by blowing air into the polymer tube to increase the diameter of the polymer tube. The radial expansion of the polymer tube may be performed at a different temperature and strain than

the temperature and strain during the extrusion of the polymer tube. Thereafter, the polymer tube is subjected to stent profile cutting for obtaining multiple stents.

[0011] However, having a two step process of longitudinally expanding the polymer tube in a first step and radially expanding the polymer tube in a second step may expose the polymer tube to different environments, thereby making the polymer tube vulnerable to contamination and affecting the overall quality of the polymer tube. Further, the two step process may involve additional resources, equipment and devices for manufacturing the polymer tube, thereby incurring additional cost. Also, such a process is observed to have a lot of wastage of the polymer material in both the steps of longitudinal expansion and radial expansion, that makes the overall process inefficient and reduce the yield for a medical grade polymer, which is exorbitantly expensive.

[0012] According to example implementations of the present subject matter, techniques for extruding polymer tubes are described. The described techniques prevent any additional step in manufacturing the polymer tubes thereby saving cost and material wastage. Further, the techniques described in the present subject matter prevent any contamination of the polymer tubes.

[0013] In an example implementation of the present subject matter, an extrusion assembly to extrude a polymer tube, for manufacturing stents, is described. The extrusion assembly includes an extruder, an annular die, and a slotted tube. The extruder includes a hopper, an extruding screw, and an outlet having a specific diameter. The annular die includes a first end, a second end, and a circular opening and is coaxially coupled to the extruder at the first end. In an example, the annular die is in fluid communication with the extruder to receive a polymer melt from the extruder. The diameter of the circular opening is less than or equal to the specific diameter of the outlet of the extruder.

[0014] In an example, the slotted tube includes a first end and a second end, and is coupled to the annular die at the first end. The slotted tube is coupled to the annular die such that a portion of the slotted tube is surrounded by the annular die. Further, the slotted tube and the annular die are arranged such that the

slotted tube is coaxially aligned with the circular opening of the annular die. The slotted tube includes multiple through holes extending from inner surface to outer surface of the slotted tube. Further, an air inlet is coupled to the slotted tube to provide flow of pressurized air or gas to the slotted tube.

5 [0015] In an example, polymer pellets are fed to the extruder through the hopper. The polymer pellets are crushed by rotational motion of the extruder screw to obtain a viscous and molten form of the polymer pellets, referred to as polymer melt, hereinafter. The polymer melt is then pushed towards the outlet of the extruder by the extruder screw and then released through the outlet of the
10 extruder. The polymer melt released through the outlet is then passed through the circular opening of the annular die to extrude the polymer tube. As the slotted tube is coupled to the circular opening, the polymer tube extruded out of the annular die moves over the slotted tube such that the polymer tube surrounds the slotted tube without making any surface contact with the slotted tube.

15 [0016] In an example implementation of the present subject matter, pressurized air may be provided to the slotted tube through the air inlet. The pressurized air is then supplied to the polymer tube passing over the slotted tube through the multiple through holes, thereby radially expanding the polymer tube. In an example, the amount and pressure of the supplied pressurized air may be
20 regulated based on extent of radial expansion for the polymer tube. The polymer tube passing over the slotted tube is also simultaneously pulled by multiple rollers to longitudinally stretch the polymer tube. After reaching the multiple rollers, the polymer tube is further processed to obtain one or more stents.

[0017] Thus, the extrusion assembly described in the present subject
25 matter provides efficient extrusion of polymer tubes whereby the polymer tubes are radially expanded and longitudinally expanded in a one process step. The radial and longitudinal expansion in the same process step prevents use of additional resources and devices, and makes the overall process cost efficient. Further, the extrusion assembly prevents contamination of the polymer tubes and
30 reduces wastage of the expensive polymer material.

[0018] The following description describes the extrusion assembly and its uses in detail. While aspects of the extrusion assembly can be implemented in any number of different applications, the extrusion assembly as per the present subject matter is described in the context of the following exemplary implementations.

5 [0019] FIG. 1 illustrates an extrusion assembly 100, in accordance with an implementation of the present subject matter. The extrusion assembly 100 may include an extruder 102, an annular die 104, and a slotted tube 106. The extruder 102 includes a hopper 108, an extruder screw 110, and an outlet 112.

[0020] In an example implementation, the extruder 102 may be a tube
10 extruder for extruding tube like plastic or polymer structures. The extruder 102 may be one of a single screw extruder, twin or multiple screw extruder, and a ram extruder based on number or type of extruder screw 110 within the extruder 102. Further, the extruder screw may be a standard screw, a barrier screw to block polymer melt from surrounding polymer pellets, and a mixing screw to allow
15 mixing of additives to the polymer pellets before extrusion. In an example, the outlet 112 has a specific diameter.

[0021] The annular die 104 is coupled to the outlet 112 of the extruder 102 at a first end and has a circular opening (not shown in the figure) with a diameter. In an example, the annular die 104 is coupled to the extruder 102 such that the
20 outlet 112 and the circular opening of the annular die 104 are aligned coaxially with each other and the annular die 104 and the extruder 102 are in fluid communication with each other. In an example, the annular die 104 may be one of a single cavity die or a multiple cavity die. In an example, the annular die 104 may be adjustable to change the diameter of the circular opening. The diameter of
25 the circular opening is either less than or equal to the diameter of the outlet 112 of the extruder 102.

[0022] The first end of the slotted tube 106 is coupled to the annular die 104 such that a portion of the slotted tube 106 is surrounded by the annular die 104 and the slotted tube 106 is coaxially aligned with the circular opening of the
30 annular die 104. In an example, the annular die 104 may include a seating

arrangement to which the slotted tube 106 may be inserted or placed. The slotted tube 106 may be a hollow cylindrical body having multiple through holes extending from inner surface to outer surface of the slotted tube. As would be understood that a slotted tube with diameter less than the diameter of the circular opening is coupled to the annular 104 such that a polymer tube extruded out of the circular opening is passed over the slotted tube and air can be blown into the polymer tube through the multiple through holes of the slotted tube for radial expansion of the moving polymer tube.

[0023] In an example, the diameter of the slotted tube is within the range of about 1.0 -2.5 millimeter (mm) and the length of the slotted tube may be within the range of about 6-60 mm. Further, the extrusion assembly 100 comprises an air inlet 114 coupled to the slotted tube 106 for supplying pressurized air or gas into the slotted tube 106. For sake of explanation, the annular die 104, the slotted tube 106, and the air inlet 114, in combination, are also referred to as slotted tube assembly.

[0024] In an example implementation of the present subject matter, the multiple through holes are arranged in different patterns over the outer surface of the slotted tube 106. The different patterns of the multiple holes on the slotted tube 106, as per different implementations of the present subject matter, have been described later with respect to forthcoming figures.

[0025] The extrusion assembly 100 further includes a sizing die 116, a water bath 118 and multiple rollers 120. In an example implementation, the sizing die 116 may be a flat faced die or a conical die. The sizing die 116 has an adjustable opening with a diameter to pass the polymer tube. The diameter of the adjustable opening of the sizing die 116 may be adjustable, and the sizing die 118 may modulate size parameters of the polymer tube through the adjustable opening. In an example, the size parameters may include diameter and thickness of the polymer tube. The water bath 118 may include a container to store water through which the polymer tube is passed for cooling and hardening. The multiple rollers 120 are positioned after the water bath 118 to rotate and pull the polymer

tube after the polymer tube is passed through the water bath 118. In an example, the multiple rollers 120 may include two rollers. The rollers 120 may include a gripping element, such as a jaw or a clamp.

[0026] In operation, the polymer pellets are fed to the extruder 102 through the hopper 108. In an example, the polymer pellets may be of a polymer material including a bioresorbable material that is a naturally dissolvable and can dissolve in a patient's body with time. Examples of the polymer material include Polylactic acid (PLA), Poly Hydroxy Alkanoate (PHA), Polycaprolactone (PCL), and Polyglycolic acid (PGA). The polymer pellets get crushed and grinded through rotational motion of the extruder screw 110 to obtain a molten form of polymer material, referred to as polymer melt, hereinafter. Thereafter, a thin thread or wire of the polymer melt is passed through the extruder 102, the annular die 104, the sizing die 116, and the water bath 118 to the rollers 120. In an example, the extruder screw 110 rotates at low rotations per minute (rpm) as a low rpm is initially required for passing the wire of the polymer material to the rollers 120. In one example, the rpm value may vary in between 1-3 rpm when the thread of the polymer melt is passed through the extruder 102. The wire is then wrapped around the gripping element of the rollers 120. The wire so wrapped around the gripping element allows pulling of the polymer tube from the extruder 102, sizing die 116, and the water bath 118 by the rollers 120.

[0027] In an example implementation, the polymer melt is gradually pushed towards the outlet 112 of the extruder by the rotational motion of the extruder screw 110 to pass the polymer melt through the outlet 112. After passing through the outlet 112, the polymer melt is passed through the circular opening of the annular die 104 to extrude polymer tube from the polymer melt. In an example, the annular die may be maintained at a specific temperature, as a low temperature may extrude highly viscous polymeric tube that is difficult to expand through pressurized air supplied subsequently for radial expansion. In an example, the temperature of the annular die 104 may be within the range of about 180 - 200 °C. Further, the low temperature causes development of excessive back pressure

in the extruder 102 and chokes the circular opening. However, if the temperature is high, then the polymer tube may drool due to lower viscosity and it becomes difficult to maintain the shape of the polymer tube during application of pressurized air or gas.

5 [0028] It would be understood that when the polymer melt is gradually pushed by the extruder screw 110 for extrusion of the polymer tube, the polymer tube is also pulled simultaneously by the rollers 120 through the thread. The polymer tube passing through the circular opening of the annular die 104 is then passed over the slotted tube 106.

10 [0029] In an example, the polymer tube passing over the slotted tube 106 may surround the slotted tube. In an example, pressurized air is supplied to the slotted tube 106 through the air inlet 114. The pressurized air is then supplied to the polymer tube surrounding the slotted tube 106 such that air is blown into the polymer tube and the polymer tube expands radially. The expansion of the
15 polymer tube radially increases the diameter of the polymer tube and aligns the polymer chains of the polymer tube radially. In such an alignment, the polymer chains get closely packed in the radial direction and provide strength to bear radial stress. This enhances mechanical properties, such as radial stiffness for bearing the radial stress to the polymer tube. In an example, the amount of pressurized air
20 may be supplied based on the expansion needed for the polymer tube.

[0030] After the polymer tube is expanded, the polymer tube is passed through the adjustable opening of the sizing die 116. During passing of the polymer tube through the adjustable opening, the sizing parameters such as diameter and thickness of the polymer tube, may be regulated by adjusting the
25 diameter of the adjustable opening. For instance, if the diameter of the adjustable opening is reduced, then the diameter of the polymer tube passing through the opening also reduces. As would be understood that the polymer tube passed through the opening of the sizing die 116 is not rigid and may have to be hardened for further processing. Therefore, the polymer tube is passed through the container
30 of the water bath 118. The passing of the polymer tube through the water bath 118

lowers the temperature and hardens the polymer tube. Further, the water bath 118 prevents further stretching of the polymer tube in radial and axial direction. If the passing of the polymer tube through the water bath 118 is not performed in a timely manner, then due to semi molten state of polymer, the polymer tube may be continuously stretched under the applied radial and axial forces and may cause a change in tube dimension that is undesirable. The polymer tube is simultaneously pulled by the rollers 120 after passing through the water bath 118. In an example, the pulling of the polymer tube through the rollers 120 is performed in such a manner that the polymer chains are aligned axially and are closely packed to provide enhanced mechanical properties to bear longitudinal stress. In an example, various parameters such as pressure of the pressurized air and roller speed may be regulated to alter alignment of the polymer chains.

[0031] In an example, the thickness of the polymer tubes extruded is within the range of about 100-150 micrometer (μm). Thereafter, the polymer tube is processed for obtaining multiple stents from the polymer tube by forming a stent substrate from the polymer tube and cutting a stent profile on the stent substrate. In an example, the stent profile cutting may be performed using one of a cold laser technique or a femtosecond laser technique.

[0032] Thus, the extrusion assembly 100 allows biaxial expansion of polymer tubes which enhances the mechanical properties of the extruded tubes simultaneously in radial and axial directions. The enhanced mechanical properties make the polymer tubes suitable for medical devices, such as vascular stent applications and peripheral nerve conduits.

[0033] To observe the physical and mechanical properties of the polymer tubes extruded through the extrusion assembly 100, an experiment was conducted. In the experiment, the physical and mechanical properties of the polymer tubes obtained through the extrusion assembly 100 were measured and compared with the properties of polymer tubes obtained using conventional techniques. The results of the experiment have been captured in Table 1 and Table 2.

[0034] Table 1 captures Young's modulus value for the polymer tubes extruded using the extrusion assembly 100 compared to polymer tubes extruded using conventional techniques. The data shown in the Table 1 is based on average of values obtained in 10 tests performed on the polymer tubes.

Conventionally Extruded Tube	Biaxially extruded tube
4400 MPa ± 343	4800 MPa ± 397

5

Table 1: Young's Modulus comparison

[0035] As would be understood that Young's modulus is indicative of elastic properties of the polymer tubes of bearing stress. In the Table 1, the left column includes the Young's modulus value for the polymer tubes extruded using conventional techniques and the right column shows the Young's modulus value for the polymer tubes extruded using the extrusion assembly 100. It can be clearly seen that the Young's modulus value for the polymer tube is higher than that of the conventionally extruded tubes thereby providing enhanced elastic property to the polymer tube extruded through the extrusion assembly 100. It is observed that the polymer tubes have higher Young's modulus because of enhanced molecular chain orientation along the direction of applied pressurized air during radial expansion of the polymer tubes.

10

15

[0036] Table 2 provides a comparison of average burst pressure of the polymer tubes extruded through the extrusion assembly 100 and polymer tubes obtained through conventional techniques. The data shown in the Table 2 is based on about 10 specimens.

20

Conventionally Extruded Tube with Average tube thickness of 0.1445 mm and tube diameter 3.002 mm	Biaxially extruded tube with average tube thickness of 0.1457 mm and tube diameter of 2.982mm
20 bar ± 1	24.4 bar ± 1.5

Table 2 Average Burst Pressure

[0037] In the Table 2, the left column includes average burst pressure of the extruded tube using conventional techniques with an average thickness of 0.1445 millimeter (mm) and tube diameter of 3.002 mm. The right column includes average burst pressure of the extruded tube using extrusion assembly 100
5 with an average thickness of 0.1457 millimeter (mm) and tube diameter of 2.982 mm. The higher value of average burst pressure provides enhanced mechanical properties of bearing radial compressive force exerted by a lumen or a blood vessel. It is observed that the higher value of average burst pressure is because of polymer chain orientation in the circumferential direction due to force applied by
10 the pressurized air or gas during radial expansion.

[0038] Further, the pulling of the polymer tube longitudinally and expanding the polymer tube radially in the same process reduces wastage of the polymer material and prevents use of additional equipment thereby reducing cost. Further, such a process prevents contamination of the polymer tubes.

15 [0039] The various predefined pattern of the multiple through holes on the slotted tube 106 are described with reference to Fig. 2(a), Fig. 2(b), Fig. 2(c), and Fig. 2(d) respectively.

[0040] Fig. 2(a) illustrates a slotted tube 106 having a regular pattern of through holes, according to an implementation of the present subject matter. In an
20 example, the predefined pattern of the through holes may be understood as distribution of the through holes in multiple rows and columns with each row and column having number of through holes. Further, as per a predefined pattern, distance between consecutive through holes in a row and in a column may vary.

[0041] In the regular pattern, the distance between consecutive through
25 holes in a column is 'D' and distance between consecutive through holes in a row is 'l'. The slotted tube may have a length of 'L' and the diameter of each through hole is 'd'. In an example, the length 'L' of the slotted tube is within the range of about 6-60 mm and the diameter 'd' of the through holes may be within the range of about 100 – 1000 μm . Further, the thickness of the slotted tube is 't'. In one
30 example, the thickness 't' may be about 0.70 millimeter (mm). It would be

understood that amount of the pressurized air and pattern of flow of the pressurized air from the through holes is based on distribution of the through holes and type or shape of the through holes on the slotted tube 106.

[0042] Fig. 2(b) illustrates an example slotted tube 106 having alternate
5 arrangement of the through holes according to an implementation of the present subject matter. In the alternate arrangement, each through hole has a diameter 'd' and consecutive through holes in a column are separated by a distance 'D' and consecutive through holes in a row are separated by a distance 'l₂'. In an example, the distance 'l₂' and 'D' between through holes may be equal to diameter of a
10 through hole, i.e., within the range of about 100 – 1000 μm. Further, the length of the slotted tube 106 is 'L' and the thickness of the slotted tube 106 is 't'. The variables 'd', 'D', 'l₂', 't' and 'L' are numerical values representing units of length in mm. In an example, the through holes in the alternate pattern are conical in shape with the through holes having a wide opening at the outer surface and
15 narrow opening at the inner surface. Further, the through holes may subtend different angles, such as 'α' and 'β', with a central axis of the slotted tube 106 based on the position of a through hole on the surface of the slotted tube 106. In one example, the values of 'α' and 'β' may be within the range of about 1-30 degrees.

[0043] Fig. 2(c) illustrates an example of the slotted tube 106 having a
20 spiral arrangement of the through holes according to an implementation of the present subject matter. In the spiral arrangement, the consecutive through holes in a row and in a column are spaced at an equal distance and each through hole has a diameter 'd' and thickness 't' of the slotted tube. In an example, the spiral
25 arrangement of the through holes allows the air to flow out in a spiral manner.

[0044] Fig. 2(d) illustrates an example slotted tube 106 having multiple
through holes with varying diameter according to an implementation of the present subject matter. In such an arrangement, the varying diameters may either be in an increasing order or a decreasing order. For instance, in a row the through
30 holes from left to right have diameters in an increasing order, such as 'd₁', 'd₂',

'd₃', 'd₄', and 'd₅' with diameter 'd₁' being the shortest of the diameters of the through holes and the diameter d₅ being the longest. In an example, the diameters 'd₁', 'd₂', 'd₃', 'd₄', and 'd₅' of the through holes may be within the range of about 100 – 1000 μm. Further, the distance between the through holes in a row is 'D'. It would be understood that the amount of air flowing out of the through holes may vary based on diameter of the through holes.

[0045] In an example, the slotted tube 106 with such an arrangement of through holes is positioned such that the through holes with the shorter diameters are arranged closer to the annular die 104 and the through holes with larger diameters are aligned on the opposite side. As would be understood that the polymer tube extruded through the annular die 104 is generally at a high temperature and is in a semi-solid state, and when the polymer tube approaches opposite end of the slotted tube 106, the polymer tube gradually cools down and solidifies. Therefore, less amount of air may be used to expand the polymer tube at semi-solid state and large amount of air may be used for expanding the polymer tube which is going to become solid. The through holes with shorter diameter supplies less amount of air to the polymer tube when the polymer tube in the semi-solid state and the through holes with larger diameters supply high amount of air to expand the solidified polymer tube thereby providing uniform expansion of the polymer tube.

[0046] Thus, the extrusion assembly 100 may provide polymer tubes with enhanced mechanical and physical properties of radial and longitudinal stiffness. Further, the polymer tubes are also observed to have higher burst strength and elastic properties as compared to polymer tube extruded through conventional techniques.

[0047] Although implementations for the extrusion assembly, as per the present subject matter, have been described in a language specific to structural features and/or applications, it is to be understood that the present subject matter is not necessarily limited to the specific features or applications

described. Rather, the specific features and applications are disclosed as exemplary implementations.

I/We claim:

1. An extrusion assembly comprising:

an extruder having an outlet with a specific diameter, wherein the extruder is to release through the outlet a polymer melt;

5 an annular die having a first end, a second end and a circular opening, coaxially coupled to the extruder, wherein diameter of the annular die is less than or equal to the specific diameter, and wherein the annular die is in fluid communication with the extruder such that the annular die is to pass the polymer melt for extrusion into a polymer tube;

10 a slotted tube having its one end coupled to the annular die such that a portion of the slotted tube is surrounded by the annular die and the slotted tube is coaxially aligned with the circular opening of the annular die, wherein the slotted tube further comprises a plurality of through holes extending from inner surface of the slotted tube to outer surface of the slotted tube; and

15 an air inlet coupled to the slotted tube to provide a flow of pressurized air into the slotted tube, wherein the slotted tube is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.

2. The extrusion assembly as claimed in claim 1 further comprising:

20 a sizing die having an adjustable opening, wherein the sizing die is to modulate, through the adjustable opening, size parameters of the polymer tube;

25 a water bath coupled to the sizing die, wherein the water bath comprises a container to store water, and wherein the water bath is to allow the polymer tube through it for cooling and hardening the polymer tube;

a plurality of rollers to rotate in a predetermined direction to apply a pulling axial force on the polymer tube extruded out of the annular die, wherein the polymer tube passes the sizing die and the water bath to reach the rollers.

30

3. The extrusion assembly as claimed in claim 2, wherein the plurality of rollers comprises at least two rollers for applying the pulling force to the polymer tube.
- 5 4. The extrusion assembly as claimed in claim 1, wherein the plurality of through holes is distributed in a predefined arrangement on the outer surface of the slotted tube.
- 10 5. The extrusion assembly as claimed in claim 3, wherein the predefined arrangement is a spiral arrangement.
6. A polymer tube manufactured using an extrusion assembly as claimed in any one of the preceding claims.
- 15 7. A slotted tube assembly comprising:
 - an annular die having a first end, a second end, and a circular opening, wherein the annular die is to pass, through the circular opening, a polymer melt for extrusion into a polymer tube;
 - 20 a slotted tube having its one end coupled to the annular die such that a portion of the slotted tube is surrounded by the annular die and the slotted tube is coaxially aligned with the circular opening of the annular die, wherein the slotted tube further comprises a plurality of through holes extending from inner surface of the slotted tube to outer surface of the slotted tube; and
 - 25 an air inlet coupled to the slotted tube to provide a flow of pressurized air into the slotted tube, wherein the slotted tube is to supply the pressurized air outwards, through the plurality of through holes, into the polymer tube.
- 30 8. The slotted tube assembly as claimed in claim 6, wherein the plurality of through holes are distributed in a predefined arrangement on the outer surface of the slotted tube.

9. The slotted tube assembly as claimed in claim 7, wherein the predefined arrangement is a spiral arrangement.

10. The slotted tube assembly as claimed in claim 6, wherein the polymer melt is
5 of a polymer material including at least one of Polylactic Acid (PLA), Poly Hydroxy Alkanoate (PHA), Polycaprolactone (PCL), and Polyglycolic Acid (PGA).

11. The slotted tube assembly as claimed in claim 6, wherein the diameter of the
10 slotted tube is about 1.5-2.0 millimeter (mm).

Date **14 October 2016**

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Agent for the Applicant

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To,

The Controller of Patents

The Patent Office at **New Delhi**

20

ABSTRACT

POLYMER TUBES FOR MANUFACTURING STENTS

An extrusion assembly (100) is described. The extrusion assembly (100) includes an extruder (102), an annular die (104), and a slotted tube (106). The extruder (102) includes an outlet (112) to release a polymer melt. The annular die (104) includes a first end, a second end and a circular opening and is coaxially coupled to the extruder (102). Further, the annular die (104) is in fluid communication with the extruder (102) to pass the polymer melt. The slotted tube (106) is coaxially coupled to the annular die (104) such that a portion of the slotted tube (106) is surrounded by the annular die (104). The slotted tube (106) comprises multiple through holes to supply air or gas to a polymer tube. The extrusion assembly (100) includes an air inlet (114) coupled to the slotted tube (106) to provide flow of pressurized air or gas into the slotted tube (106).

<<To be published with FIG. 1>>

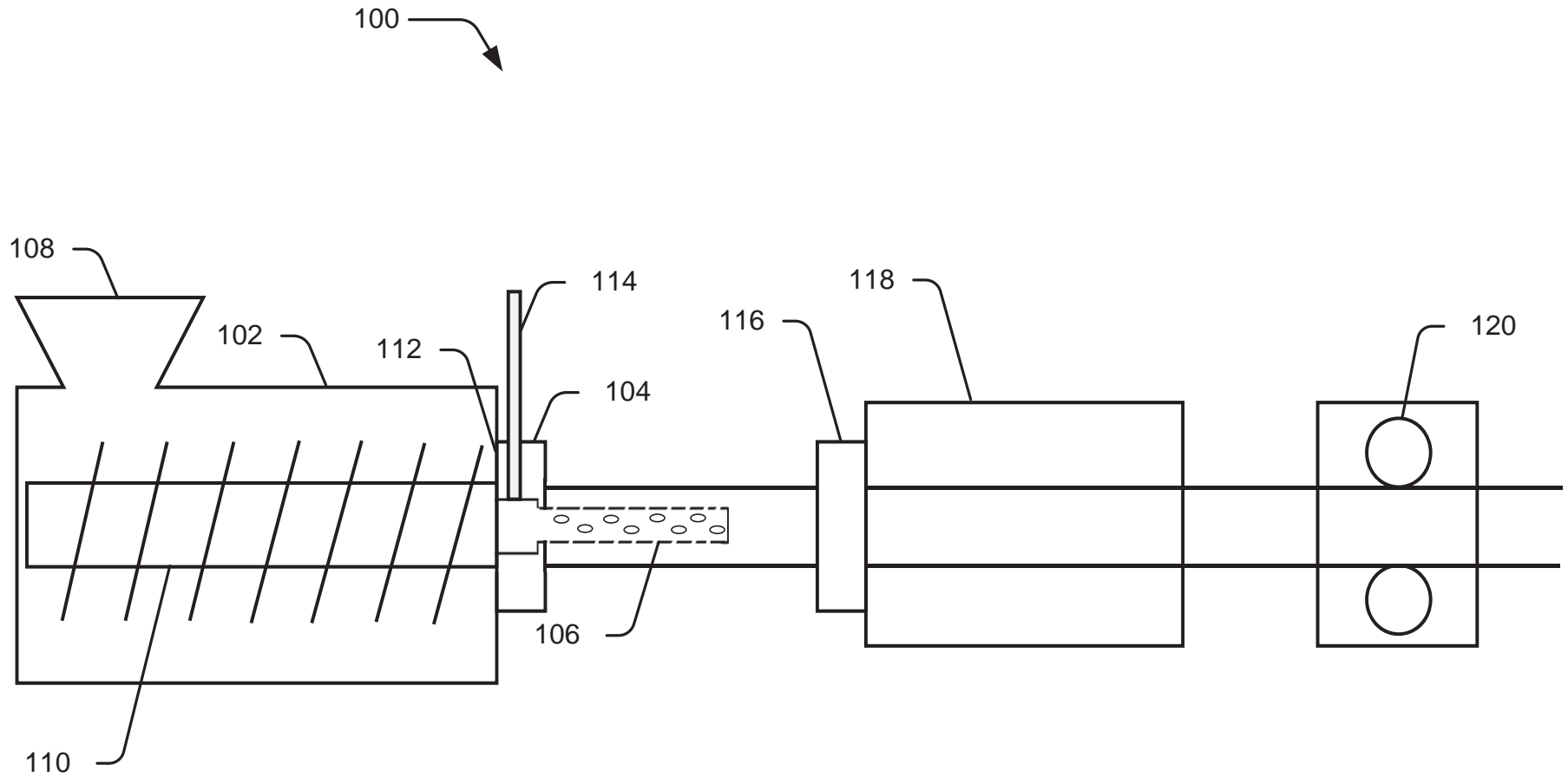


Fig. 1

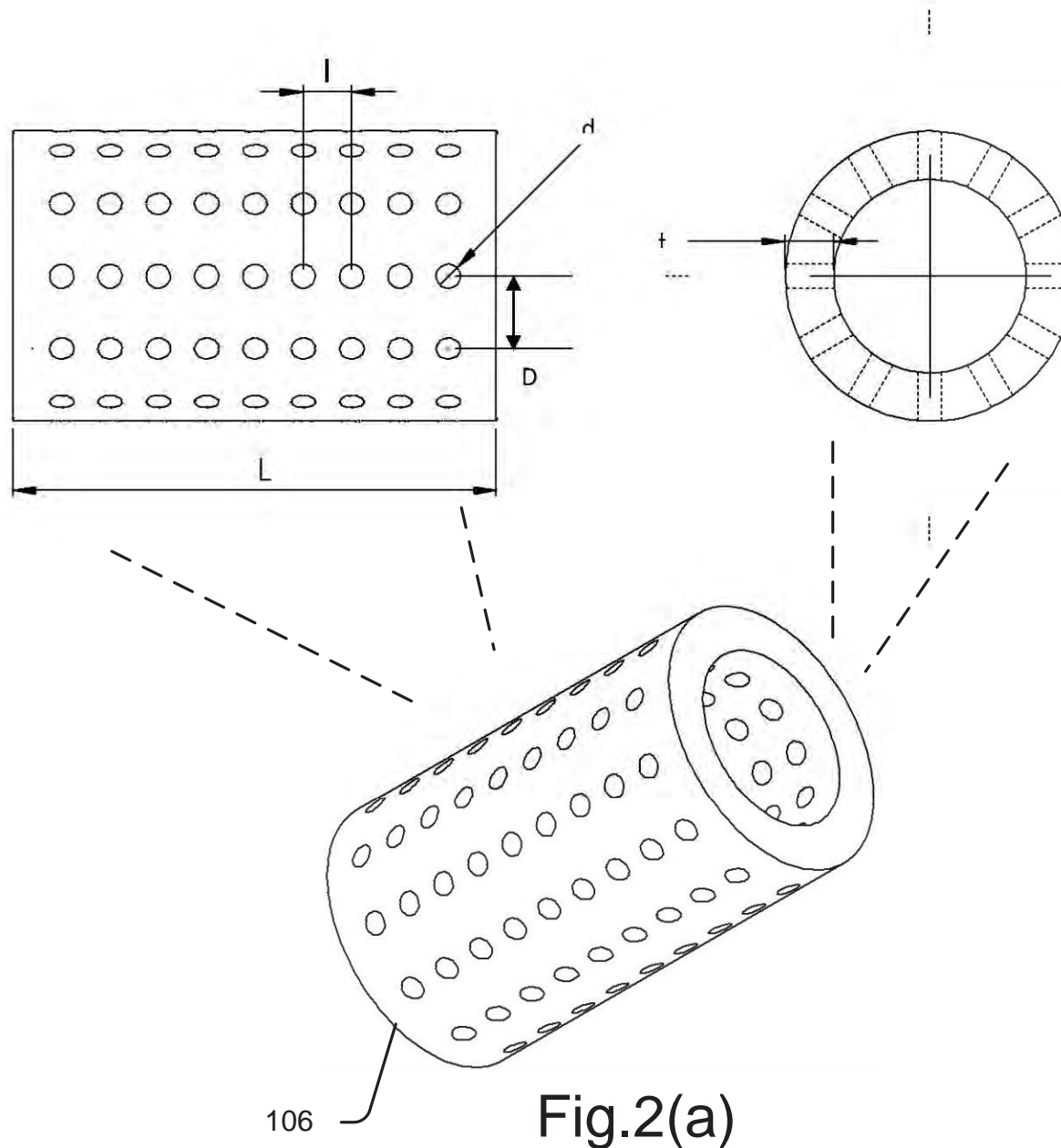


Fig.2(a)

106

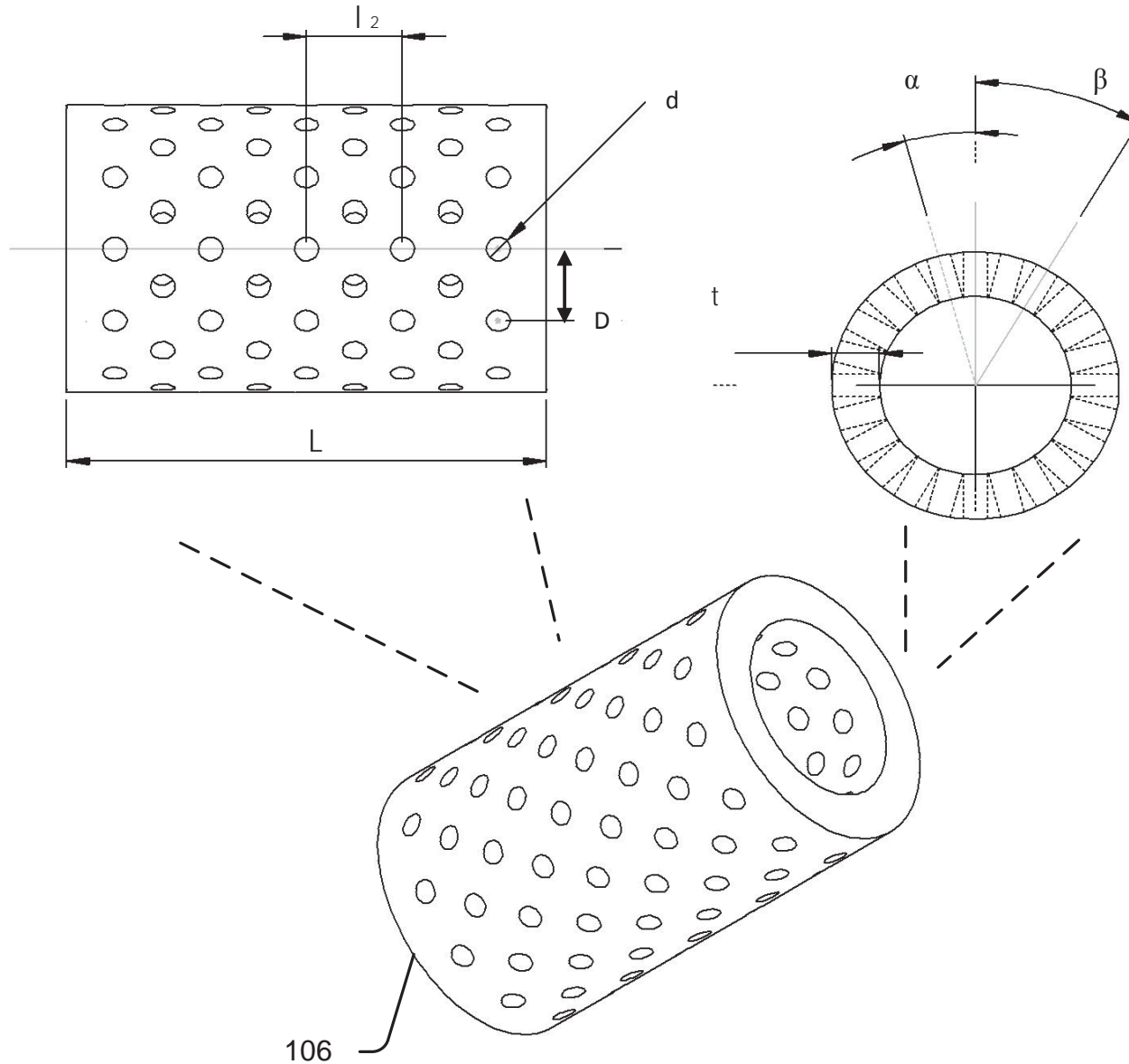


Fig.2(b)

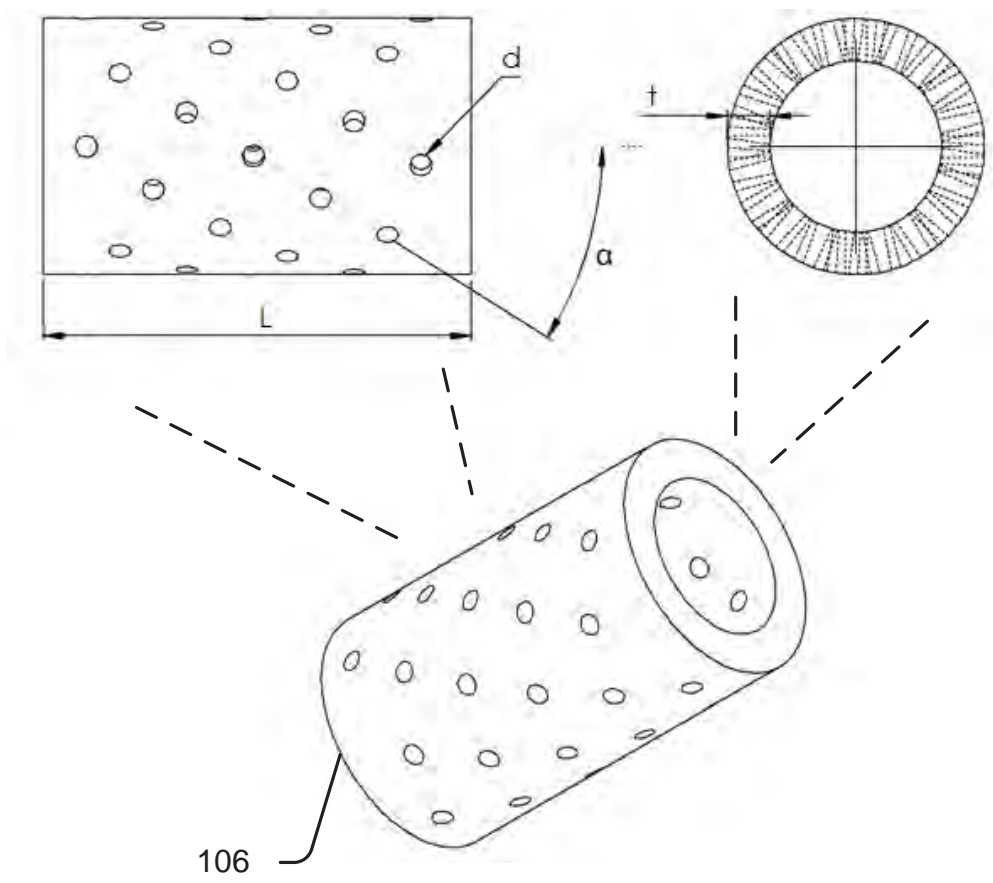


Fig.2(c)

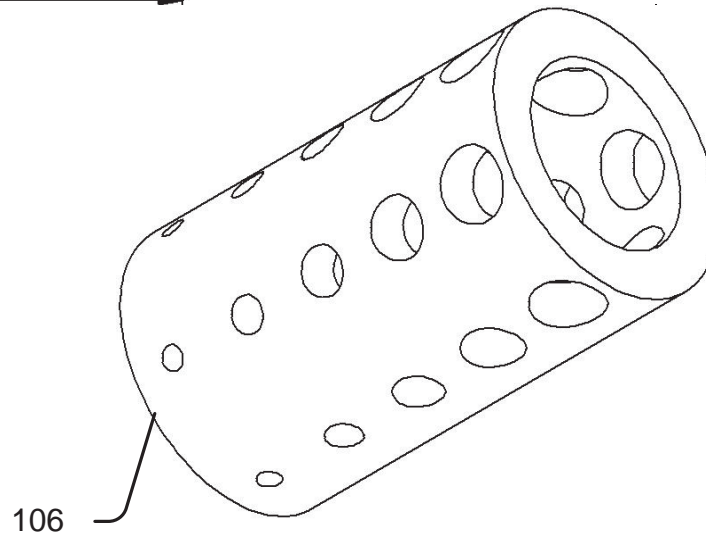
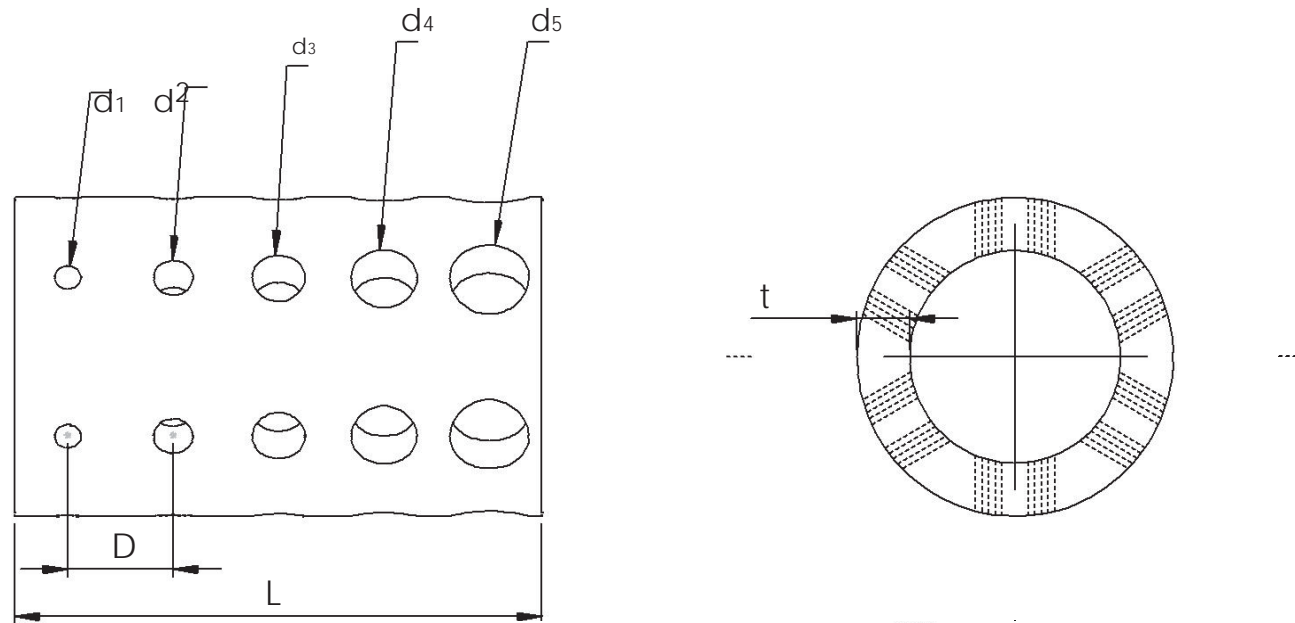


Fig.2(d)

FORM 18 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 REQUEST/EXPRESS REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT <i>[See section 11B and rule 20(4)(ii),</i> <i>24B(1)(i)]</i>		(FOR OFFICE USE ONLY) RQ No.: Filing Date: Amount of Fees Paid: CBR No.: Signature:
1. APPLICANT(S)/OTHER INTERESTED PERSON:		
NAME	NATIONALITY	ADDRESS
INDIAN INSTITUTE OF TECHNOLOGY, DELHI	Indian	Indian Institute of Technology, Delhi Hauz Khas, New Delhi-110016, India
<i>(d) Date of publication of the application under section 11A...</i>		
2. Statement in case of request for examination made by the applicant(s)		
We, hereby request that our application for patent No. filed on for the invention titled POLYMER TUBES FOR MANUFACTURING STENTS shall be examined under sections 12 and 13 of the Act.		
3. Statement in case of request for examination made by any other interested person		
NOT APPLICABLE		
4. ADDRESS FOR SERVICE		
LAKSHMIKUMARAN & SRIDHARAN B6/10, Safdarjung Enclave New Delhi 110029 India Telephone No.: (91) 11 41299800 Fax No: (91) 11 26197578 Email: iprdel@lakshmisri.com		
Dated 14 October 2016		
Signature:		
Name: MALATHI LAKSHMIKUMARAN IN/PA-1433 OF LAKSHMI KUMARAN & SRIDHARAN AGENT FOR THE APPLICANT(S) To, The Controller of Patents The Patent Office at New Delhi		

FORM 18 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 REQUEST/EXPRESS REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT <i>[See section 11B and rule 20(4)(ii),</i> <i>24B(1)(i)]</i>		(FOR OFFICE USE ONLY) RQ No.: Filing Date: Amount of Fees Paid: CBR No.: Signature:
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NOT APPLICABLE		
4. ADDRESS FOR SERVICE		
LAKSHMIKUMARAN & SRIDHARAN B6/10, Safdarjung Enclave New Delhi 110029 India Telephone No.: (91) 11 41299800 Fax No: (91) 11 26197578 Email: iprdel@lakshmisri.com		
Dated 14 October 2016		
Signature:		
Name: MALATHI LAKSHMIKUMARAN IN/PA-1433 OF LAKSHMI KUMARAN & SRIDHARAN AGENT FOR THE APPLICANT(S) To, The Controller of Patents The Patent Office at New Delhi		

FORM 3
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See section 8, rule 12)

We, **INDIAN INSTITUTE OF TECHNOLOGY, DELHI** of **Indian Institute of Technology, Delhi Hauz Khas, New Delhi-110016, India**, hereby declare that we have not made any application for the same/substantially the same invention outside India

Name of Country	Date of Application.	Application No	Status of the Application	Date of Publication	Date of Grant
NIL	NIL	NIL	NIL	NIL	NIL

that the rights in the application(s) has/have been assigned to none;

that we undertake that up to the date of grant of the patent, by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application.

Dated this 14 October 2016

Signature:

Name: **MALATHI LAKSHMIKUMARAN**
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
DECLARATION AS TO INVENTORSHIP
(See section 10(6) and rule 13(6))

1. APPLICANT(S)

NAME	NATIONALITY	ADDRESS
INDIAN INSTITUTE OF TECHNOLOGY, DELHI	Indian	Indian Institute of Technology, Delhi Hauz Khas, New Delhi-110016, India

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of our application numbered dated is/are

2. INVENTOR(S)

NAME	NATIONALITY	ADDRESS
BHATNAGAR, Naresh	Indian	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India
BHATI, Pooja	Indian	Department of Mechanical Engineering, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110016, India

Dated this 14 October 2016

Signature:

Name: **MALATHI LAKSHMIKUMARAN**
IN/PA-1433
OF LAKSHMI KUMARAN & SRIDHARAN
AGENT FOR THE APPLICANT(S)

To,
The Controller of Patents
The Patent Office at New Delhi

FORM 28
THE PATENTS ACT, 1970
(39 of 1970)
AND
THE PATENTS RULES, 2003
TO BE SUBMITTED BY A SMALL ENTITY /STARTUP/EDUCATIONAL INSTITUTION
[See rules 2 (fa), 2(fb), 2(ca) and 7]

1	Insert name, address and nationality.	We, INDIAN INSTITUTE OF TECHNOLOGY, DELHI of Indian Institute of Technology, Delhi, Hauz Khas, New Delhi Delhi 110 016 India , Nationality: Indian ; applicant in respect of the application no. 201611035281 hereby declare we are an educational institution in accordance with rule 2(ca) and submit the following document(s) as proof:
2	Documents to be submitted	ii. For claiming the status of an Educational Institution: We hereby are attaching: A. Copy of Indian Institute of Technology Act, 1961
3	To be signed by the applicant(s) / patentee (s) / authorised registered patent agent.	The information provided herein is correct to the best of our knowledge and belief. Dated this 01 November 2021
4	Name of the natural person who has signed. Designation and official seal, if any, of the person who has signed.	Signature MALATHI LAKSHMIKUMARAN IN/PA-1433 Agent for the Applicant

ACT & STATUTES



**Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110016**

CONTENTS

ACT

Chapter I — Preliminary	1
Chapter II — The Institutes	3
Chapter III — The Council	12
Chapter IV — Miscellaneous	16
The Schedule	17
The Indian Institutes of Technology (Amendment) Act	19

STATUTES

1. Short Title	23
1A. Definitions	23
2. The Board	24
3. Authentication of Orders and Decisions of the Board	25
4. The Senate	25
5. Finance Committee	27
6. Building & Works Committee	28
7. The Chairman	29
8. Travelling Allowances	29
9. The Director	30
10. The Deputy Director	32
11. Classification of the Members of the Staff of the Institute	32
12. Appointments	32
13. Terms and Conditions of Service of Permanent Employees	36
14. Terms and Conditions of Service of Temporary Employees	41
15. Appointment on Contracts	42
16. Contributory Provident Fund	42
16A. Contributory Provident Fund-cum-Gratuity Scheme	43
16B. General Provident Fund-cum-Pension-cum-Gratuity Scheme	45

17. Vacation and Leave	47
18. Residential Accommodation for Staff	48
19. Departments	49
20. Head of the Department	49
21. Institution of Fellowships, Scholarships, Exhibitions, Medals and Prizes	50
22. Fees	51
23. Halls and Hostels	54
24. Conferment of Honorary Degrees	54

SCHEDULES

Schedule 'A'	Contract of Service	55
Schedule 'AA'	Medical Attendance and Treatment	58
Schedule 'B'	Conduct Rules	64
Schedule 'C'	Contributory Provident Fund	69
Schedule 'D'	Leave Provisions	106
Schedule 'E'	Contributory Provident Fund cum Gratuity Scheme	118
Schedule 'F'	General Provident Fund cum Pension cum-Gratuity Scheme	158

*To be published in Part II, Section 3, Sub-section (ii) of the
Gazette of India*

No. F. 24-19/63-T. 6

GOVERNMENT OF INDIA
MINISTRY OF SCIENTIFIC RESEARCH AND CULTURAL AFFAIRS

New Delhi, the 12th September, 1963

NOTIFICATION

In exercise of the powers conferred by sub-section (2) of section 1 of the Institutes of Technology (Amendment) Act, 1963 (29 of 1963), the Central Government hereby appoints the 13th day of September, 1963 as the date on which the said Act shall come into force.

Sd/- L.S. Chandrakant
Joint Educational Adviser (Technical)

To
The Manager,
Government of India Press,
New Delhi.

No. F. 24-19/63-T. 6

New Delhi, the 16th September, 1963

Copy forwarded to :

1. The Director, Indian Institute of Technology, Kharagpur, Bombay-76/Madras-36/Kanpur.
2. The Principal, College of Engineering & Technology, Hauz Khas, New Delhi.
3. All State Governments.
4. All Chief Commissioners of Centrally Administered Territories.
5. Lt. Governor, Himachal Pradesh/Goa.
6. All Ministries of the Government of India, the Cabinet Secretaries, the Prime Minister's Secretariat, the Planning Commission, the Secretary to the President, the Union Public Service Commission, New Delhi.
7. The Comptroller and Auditor General of India.
8. The Accountant General, Central Revenues, New Delhi.

9. The Registrar (with 15 spare copies), Indian Institute of Technology, Kharagpur/ Bombay-76/Madras-36/Kanpur. It is requested that the spare copies may kindly be circulated among the members of the Board of Governors of the Institute.
10. All attached and subordinate offices of the Ministry.
11. All officers and sections of the Ministry.
12. The Registrar, Indian Institute of Science, Bangalore.
13. Secretary, University Grants Commission, New Delhi.
14. Secretary, Inter-Universities Board, New Delhi.
15. Registrar, University of Delhi, Delhi.
16. All members of the Council of Institute of Technology.

Sd/- H.S. Shahani
Assistant Educational Adviser (T)

ACT

*(Effective from 13th September, 1963
vide Ministry of Scientific Research &
Cultural Affairs, Govt. of India,
Gazette Notification No. F. 24-19/63-T. 6,
dated 12th September, 1963)*

THE GAZETTE OF INDIA
EXTRAORDINARY
PART II—SECTION I
PUBLISHED BY AUTHORITY

No. 63, New Delhi, Wednesday, December 20, 1961
Agrahayana 29, 1883

MINISTRY OF LAW
(Legislative Department)

*New Delhi, the 20th December, 1961
Agrahayana 29, 1883 (Saka)*

The following Act of Parliament received the assent of the President on the 19th December, 1961, and is hereby published for general information :

THE INSTITUTES OF TECHNOLOGY ACT 1961
No. 59 of 1961
(19th December, 1961)

An Act to declare certain institutions of technology to be institutions of national importance and to provide for certain matters connected with such institutions and the Indian Institute of Technology, Kharagpur.

Be it enacted by Parliament in the Twelfth Year of the Republic of India as follows :

Chapter 1
PRELIMINARY

Short title and commencement

1. (1) This Act may be called the Institutes of Technology Act, 1961.

Declaration of certain institutions of national importance

(2) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint, and different dates may be appointed for different provisions of this Act.

2. Whereas the objects of the institutions known as the Indian Institute of Technology, Bombay, the Indian Institute of Technology, Kanpur and the Indian Institute of Technology, Madras are such as to make them institutions of national importance, it is hereby declared that each such institution is an institution of national importance.

Definitions

3. In this Act, unless the context otherwise requires :

- (a) "Board", in relation to any Institute, means the Board of Governors thereof;
- (b) "Chairman" means the Chairman of the Board;
- (c) "Corresponding Institute" means:
 - (i) in relation to the society known as the Indian Institute of Technology, Bombay, the Indian Institute of Technology, Bombay,
 - (ii) in relation to the society known as the Indian Institute of Technology (Kanpur) Society, the Indian Institute of Technology, Kanpur, and
 - (iii) in relation to the society known as the Indian Institute of Technology, Madras, the Indian Institute of Technology, Madras;
- (d) "Council" means the Council established under sub-section (1) of section 31;
- (e) "Deputy Director", in relation to any Institute, means the Deputy Director thereof;
- (f) "Director" in relation to any Institute, means the Director thereof;
- (g) "Institute" means any of the Institutions mentioned in section 2 and includes the Indian Institute of Technology, Kharagpur, incorporated under the Indian Institute of Technology (Kharagpur) Act, 1956;
- (h) "Registrar", in relation to any Institute, means the Registrar thereof;
- (i) "Senate", in relation to any Institute, means the Senate thereof;
- (j) "Society" means any of the following societies registered under the Societies Registration Act, 1860, namely:
 - (i) the Indian Institute of Technology, Bombay;
 - (ii) the Indian Institute of Technology (Kanpur) Society;
 - (iii) the Indian Institute of Technology, Madras;

- (k) "Statutes" and "Ordinances", in relation to any Institute, means the Statutes and Ordinances of the Institute made under this Act.

Chapter II

THE INSTITUTES

Incorporation of
Institutes

4. (1) Each of the Institutes mentioned in Section 2 shall be a body corporate having perpetual succession and a common seal and shall, by its name, sue and be sued.

(2) The body corporate constituting each of the said institutes shall consist of a Chairman, a Director and other members of the Board for the time being of the Institute.

Effect of
Incorporation of
Institutes

5. On and from the commencement of this Act :

- (a) any reference to a society in any law (other than this Act) or in any contract or other instrument shall be deemed as a reference to the corresponding Institute;
- (b) all property, movable and immovable, of or belonging to a society shall vest in the corresponding Institute;
- (c) all the rights and liabilities of a society shall be transferred to, and be the rights and liabilities of the corresponding Institute; and
- (d) every person employed by a society immediately before such commencement shall hold his office or service in the corresponding Institute by the same tenure, at the same remuneration and upon the same terms and conditions and with same rights and privileges as to pension, leave gratuity, provident fund and other matters as he would have held the same if this Act had not been passed, and shall continue to do so unless and until his employment is terminated or until such tenure, remuneration and terms and conditions are duly altered by the Statutes.

Provided that if the alteration so made is not acceptable to such employee, his employment may be terminated by the Institute in accordance with the terms of contract with the employee or, if no provision is made therein in this behalf, on payment to him by the Institute of compensation equivalent to three months' remuneration in the case of permanent employees and one month's remuneration in the case of other employees.

6. (1) Subject to the provisions of this Act, every Institute shall exercise the following powers and perform the following duties namely :
- (a) to provide for instruction and research in such branches of engineering and technology, sciences and arts, as the Institute may think fit, and for the advancement of learning and dissemination of knowledge in such branches.
 - (b) to hold examinations and grant degrees, diplomas and other academic distinctions or titles;
 - (c) to confer honorary degrees or other distinctions;
 - (d) to fix, demand and receive fees and other charges;
 - (e) to establish, maintain and manage halls and hostels for the residence of students;
 - (f) to supervise and control the residence and regulate the discipline of students of the Institute and to make arrangements for promoting their health, general welfare and cultural and corporate life;
 - (g) to provide for the maintenance of units of the National Cadet Corps for the students of the Institute;
 - (h) to institute academic and other posts and to make appointments thereto (except in the case of the Director);
 - (i) to frame Statutes and Ordinances and to alter, modify or rescind the same;
 - (j) to deal with any property belonging to or vested in the Institute in such manner as the Institute may deem fit for advancing the objects of the Institute;
 - (k) to receive gifts, grants, donations for benefactions from the Government and to receive bequests, donations and transfers of movable and immovable properties from testators, donors or transferors as the case may be;
 - (l) to co-operate with educational or other institutions in any part of the world having objects wholly or partly similar to those of the Institute by exchange of teachers and scholars and generally in such manner as may be conducive to their common objects;
 - (m) to institute and award fellowships, scholarships, exhibitions, prizes and medals; and
 - (n) to do all such things as may be necessary, incidental or conducive to the attainment of all or any of the objects of the Institute.

(2) Notwithstanding anything contained in sub-section (1) the Institute shall not dispose of in any manner any immovable property without the prior approval of the Visitor.

Institutes to be open to all races, creeds and classes

7. (1) Every Institute shall be open to persons of either sex and of whatever race, creed, caste or class, and no test or condition shall be imposed as to religious belief or profession in admitting or appointing members, students, teachers or workers or in any other connection whatsoever.

(2) No bequest, donation or transfer of any property shall be accepted by any Institute which in the opinion of the Council involves conditions or obligations opposed to the spirit and object of this section.

Teaching at Institutes

8. All teaching at each of the Institutes shall be conducted by or in the name of the Institute in accordance with the Statutes and Ordinances made in this behalf.

Visitor

9. (1) The President of India shall be the Visitor of every Institute.

(2) The Visitor may appoint one or more persons to review the work and progress of any Institute and to hold inquiries into the affairs thereof and to report thereon in such manner as the Visitor may direct.

(3) Upon receipt of any such report, the Visitor may take such action and issue such directions as he considers necessary in respect of any of the matters dealt with in the report and the Institute shall be bound to comply with such directions.

Authorities of Institutes

10. The following shall be the authorities of an Institute, namely :

- (a) a Board of Governors;
- (b) a Senate; and
- (c) such other authorities as may be declared by the Statutes to be the authorities of the Institute.

Board of Governors

11. The Board of an Institute shall consist of the following persons, namely :

- (a) the Chairman, to be nominated by the Visitor;
- (b) the Director, *ex officio*;
- (c) one person to be nominated by the Government of each of the States comprising the zone in which the Institute is situated, from among persons who, in the opinion of that Government, are technologists or industrialists of repute;

- (d) four persons having special knowledge or practical experience in respect of education, engineering or science to be nominated by the Council; and
- (e) two professors of the Institute, to be nominated by the Senate.

Explanation: In this section, the expression "zone" means a zone as for the time being demarcated by the All-India Council for Technical Education for the purposes of this Act.

Term of office, of vacancies among, and allowances payable to, Members of Board

12. Save as otherwise provided in this section,

- (1) The term of office of the Chairman or any other member of the Board shall be three years from the date of his nomination.
- (2) The term of office of an *ex officio* member shall continue so long as he holds the office by virtue of which he is a member.
- (3) The term of office of a member nominated under clause (e) of section 11 shall be two years from the 1st day of January of the year in which he is nominated.
- (4) The term of office of a member nominated to fill a casual vacancy shall continue for the remainder of the term of the member in whose place he has been nominated.
- (5) Notwithstanding anything contained in this section, an outgoing member shall, unless the Council otherwise directs, continue in office until another person is nominated as a member in his place.
- (6) The members of the Board shall be entitled to such allowances, if any, from the Institute as may be provided for in the Statutes but no member other than the person referred to in clauses (b) and (e) of section 11 shall be entitled to any salary by reason of this sub-section.

Functions of Board

13. (1) Subject to the provisions of this Act, the Board of any Institute shall be responsible for the general superintendence, direction and control of the affairs of the Institute and shall exercise all the powers of the Institute not otherwise provided for by this Act, the Statutes and the Ordinances, and shall have the power to review the acts of the Senate.

(2) Without prejudice to the provisions of sub-section (1), the Board of any Institute shall

- (a) take decisions on questions of policy relating to the administration and working of the Institute;

- (b) institute courses of study at the Institute;
- (c) make Statutes;
- (d) institute and appoint persons to academic as well as other posts in the Institute;
- (e) consider and modify or cancel ordinances;
- (f) consider and pass resolutions on the annual report, the annual accounts and the budget estimates of the Institute for the next financial year as it thinks fit and submit them to the Council together with a statement of its development plans;
- (g) exercise such other powers and perform such other duties as may be conferred or imposed upon it by this Act or the Statutes.

(3) The Board shall have the power to appoint such committees as it considers necessary for the exercise of its powers and the performance of its duties under this Act.

Senate

14. The Senate of each Institute shall consist of the following persons, namely :

- (a) the Director, *ex officio*, who shall be the Chairman of the Senate;
- (b) the Deputy Director, *ex officio*;
- (c) the professors appointed or recognised as such by the Institute for the purpose of imparting instructions in the Institute;
- (d) three persons, not being employees of the Institute, to be nominated by the Chairman in consultation with the Director, from among educationists of repute, each from the fields of science, engineering and humanities; and
- (e) such other members of the staff as may be laid down in the Statutes.

Functions of Senate

15. Subject to the provisions of this Act, the Statutes and the Ordinances, the Senate of an Institute shall have the control and general regulation, and be responsible for the maintenance of standards of instruction, education and examination in the Institute and shall exercise such other powers and perform such other duties as may be conferred or imposed upon it by Statutes.

Chairman of Board

16. (1) The Chairman shall ordinarily preside at the meetings of the Board and at the Convocations of the Institute.

- (2) It shall be the duty of the Chairman to ensure that the decisions taken by the Board are implemented.
- (3) The Chairman shall exercise such other powers and perform such other duties as may be assigned to him by this Act or the Statutes.
- Director** 17. (1) The Director of each Institute shall be appointed by the Council with the prior approval of the Visitor.
- (2) The Director shall be the principal academic and executive officer of the Institute and shall be responsible for the proper administration of the Institute and for the imparting of instruction and maintenance of discipline therein.
- (3) The Director shall submit annual reports and accounts to the Board.
- (4) The Director shall exercise such other powers and perform such other duties as may be assigned to him by this Act or the Statutes or Ordinances.
- Deputy Director** 18. The Deputy Director of each Institute shall be appointed on such terms and conditions as may be laid down by the Statutes and shall exercise such powers and perform such duties as may be assigned to him by this Act or the Statutes or by the Director.
- Registrar** 19. (1) The Registrar of each institute shall be appointed on such terms and conditions as may be laid down by the Statutes and shall be the custodian of records, the common seal, the funds of the Institute and such other property of the Institute as the Board shall commit to his charge.
- (2) The Registrar shall act as the Secretary of the Board, the Senate, and such committees as may be prescribed by the Statutes.
- (3) The Registrar shall be responsible to the Director for the proper discharge of his functions.
- (4) The Registrar shall exercise such other powers and perform such other duties as may be assigned to him by this Act or the Statutes or by the Director.
- Other authorities and officers** 20. The powers and duties of authorities and officers other than those herein before mentioned shall be determined by the Statutes.
- Grants by Central Government** 21. For the purpose of enabling the Institutes to discharge their functions efficiently under this Act, the Central Government may, after

due appropriation made by Parliament by law in this behalf, pay to each Institute in each financial year such sums of money and in such manner as it may think fit.

Fund of the
Institute

22. (1) Every Institute shall maintain a fund to which shall be credited :

- (a) all moneys provided by the Central Government;
 - (b) all fees and other charges received by the Institute;
 - (c) all moneys received by the Institute by way of grants, gifts, donations, benefactions, bequests or transfers; and
 - (d) all moneys received by the Institute in any other manner or from any other source.
- (2) All moneys credited to the Fund of any Institute shall be deposited in such Banks or invested in such manner as the Institute may, with the approval of the Central Government, decide.
- (3) The Fund of any Institute shall be applied towards meeting the expenses of the Institute including expenses incurred in the exercise of its powers and discharge of its duties under this Act.

Accounts and
Audit

23. (1) Every Institute shall maintain proper accounts and other relevant records and prepare an annual statement of accounts including the balance-sheet in such form as may be prescribed by the Central Government in consultation with the Comptroller and Auditor-General of India.

(2) The accounts of every Institute shall be audited by the Comptroller and Auditor-General of India and any expenditure incurred by him in connection with such audit shall be payable by the Institute to the Comptroller and Auditor-General of India.

(3) The Comptroller and Auditor-General of India and any person appointed by him in connection with the audit of the accounts of any Institute shall have the same rights, privileges and authority in connection with such audit as the Comptroller and Auditor-General of India has in connection with the audit of the Government accounts, and, in particular shall have the rights to demand the production of books, accounts connected vouchers and other documents and papers and to inspect the offices of the Institute.

(4) The accounts of every Institute as certified by the Comptroller and Auditor-General of India or any other person appointed by him in this behalf together with the audit report thereon shall be forwarded annually to the Central Government and that Government shall cause the same to be laid before each House of Parliament.

Pension and
Provident Fund

24. (1) Every Institute shall constitute for the benefit of its employees, including the Director, in such manner and subject to such conditions as may be prescribed by the Statutes, such pension, insurance and provident funds as it may deem fit.

(2) Where any such provident fund has been so constituted, the Central Government may declare that the provisions of the Provident Funds Act, 1925 shall apply to such funds as if it were a Government Provident Fund.

Appointments

25. All appointments on the staff of any Institute, except that of the Director, shall be made in accordance with procedure laid down in the Statutes, by—

- (a) The Board, if the appointment is made on the academic staff in the post of Lecturer or above or if the appointment is made on the non-academic staff in any cadre the maximum of the pay scale for which exceeds six hundred rupees per month;
- (b) by the Director, in any other case.

Statutes

26. Subject to the provisions of this Act, the Statutes may provide for all or any of the following matters, namely :

- (a) the conferment of honorary degrees;
- (b) the formation of departments of teaching;
- (c) the fees to be charged for courses of study in the Institute and for admission to the examinations of degrees and diplomas of the Institute;
- (d) the institution of fellowships, scholarships, exhibitions, medals and prizes;
- (e) the term of office and the method of appointment of officers of the Institute;
- (f) the qualifications of teachers of the Institute;
- (g) the classification, the method of appointment and the determination of the terms and conditions of service of teachers and other staff of the Institute;
- (h) the constitution of pension, insurance and provident funds for the benefit of the officers, teachers and other staff of the Institute;
- (i) the constitution, powers and duties of the authorities of the Institute;
- (j) the establishment and maintenance of halls and hostels;

- (k) the conditions of residence of students of the Institute and the levying of fees for residence in the halls and hostels and of other charges;
- (l) the manner of filling vacancies among members of the Board;
- (m) the allowances to be paid to the Chairman and members of the Board;
- (n) the authentication of the orders and decisions of the Board;
- (o) the meetings of the Board, the Senate, or any committee, the quorum at such meetings and the procedure to be followed in the conduct of their business; and
- (p) any other matter which by this Act is to be or may be prescribed by the Statutes.

Statutes how made

27. (1) The first Statutes of each Institute shall be framed by the Council with the previous approval of the Visitor and a copy of the same shall be laid as soon as may be before each House of Parliament.

(2) The Board may, from time to time, make new or additional Statutes or may amend or repeal the Statutes in the manner hereafter in this section provided.

(3) Every new Statute or addition to the Statutes or any amendment or repeal of a Statute shall require the previous approval of the Visitor who may assent thereto or withhold assent or remit it to the Board for consideration.

(4) A new Statute or a Statute amending or repealing an existing Statute shall have no validity unless it has been assented to by the Visitor.

Ordinances

28. Subject to the provisions of this Act and the Statutes, the Ordinances of each Institute may provide for all or any of the following matters, namely :

- (a) the admission of the students to the Institute;
- (b) the courses of study to be laid down for all degrees and diplomas of the Institute;
- (c) the conditions under which students shall be admitted to the degree or diploma courses and to the examinations of the Institute, and shall be eligible for degrees and diplomas;
- (d) the conditions of award of the fellowships, scholarships, exhibitions, medals and prizes;

- (e) the conditions and mode of appointment and duties of examining bodies, examiners and moderators;
- (f) the conduct of examinations;
- (g) the maintenance of discipline among the students of the Institute; and
- (h) any other matter which by this Act or the Statutes is to be or may be provided for by the Ordinances.

Ordinances how made

29. (1) Save as otherwise provided in this section, Ordinances shall be made by the Senate.

(2) All Ordinances made by the Senate shall have effect from such date as it may direct, but every Ordinance so made shall be submitted, as soon as may be, to the Board and shall be considered by the Board at its next meeting.

(3) The Board shall have power by resolution to modify or cancel any such Ordinance and such Ordinance shall from the date of such resolution stand modified accordingly or cancelled, as the case may be.

Tribunal of Arbitration

30. (1) Any dispute arising out of contract between an Institute and any of its employees shall, at the request of the employee concerned or at the instance of the Institute, be referred to a Tribunal of Arbitration consisting of one member appointed by the Institute, one member nominated by the employee, and an umpire appointed by the Visitor.

(2) The decision of the Tribunal shall be final and shall not be questioned in any court.

(3) No suit or proceeding shall lie in any court in respect of matter which is required by sub-section (1) to be referred to the Tribunal of Arbitration.

(4) The Tribunal of Arbitration shall have power to regulate its own procedure.

(5) Nothing in any law for the time being in force relating to arbitration shall apply to arbitrations under this section.

Chapter III

THE COUNCIL

Establishment of Council

31. (1) With effect from such date as the Central Government may, by notification in the Official Gazette, specify in this behalf, there shall be established a central body to be called the Council.

(2) The Council shall consist of the following members, namely :

- (a) the Minister in charge of technical education in the Central Government, *ex officio*, as Chairman;
- (b) the Chairman of each Institute, *ex officio*;
- (c) the Director of each Institute, *ex officio*;
- (d) the Chairman, University Grants Commission, *ex officio*;
- (e) the Director-General, Council of Scientific and Industrial Research, *ex officio*;
- (f) the Chairman of the Council of the Indian Institute of Science, Bangalore, *ex officio*;
- (g) the Director of Indian Institute of Science, Bangalore, *ex officio*;
- (h) three persons to be nominated by the Central Government, one to represent the Ministry concerned with technical education, another to represent the Ministry of Finance, and the third to represent any other Ministry;
- (i) one person to be nominated by the All-India Council for Technical Education;
- (j) not less than three, but not more than five persons to be nominated by the Visitor, who shall be persons having special knowledge or practical experience in respect of education, industry, science or technology;
- (k) three members of Parliament, of whom two shall be elected by the House of People from among its members and one by the Council of States from among its members.

(3) An officer of the Ministry of Central Government concerned with technical education shall be nominated by that Government to act as the Secretary of the Council.

Term of office of vacancies among, and allowances payable to members of Council

32. (1) Save as otherwise provided in this section, the term of office of a member of the Council shall be three years from the date of his nomination or election, as the case may be.

(2) The term of office of an *ex officio* member shall continue so long as he holds the office by virtue of which he is a member.

(3) A member of the Council referred to in clause (h) of subsection (2) of section 31 shall hold office during the pleasure of the Central Government.

(4) The term of office of a member elected under clause (k) of sub-section (2) of section 31 shall expire as soon as he ceases to be a member of the House which elected him.

(5) The term of office of a member nominated or elected to fill a casual vacancy shall continue for the remainder of the term of the member in whose place he has been nominated or elected.

(6) Notwithstanding anything contained in this section an outgoing member shall, unless the Central Government otherwise directs, continue in office until another person is nominated or elected as a member in his place.

(7) The members of the Council shall be paid such travelling and other allowances by the Central Government as may be determined by that Government, but no member shall be entitled to any salary by reason of this sub-section.

Functions of
Council

33. (1) It shall be the general duty of the Council to co-ordinate the activities of all the Institutes.

(2) Without prejudice to the provisions of sub-section (1) the Council shall perform the following functions, namely :

- (a) to advise on matters relating to the duration of the courses, the degrees and other academic distinctions to be conferred by the Institutes, admission standards and other academic matters;
- (b) to lay down policy regarding cadres, methods of recruitment and conditions of service of employees, institution of scholarships and freeships, levying of fees and other matters of common interest;
- (c) to examine the development plans of each Institute and to approve such of them as are considered necessary and also to indicate broadly the financial implications of such approved plans;
- (d) to examine the annual budget estimates of each Institute and to recommend to the Central Government the allocation of funds for that purpose;
- (e) to advise the Visitor, if so required, in respect of any function to be performed by him under this Act; and
- (f) to perform such other functions as are assigned to it by or under this Act.

Chairman of
Council

34. (1) The Chairman of the Council shall ordinarily preside at the meetings of the Council.

Power to make rules in respect of matters in this chapter

- (2) It shall be the duty of the Chairman of the Council to ensure that the decisions taken by the Council are implemented.
 - (3) The Chairman shall exercise such other powers and perform such other duties as are assigned to him by this Act.
35. (1) The Central Government may *by notification in the official gazette make rules to carry out the purposes of this Chapter.
- (2) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely :
 - (a) the manner of filling vacancies among the members of the Council;
 - (b) the disqualifications for being chosen as, and for being a member of the Council;
 - (c) the circumstances in which, and the authority by which, members may be removed;
 - (d) the meetings of the Council and the procedure of conducting business thereat;
 - (e) the travelling and other allowances payable to members of the Council; and
 - (f) the functions of the Council and the manner in which such functions may be exercised.
 - *(3) Every rule made by the Central Government under this Chapter shall be laid; as soon as may be after it is made, before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule."

* Added vide Min. of Human Resource Development letter No. F 11-2/79-T.6, dated 4th November, 1986.

Chapter IV
MISCELLANEOUS

Acts and proceedings not to be invalidated by vacancies etc.

36. No act of the Council, or any Institute or Board or Senate or any other body set up under this Act or the Statutes, shall be invalid merely by reason of —

- (a) any vacancy in, or defect in the constitution thereof, or
- (b) any defect in the election, nomination or appointment of a person acting as a member thereof, or
- (c) any irregularity in its procedure not affecting the merits of the case.

Power to remove difficulties

37. If any difficulty arises in giving effect to the provisions of this Act the Central Government may, by order published in the Official Gazette, make such provision or give such direction not inconsistent with the purposes of this Act, as appears to it to be necessary or expedient for removing the difficulty.

Transitional provisions

38. Notwithstanding anything contained in this Act—

- (a) the Board of Governors of an Institute functioning as such immediately before the commencement of this Act shall continue to so function until a new Board is constituted for that Institute under this Act, but on the constitution of a new Board under this Act, the members of the Board holding office before such constitution shall cease to hold office;
- (b) any academic Council constituted in relation to any Institute before the commencement of this Act shall be deemed to be the Senate constituted under this Act until a Senate is constituted under this Act for that Institute;
- (c) until the first Statutes and the Ordinances are made under this Act, the Statutes and Ordinances of the Indian Institute of Technology, Kharagpur as in force immediately before the commencement of this Act shall continue to apply to that Institute and shall, with the necessary modifications and adaptations, also apply to any other Institute, in so far as they are not inconsistent with the provisions of this Act.

Repeal and savings

- 39.** (1) The Indian Institute of Technology (Kharagpur) Act, 1956 (5 of 1956) is hereby repealed.
- (2) Notwithstanding such repeal, the provisions of the said Act set out in the Schedule shall continue to have effect.

Provided that in the said provisions, the expression "this Act" means the said provisions.

THE SCHEDULE
(See Section 39)

*Provisions of the Indian Institute of Technology (Kharagpur)
Act, 1956, continued in force*

Declaration of the Indian Institute of Technology (Kharagpur) as an Institution of National Importance

2. Whereas the objects of the institution known as the Indian Institute of Technology at Kharagpur in the district of Midnapore in the State of West Bengal are such as to make the institution one of national importance, it is hereby declared that the institution known as the Indian Institute of Technology, Kharagpur, is an institution of National Importance.

Definitions

3. In this Act, unless the context otherwise requires—

- (b) "Board" means the Board of Governors of the Institute;
- (c) "Chairman" means the Chairman of the Board;
- (d) "Director" means the Director of the Institute;
- (e) "Institute" means the Institute known as the Indian Institute of Technology, Kharagpur, incorporated under this Act.

Incorporation

4. (1) The first Chairman, the first Director and the first member of the Board who shall be the persons appointed in this behalf by the Central Government, by notification in the Official Gazettee, and all persons, who may hereafter become or be appointed as officers or members of the Board, so long as they continue to hold such office or membership, are hereby constituted a body corporate by the name of the Indian Institute of Technology, Kharagpur.

(2) The Institute shall have perpetual succession and a common seal, and shall sue and be sued by the said name.

Transfer of service of existing employees of the Indian Institute of Technology at Kharagpur

5. (1) Subject to the provision of this Act, every person who is permanently employed in the Indian Institute of Technology at Kharagpur immediately before the commencement of this Act shall, on and from such commencement, become an employee of the Institute and shall hold his office or service therein by the same tenure, at the same remuneration and upon the same terms and conditions and with the same rights and privileges as to pension, leave, gratuity, provident fund and other matters as he would have held the same on the date of commencement of this Act if this Act had not been passed.

(2) Notwithstanding anything contained in sub-section (1), the Institute may, with the prior approval of the Visitor, alter the terms and conditions of any employee specified in sub-section (1), and if the

alteration is not acceptable to such employee, his employment may be terminated by the Institute in accordance with the terms of the contract with the employee, or, if no provision is made therein in this behalf, on payment to him by the Institute of compensation equivalent to three months' remuneration.

(3) Every person employed in the Indian Institute of Technology at Kharagpur other than any such person as is referred to in subsection (1) shall, on and from the commencement of this Act become an employee of the Institute upon such terms and conditions as may be provided for in the Statutes, and until such provision is made on the terms and conditions applicable to him immediately before such commencement.

ACT NO. 29 of 1963
**THE INSTITUTES OF TECHNOLOGY (AMENDMENT)
ACT**

**An Amendment Act
to amend
The Institutes of Technology Act, 1961**

Be it enacted by Parliament in the Fourteenth Year of the Republic of India as follows :

Short title and commencement

1. (1) This Act may be called the Institutes of Technology (Amendment) Act, 1963.
- (2) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint.

Amendment of Section 2

2. In section 2 of the Institutes of Technology Act, 1961 (hereinafter 59 referred to as the Principal Act), of 1961 after the words "the Indian Institute of Technology, Bombay," the words "the College of Engineering and Technology, Delhi," shall be inserted.

Amendment of Section 3

3. In section 3 of the Principal Act— (a) in clause (c), after sub-clause (i), the following sub-clause shall be inserted, namely :

“(a) in relation to the society known as the College of Engineering and Technology, Delhi, the Indian Institute of Technology, Delhi,”

- (b) in clause (j), after sub-clause (i), the following sub-clause shall be inserted, namely :

“(ia) the College of Engineering and Technology, Delhi;”

Amendment of Section 4

4. In section 4 of the Principal Act, after sub-section (1), the following sub-section shall be inserted, namely :

“(1A) The College of Engineering and Technology, Delhi shall, on such incorporation, be called the Indian Institute of Technology Delhi”

Amendment of Section 12

5. In sub-section (3) of section 12 of the Principal Act, for the word, brackets and letter "clause (c)", the word, brackets and letter "clause (c)" shall be, and shall be deemed always to have been substituted.

Amendment of Section 38

6. In section 38 of the Principal Act, in clause (b), for the words "any Academic Council constituted in relation to any Institute", the words

"the Staff Committee constituted in relation to the College of Engineering and Technology, Delhi and any Academic Council constituted in relation to any other institute" shall be substituted.

College of
Engineering and
Technology, Delhi
to cease to be
affiliated College of
University of Delhi

7. Notwithstanding anything contained in the Delhi University Act, 1922 (8 of 1922), or the Statutes made thereunder, the College of Engineering and Technology, Delhi, incorporated under this Act, shall, on the commencement of this Act, cease to be an "Affiliated College" within the meaning of clause (a) of section 2 of the Delhi University Act, 1922, except as respects things done or omitted to be done before such cesser.

STATUTES

(Effective from 15th October, 1963 vide Ministry of Scientific Research and Cultural Affairs, Government of India No. F. 25-10/62-T.6, dated 15th October, 1963 and corrected up to June 1991)

INDIAN INSTITUTE OF TECHNOLOGY DELHI

STATUTES

*1. Short Title

These Statutes may be called the Indian Institutes of Technology, Kharagpur/ Bombay/Madras/Kanpur/Delhi Statutes.

†1A. Definitions

- (a) 'Act' means the Institutes of Technology Act, 1961;
- (b) 'Assistant Warden' in relation to the Hall of Residence of the Institute means Assistant Warden thereof;
- (c) 'Authorities', 'Officers' and 'Professors' respectively mean the authorities, officers and professors of the Institute;
- (d) 'Board' means the Board of Governors of the Institute;
- (e) 'Building and Works Committee' means the Building and Works Committee of the Institute;
- (f) 'Chairman' means the Chairman of the Board;
- (g) 'Council' means the Council of the Institute;
- (h) 'Deputy Director' means the Deputy Director of the Institute;
- (i) 'Director' means Director of the Institute;
- (j) 'Finance Committee' means the Finance Committee of the Institute;
- (k) 'Institute' means Institute known as the Indian Institute of Technology, Delhi, incorporated under the Act;
- (l) 'Ordinances' means the Ordinances of the Institute;
- (m) 'Registrar' means the Registrar of the Institute;
- (n) 'Senate' means the Senate of the Institute;
- (o) 'Warden' in relation to a Hall of Residence of the Institute means a Warden thereof.

* Inserted vide Ministry of Education letter No. F. 24-42/63-T.6 (Vol.III), dated 22nd August, 1975. Effective from August 12, 1975.

† Re-numbered vide Ministry of Education letter No. F-24-42/63-T.6 (Vol.III), dated 22nd August, 1975. Effective from August 12, 1975.

2. The Board

(1) The bodies entitled to nominate or elect representatives on the Board shall be invited by the Registrar to do so within a reasonable time not ordinarily exceeding eight weeks from the date on which such invitations are issued by him. The same procedure shall be followed for filling casual vacancies on the Board.

(2) The Board shall ordinarily meet four times during a calendar year.

(3) Meetings of the Board shall be convened by the Chairman either on his own initiative or at the request of the Director or on a requisition signed by not less than three members of the Board.

(4) Six members shall form a quorum for a meeting of the Board.

* Provided that if a meeting is adjourned for want of quorum, it shall be held on the same day in the next week, at the same time and place, or on such other day and such other time and place as the Chairman may determine, and if at such a meeting, a quorum is not present within half-an-hour from the time appointed for holding a meeting, the members present shall be a quorum;

(5) All questions considered at the meetings of the Board shall be decided by a majority of the votes of the members present including the Chairman. If the votes be equally divided, the Chairman shall have a second or casting vote.

(6) The Chairman, if present, shall preside at every meeting of the Board. In his absence, the members present shall elect one from amongst themselves to preside at the meeting.

(7) A written notice of every meeting shall be sent by the Registrar to every member at least three weeks before the date of the meeting. The notice shall state the place, the date and time of the meeting.

† Provided that the Chairman may call a special meeting of the Board at short notice to consider urgent special issues.

(8) The notice may be delivered either by hand or sent by registered post at the address of each member as recorded in the office of the Board and if so sent, shall be deemed to be duly delivered at the time at which notice would be delivered in the ordinary course of post.

(9) Agenda shall be circulated by the Registrar to the members at least ten days before the meeting.

(10) Notices of motions for inclusion of any item on the agenda must reach the Registrar at least one week before the meeting. The Chairman may, however, permit inclusion of any item for which due notice has not been received.

* Inserted vide Ministry of Education letter No. F.24-9/64-T.6, dated 7th September, 1967 and amended vide Ministry of Education letter No. F.24-9/64-T.6, dated 4th March, 1968.

† Added vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

(11) The ruling of the Chairman in regard to all questions of procedure shall be final.

(12) The minutes of the proceedings of a meeting of the Board shall be drawn up by the Registrar and circulated to all members of the Board present in India. The minutes, along with any amendment suggested, shall be placed for confirmation at the next meeting of the Board. After the minutes are confirmed and signed by the Chairman, they shall be recorded in a minute book which shall be kept open for inspection of the members of the Board and the Council at all times during office hours.

* (13) If a member of the Board fails to attend three consecutive meetings without leave of absence from the Board he shall cease to be a member of the Board.

3. Authentication of Orders and Decisions of the Board

All orders and decisions of the Board shall be authenticated by the signature of the Registrar or any other person authorised by the Board in this behalf.

4. The Senate

(1) In addition to the persons mentioned in section 14 of the Act, the following shall be the members of the Senate, namely :

- † (a) Heads of the departments, centres, schools or divisions other than Professors;
 - (b) The Librarian of the Institute;
 - (c) One Warden by rotation in order of seniority in service as Warden, for a period of one year;
 - (d) Workshop Superintendent of the Institute;
 - (e) Not more than six other members of the staff for their special knowledge appointed by the Chairman after consultation with the Director for such period as may be specified by the Chairman;
- (2) Subject to the provisions of the Act, the Senate shall have the power to :
- (a) frame and revise curricula and syllabi for the courses of studies for the various Departments;
 - (b) make arrangements for the conduct of examinations; appoint examiners, moderators, tabulators and the like;
 - (c) declare the results of the examinations or to appoint Committees or officers to do so and to make recommendations to the Board regarding conferment or grant of degrees, diplomas and other academic distinctions or titles;
 - (d) appoint Advisory Committees or Expert Committees or both for the Departments of the Institute to make recommendation on academic

* Added vide Ministry of Education letter No. F.24-9/64-T.6, dated 7th September, 1967.

† Substituted vide Ministry of Education letter No.11-7/76-T-6, dated 26th October, 1977. Effective from October, 22, 1977.

matters connected with the working of the Department, the Head of the Department concerned shall act as convener of such Committees;

- (e) appoint Committees from amongst the members of the Senate, other teachers of the Institute and experts from outside to advise on such specific academic matters as may be referred to any such Committee by the Senate;
- (f) consider the recommendations of the Advisory Committee attached to various departments and that of Expert and other committees and take such action (including the making of recommendations to the Board) as circumstances of each case may require;
- (g) make periodical review of the activities of the departments and take appropriate action (including the making of recommendations to the Board);
- (h) supervise the working of the Library;
- (i) promote research within the Institute and require reports on such research from the persons engaged thereon;
- * (j) provide for the inspection of the classes and the Halls of Residence in respect of the instructions and discipline therein, supervise the co-curricular activities of the students of the Institute and submit reports thereon to the Board;
- (k) award stipends, scholarships, medals and prizes and make other awards in accordance with the Ordinances and such other conditions as may be attached to the awards;
- (l) make recommendations to the Board with regard to (i) the creation of posts on the academic staff and the abolition thereof, and (ii) the emoluments and duties attached to such posts.

(3) The Senate shall meet as often as is necessary but not less than four times during a calendar year.

* (4) Meetings of the Senate shall be convened by the Chairman of the Senate either on his own initiative or on a requisition signed by not less than 20% of the members of the Senate. Requisitioned meeting shall be a special meeting to discuss only those items of agenda for which requisition is made. The requisitioned meeting shall be convened by the Chairman of the Senate on date and time convenient to him within 15 days of the notice given for such a requisition.

‡(5) One third of the total number of members of the Senate shall form a quorum for a meeting of the Senate.

* Substituted vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

‡ Amended vide Ministry of Education letter No. F.11-7/78-T.6, dated 21st July, 1979. Effective from July 7, 1979.

(6) The Director, if present, shall preside at every meeting of the Senate. In his absence, the Deputy Director shall preside and in the absence of both the Director and the Deputy Director, the seniormost of the Professors present shall preside at the meeting.

(7) A written notice of every meeting, together with the agenda, shall be circulated by the Registrar to the members of the Senate at least a week before the meeting. The Chairman of the Senate may permit inclusion of any item for which due notice could not be given.

(8) Notwithstanding the provisions of sub-statute (7), the Director may call an emergency meeting of the Senate at short notice to consider urgent special issues.

(9) The ruling of the Chairman of the Senate in regard to all questions of procedure shall be final.

(10) The minutes of the proceedings of a meeting of the Senate shall be drawn up by the Registrar and circulated to all the members of the Senate present in India, provided that any such minute shall not be circulated if the Senate considers such circulation prejudicial to the interests of the Institute. The minutes, along with amendments, if any, suggested shall be placed for confirmation at the next meeting of the Senate. After the minutes are confirmed and signed by the Chairman of the Senate they shall be recorded in a minute book which shall be kept open for inspection of the members of the Senate, the Board and the Council at all times during office hours.

5. Finance Committee

(1) It is hereby declared that the Finance Committee, hereafter in this sub-statute referred to as 'Committee' shall also be an authority within the meaning of section 10 of the Act and shall consist of the following persons, namely :

- (a) the Chairman, *ex officio*, who shall be the Chairman of the Committee;
- (b) two persons nominated by the Central Government;
- (c) two persons nominated by the Board; and
- (d) the Director.

(2) The Committee shall perform the following functions :

- (a) examine and scrutinise the annual budget of the Institute prepared by the Director and make recommendations to the Board;
- (b) give its views and make its recommendations to the Board either on the initiative of the Board or of the Director, or on its own initiative of any financial question affecting the Institute.

(3) The Committee shall meet at least once a year.

(4) Three members of the Committee shall form a quorum for a meeting of the Committee.

(5) The Chairman, if present, shall preside over the meeting of the Committee. In his absence, the members present shall elect one from amongst themselves to preside over the meeting.

(6) The provisions in these Statutes regarding notices of the meeting, inclusion of items in the agenda and confirmation of the minutes applicable to the meetings of the Board shall, so far as may be, be followed in connection with the meeting of the Committee.

(7) A copy of the minutes of every meeting of the Committee shall be sent to the Board.

6. Building and Works Committee

(1) It is hereby declared that the Building and Works Committee, hereafter in this sub-statute referred to as 'Committee', consisting of not less than five and not more than seven members as may be appointed by the Board, shall also be an authority within the meaning of section 10 of the Act.

(2) The Committee shall perform the following functions and have the following powers :

- (a) It shall be responsible under the direction of the Board for construction of all major capital works after securing from the Board the necessary administrative approval and expenditure sanction.
- (b) It shall have the power to give the necessary administrative approval and expenditure sanction for minor works and works pertaining to maintenance and repairs, within the grant placed at the disposal of the Institute for the purpose.
- (c) It shall cause to be prepared estimates of cost of buildings and other capital works, minor works, repairs, maintenance and the like.
- (d) It shall be responsible for making technical scrutiny as may be considered necessary by it.
- (e) It shall be responsible for enlistment of suitable contractors and acceptance of tenders and shall have the power to give directions for departmental works where necessary.
- (f) It shall have the power to settle rates not covered by tender and settle claims and disputes with contractors.

(3) The Committee shall perform such other functions in the matter of construction of buildings and development of land for the Institute as the Board may entrust to it from time to time.

(4) In emergent cases the Chairman of the Committee may exercise the powers of the Committee. Such cases shall be reported by him to the Committee and the Board at the next meeting of the Committee and of the Board.

(5) The Committee shall meet as often as is necessary, but at least twice a year.

(6) Three members shall form a quorum for a meeting of the Committee.

(7) The provisions in these Statutes regarding notices of meeting, inclusion of items in the agenda and confirmation of the minutes applicable to the meeting of the Board shall, so far as may be, be followed in connection with the meeting of the Committee.

(8) A copy of the minutes of every meeting of the Committee shall be sent to the Board.

7. The Chairman

(1) The Chairman shall have the power to fix, on the recommendations of the Selection Committee, the initial pay of an incumbent at a stage higher than the minimum of the scale in respect of posts to which appointments can be made by the Board under the provisions of the Act.

(2) The Chairman shall have the power to send members of the staff of the Institute for training or for a course of instruction outside India subject to such terms and conditions as may be laid down by the Board from time to time.

* (3) Contract of service between the Institute and the Director shall be in writing as set out in Schedule 'A' and be expressed to be made in the name of the Institute, and every such contract shall be executed by the Chairman, but the Chairman shall not be personally liable in respect of anything under such contract.

(4) In emergent cases the Chairman may exercise the powers of the Board and inform the Board of the action taken by him for its approval.

8. Travelling Allowances

(1) Members of the Board and other authorities of the Institute and member of the Committees constituted under the Act or these Statutes or appointed by the Board and other authorities, other than Government employees and employees of the Institute, shall be entitled to travelling allowance and daily allowance for attending the meetings of the authorities and their Committees as laid down by the Board from time to time.

(2) Members of the Board and other authorities of the Institute and the Committees who are Government employees shall receive travelling allowance and daily allowance from the source from which they draw their salaries at rates admissible to them. If so required, the Institute shall reimburse the Department/Government concerned.

* Amended vide Ministry of Education letter No. 10-1/75-T.6, dated 26th November, 1976. Effective from November 20, 1976.

* If, however, required by members, the Institute shall re-imburse the TA or DA as laid down by the Board from time to time, to the members concerned if they declare that they shall not claim TA or DA from other source.

Provided that the Institute may pay to the aforesaid Government employees travelling allowance and daily allowance at the rates admissible to them, if they have been authorised by the appropriate Government to receive such travelling allowance and daily allowance.

9. The Director

(1) Subject to the budget provisions made for the specific purpose, the Director shall have the power to incur expenditure in accordance with the procedure as may be laid down by the Board from time to time.

(2) The Director shall have the power to reappropriate funds with respect to different items constituting the recurring budget up to a limit of Rs. 10,000 for each item, provided that such reappropriation will not involve any liability in future years. Every such reappropriation shall, as soon as possible, be reported to the Board.

†(3) The Director shall have the power to waive recovery of over-payment up to Rs. 500 to a member of the staff whose basic pay is Rs. 500 per mensem or less, not detected within twenty-four months of payment. Every such waiver shall, as soon as possible, be reported to the Board.

(4) The Director shall have the power to write off irrecoverable losses up to Rs. 1,000 and of irrecoverable value of stores lost or rendered unserviceable due to fair wear and tear up to Rs. 5,000 in any individual case subject to such stipulations as may be made by the Board from time to time.

(5) The Director shall have the power to fix, on the recommendations of the Selection Committee, the initial pay of an incumbent at a stage higher than the minimum of the scale, but not involving more than five increments, in respect of posts to which appointment can be made by him under the powers vested in him by the provisions of the Act.

(6) The Director shall have the power to employ technicians and workmen paid from contingencies involving emoluments not exceeding Rs. 7 per head per day.

(7) The Director shall have the power to send members of the staff for training or for a course of instruction inside India subject to such terms and conditions as may be laid down by the Board from time to time.

(8) The Director shall have the power to sanction remission or reduction of rents for buildings rendered wholly or partially unsuitable.

* Inserted vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

† Amended vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

(9) The Director shall have the power to sanction temporary allocation of any building for any purpose other than that for which it was constructed.

(10) In exceptional cases, subject to availability of funds, the Director shall have the power to create temporary posts with the approval of the Chairman, of not more than two years' duration on approved scales of pay under report to the Board provided that no such post, of which the Director is not the appointing authority, shall be so created.

(11) The Director shall have the power of a Head of Department for purposes of rules in the Account Code, the Fundamental and Supplementary Rules and other rules of the Government in so far as they are applicable or may be made applicable to the conduct of the business of the Institute.

(12) If, for any reason, the Registrar is temporarily absent for a period not exceeding one month, the Director may take over, or assign to any member of the staff of the Institute, any of the functions of the Registrar as he deems fit. Provided that if, at any time, the temporary absence of the Registrar exceeds one month the Board may, if it thinks fit, authorise the Director to take over or assign the function of the Registrar as aforesaid, for a period exceeding one month.

(13) All contracts for and on behalf of the Institute, except the one between the Institute and the Director shall, when authorised by a resolution of the Board passed in that behalf, be in writing and be expressed to be made in the name of the Institute, and every such contract shall be executed on behalf of the Institute by the Director, but the Director shall not be personally liable in respect of anything under such contract.

* (14) The Director may, during his absence from headquarters, authorise the Deputy Director or one of the Deans or the seniormost Professor present, to sanction advances for travelling allowance, contingencies and medical treatment of the staff and sign and countersign bills on his behalf and authorise him for assuming such powers of Director as may be specifically delegated to the Deputy Director or one of the Deans or the seniormost Professor present, by him in writing.

(15) The Director may, at his discretion, constitute such Committees as he may consider appropriate.

(16) In the event of the occurrence of any vacancy in the office of the Chairman by reason of his death, resignation, or otherwise or in the event of the Chairman being unable to discharge his functions owing to absence, illness or any other cause, the Director may discharge the functions assigned to the Chairman under Statute 7.

†(17) The Director may, with the approval of the Board delegate any of his powers, responsibilities and authorities vested in him by the Act and Statutes to one or more members of academic or administrative staff of the Institute.

* Substituted vide Ministry of Education letter No. F-11-5/82-T.6, dated 10th May, 1983. Effective from February 11, 1983.

* Substituted vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

10. The Deputy Director

The Deputy Director shall assist the Director in academic and administrative work and in maintaining liaison with other institutions of higher learning and research and also with industrial undertakings and other employers.

11. Classification of the Members of the Staff of the Institute

Except in the case of employees paid from contingencies the members of staff of the Institute shall be classified as :

- (a) *Academic*—which term shall include Director, Deputy Director, Professor, Associate Professor, Assistant Professor, Lecturer, Workshop Superintendent, Associate Lecturer, Assistant Lecturer/Instructor, Scientific Officer, Research Assistant, Librarian, Deputy Librarian and such other academic posts as may be decided by the Board.
- (b) *Technical*—which term shall include Farm Superintendent, Foreman, Supervisor (Workshop), Mechanic, Farm Overseer, Horticultural Assistant, Technical Assistant, Draftsman, Physical Training Instructor and such other technical posts as may be decided by the Board.
- (c) *Administrative and others*—which term shall include Registrar, Assistant Registrar, Accounts Officer, Audit Officer, Stores Officer, Estate Officer, Medical Officer, House Surgeon and other Medical Staff, Chief Store Keeper, Steward, Office Superintendent and such other administrative and other staff as may be decided by the Board.

12. Appointments

(1) All posts at the Institute shall normally be filled by advertisement; but, the Board shall have the power to decide, on the recommendations of the Director, that a particular post be filled by invitation or by promotion from amongst the members of the staff of the Institute.

(2) While making appointments, the appointing authority shall take into consideration the claims of the members of the scheduled castes and scheduled tribes consistently with the maintenance of efficiency of administration and the teaching at the Institute.

(3) Selection Committees for filling up of posts under the Institute (other than the posts on contract basis) by advertisement or by promotion from amongst the members of staff of the Institute shall be constituted in the manner laid down below, namely :

- (a) In the case of posts of Deputy Director and Professor, the Selection Committee shall consist of :
 - (i) Director Chairman
 - (ii) One nominee of the Visitor Member

- (iii) Two nominees of the Board, one being an expert, but other than a member of the Board Members
- (iv) One expert nominated by the Senate other than a member of the Senate Member
- (b) In the case of posts of Assistant Professor, Senior Scientific Officer and Lecturer, the Selection Committee shall consist of :
 - (i) Director Chairman
 - (ii) Two nominees of the Board, one being an expert, but other than a member of the Board Members
 - (iii) One expert nominated by the Senate Member
 - (iv) Head of the Department/Centre concerned, if the post for which selection is made is lower in status than that occupied by the Head of the Department/Centre Member
- *(bb) In the case of personal promotion to posts of Lecturer or Associate Lecturer, or to posts of Assistant Professor from Lecturer, the Selection Committee shall consist of :
 - (i) Director Chairman
 - (ii) Two nominees of the Board, one being an expert, but other than a member of the Board Members
 - (iii) One expert nominated by the Senate Member
 - (iv) One nominee of the Chairman of the Council of Institutes of Technology Member
 - (v) Head of the Department/Centre concerned, if the post for which selection is made is lower in status than that occupied by the Head of the Department/Centre Member
- (c) In the case of posts of Librarian and Workshop Superintendent, the Selection Committee shall consist of :
 - (i) Director Chairman
 - (ii) Two nominees of the Board, one being an expert, but other than a member of the Board Member
 - (iii) One expert nominated by the Senate Member
- (d) In the case of posts of Registrar, Assistant Registrar, Accounts Officer, Audit Officer, Stores Officer, Estate Officer and Medical Officer, the Selection Committee shall consist of :
 - (i) Director Chairman

* Inserted vide Ministry of Education letter No. F.10-60/74-T.6, dated 1st October, 1975. Effective from September 26, 1975.

- | | | |
|-------|---|--------|
| (ii) | Deputy Director | Member |
| (iii) | Two nominees of the Board | Member |
| (iv) | Registrar, except for the post of Registrar | Member |

* (e) In the case of other posts not covered by categories (a), (b), (bb), (c) or (d) and carrying a scale of pay the maximum of which exceeds Rs. 900 per mensem, the Selection Committee shall consist of :

- | | | |
|-------|--|----------|
| (i) | Director or his nominee | Chairman |
| (ii) | A nominee of the Board | Member |
| (iii) | Head of the Department/Centre concerned or Registrar, as the case may be | Member |
| (iv) | An expert from the staff of the Institute nominated by the Director | Member |

(f) In the case of all other posts, the Director may at his discretion, constitute such Selection Committees as may be considered appropriate by him.

(4) In the absence of the Director, any member of the staff of the Institute, who is appointed to perform the current duties of the Director, shall be the Chairman of the Selection Committees in the place of the Director.

(5) In the absence of the Deputy Director, the Director may nominate any member of the staff of the Institute to work on the Selection Committees in his place.

(6) Where a post is to be filled on contract basis or by invitation, the Chairman may, at his discretion, constitute such *ad hoc* Selection Committees, as circumstances of each case may require.

(7) Where a post is to be filled by promotion from amongst the members of the Institute or temporarily for a period not exceeding twelve months, the Board shall lay down the procedure to be followed.

(8) Notwithstanding anything contained in these Statutes, the Board shall have the power to make appointments of persons trained under "approved" programmes in such manner as it may deem appropriate. The Board will maintain a schedule of such "approved" programmes.

(9) If the post is to be filled by advertisement, the terms and conditions of the post shall be advertised by the Registrar and all applications received within the date specified in the advertisement shall be considered by the Selection Committee.

Provided that the Selection Committee may, for sufficient reasons, consider any application received after the date so specified.

(10) The Selection Committee shall examine the credentials of all persons who have applied and may also consider other suitable names suggested, if any, by a member of the Selection Committee or brought otherwise to the notice of the Committee. The Selection Committee may interview any of the candidates, as it thinks

* Amended vide Ministry of Education letter No. F. 10-60/74-T. 6, dated 1st October, 1975. Effective from September 26, 1976. Re-numbered vide Ministry of Education letter No. 11-7/76-T.6, dated 26th September, 1977. Effective from October 22, 1977.

fit and shall, at the discretion of its Chairman, cause a written test or tests to be held for all or some of the candidates as the Chairman may think fit, and shall make its recommendations to the Board or the Director, as the case may be, the names of the selected candidates being arranged in order of merit.

(11) No act or proceeding of any Selection Committee shall be called in question on the ground merely of the absence of any member or members of the Selection Committee.

Provided that, if any meeting of the Selection Committee is found necessary, the Registrar shall give notice of the meeting to the members of the Committee at least a fortnight before the date of the meeting.

(12) Unless otherwise provided for under these Statutes, a Selection Committee constituted for the purpose of making recommendations for appointment to a post shall be eligible to exercise its functions in relation to that post until the time the appointment is made.

(13) A candidate applying for a post under the Institute shall be charged application fees at the rates detailed below :

- | | |
|---|----------|
| (a) Post carrying a scale of pay, the initial salary of which is less than Rs. 210 per mensem | Rs. 1.00 |
| (b) Post carrying a scale of pay, the initial salary of which is Rs. 210 or over but less than Rs. 400 per mensem | Rs. 3.00 |
| (c) Post carrying a scale of pay, the initial salary of which is Rs. 400 or over per mensem | Rs. 7.50 |

Provided that the candidates belonging to scheduled castes and scheduled tribes and displaced persons may be granted such concessions in the payment of application fees as may be decided by the Board from time to time.

(14) Candidates selected for interview for a post under the Institute may be paid such travelling allowance as may be determined by the Board from time to time in this behalf.

(15) All appointments made at the Institute shall be reported to the Board at its next meeting.

13. Terms and Conditions of Service of Permanent Employees

Permanent employees of the Institute shall be governed by the following terms and conditions :

(1) Every appointment shall be subject to the conditions that the appointee is certified as being in sound health and physically fit for service in India by a medical authority nominated by the Board.

Provided that the Board may, for sufficient reasons, relax the medical requirements in any particular case or class of cases, subject to such conditions, if any, as may be laid down by the Board.

*(2) Subject to the provisions of the Act and the Statutes, all appointments to posts under the Institute shall ordinarily be made on probation for a period of one year after which period the appointee, if confirmed, shall continue to hold his office subject to the provisions of the Act and the Statutes, till the end of the month in which he attains the age of sixty years.

†Provided that where the Board considers that in the interest of students and for the purpose of teaching and guiding the research scholars any member of the academic staff should be re-employed, it may re-employ such a member till the end of the semester of the academic session as may be considered appropriate in the circumstances of each case.

Provided further that where it becomes necessary to re-employ any such member beyond the end of the semester or academic session as the case may be, the Board may with the previous approval of the Visitor, re-employ any such member for a period up to three years in the first instance and up to two years thereafter and in no case exceeding the end of the academic session in which he attains the age of 65 years. Provided also that in no circumstances such member shall be re-employed for any purposes other than those of teaching and guiding the research scholars.

‡(a) Retirement on Completion of 20 Years' Qualifying Service

‡At any time after an employee has completed twenty years' qualifying service, he may, by giving notice, of not less than three months, in writing to the appointing authority, retire from service on the terms and conditions laid down by the Central Government from time to time for its own employees.

*(2A) Subject to the provisions of the Act and the Statutes, all the new appointments to posts on revised salary scales adopted with effect from the 1st January, 1986 under the Institute shall ordinarily be made on probation for a period of one year after which period the appointee, if confirmed, shall continue to hold his office, subject to the provisions of the Act and the Statutes, as follows :

- | | | | |
|-----|--|---|--|
| (a) | Teaching Staff
(Faculty) and
Group 'D' staff | : | Till the end of the month in
which he attains the age of
60 years. |
| (b) | Groups 'A', 'B'
and 'C' staff
(Non-faculty) | : | Till the end of the month in
which he attains the age of
58 years. |

* Amended vide Ministry of Education letter No. L. 11011/1/77-T. 6, dated 2nd June, 1977. Effective from May 27, 1977.

†Substituted vide Ministry of Education letter No. F.11-7/68-T. 6, dated 9th May, 1969. Effective from July 8, 1970. Re-substituted vide Ministry of Education letter No. L. 11011/1/77-T.6, dated 2nd June, 1977. Effective from May 27, 1977.

‡Inserted vide Ministry of Education letter No. F.11-6/78-T.6, dated 23rd September, 1981. Effective from September 17, 1981.

‡Added vide Ministry of Human Resource Development (Department of Education) letter No. F.5-31/86-T.6 (Part III), dated July 18, 1989 and November 9, 1989. Effective from June 23, 1989.

(3) The appointing authority shall have the power to extend the period of probation of any employee of the Institute for such periods as may be found necessary, provided that if, after the period of probation, the official is not confirmed, and, his probation is also not formally extended, he shall be deemed to have continued on a temporary basis and that his services may then be terminable on a month's notice or on payment of a month's salary in lieu thereof.

*(a) Every graduate engineer appointed at the Institute on or after 1st July, 1969 shall, if so required, be liable to serve in India or abroad in any defence services or post connected with the defence of India for a period of not less than four years including the period spent on training, if any.

Provided that such person—

- (i) shall not be required to serve as aforesaid after the expiry of ten years from the date of such appointment, and
- (ii) shall not ordinarily be required to serve as aforesaid after attaining the age of forty years.

(4) An employee of the Institute shall devote his whole time to the service of the Institute and shall not engage, directly or indirectly, in any trade or business or any other work which may interfere with the proper discharge of his duties, but the prohibition herein contained shall not apply to academic work and consultative practice undertaken with the prior permission of the Director, which may be given subject to such conditions as regards the acceptance of remuneration as may be laid down by the Board.

(5) The appointing authority shall have the power to terminate the services of any member of the staff without notice and without any cause assigned during the period of probation.

(6) The appointing authority shall have the power to terminate the services of any member of the staff by three months' notice or on payment of three months' salary in lieu thereof, if, on medical grounds, certified by the medical authority nominated by the Board, his retention in service is considered undesirable by such appointing authority.

(7) The Board shall have the power to terminate the services of any member of the staff on grounds of retrenchment or economy by giving to the persons concerned six months' notice in writing or on payment of six months' salary in lieu thereof.

†(8) An employee of the Institute may terminate his engagement by giving the appointing authority 3 months' notice, provided that the appointing authority may for sufficient reasons, either reduce this period or call upon the employee concerned to continue till the end of the academic session in which the notice is received.

(9) The Director may place a member of the staff appointed at the Institute under suspension —

*Inserted vide Ministry of Education letter No. T.24-30/64-T. 6, dated 13th May, 1969.

†Amended vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

- (a) where a disciplinary proceeding against him is contemplated or is pending, or
- (b) where a case against him in respect of any criminal offence is under investigation or trial.

*Provided that where a member of the staff is detained in custody for a period exceeding forty eight hours, whether in connection with a criminal offence or under any law for time being in force providing for preventive detention, such member of the staff shall be deemed to have been placed by the Director under suspension with effect from the date on which he was so detained.

During the period of suspension, the member of the staff shall be entitled to the following payments, namely :

- (a) A subsistence allowance at an amount equal to the leave salary which the staff member would have drawn if he had been on leave on half average pay or on half pay and in addition, dearness allowance, if admissible on the basis of such leave salary.

Provided that where the period of suspension exceeds six months, the Director shall be empowered to vary the amount of subsistence allowance for any period subsequent to the period of the first six months as follows :

- (i) The amount of subsistence allowance may be increased by a suitable amount not exceeding 50% of the subsistence allowance admissible during the period of the first six months, if, in the opinion of the Director, the period of suspension has been prolonged for reasons to be recorded in writing not directly attributable to the staff member;
 - (ii) The amount of subsistence allowance may be reduced by a suitable amount, not exceeding 50% of the subsistence allowance admissible during the period of first six months, if, in the opinion of the Director, the period of suspension has been prolonged due to reasons to be recorded in writing, directly attributable to the staff member;
 - (iii) The rate of dearness allowance will be based on the increase, or as the case may be the decreased amount of subsistence allowance admissible under sub-clauses (i) and (ii) above.
- (b) any other compensatory allowance admissible from time to time on the basis of pay of which the staff member was in receipt on the date of suspension subject to the fulfilment of other conditions laid down for the drawal of such allowances.

*Substituted vide Ministry of Education letter No. 11-7776-T. 6, dated 26th October, 1977. Effective from October 22, 1977.

However, no payment shall be made unless the staff member furnishes a certificate that he is not engaged in any other employment, business, profession or vocation.

The following penalties may, for good and sufficient reasons, and as hereinafter provided, be imposed on any member of the staff :

- (i) Censure;
- (ii) withholding of increments or promotion;
- (iii) recovery from the whole or part of any pecuniary loss caused to the Institute by negligence or breach of orders;
- (iv) reduction to lower service, grade or post or to a lower time-scale or to a lower stage in a time-scale;
- (v) compulsory retirement;
- (vi) removal from service which shall not be a disqualification for future employment under the Institute.
- (vii) dismissal from service which shall ordinarily be a disqualification for future employment in the Institute.

No order imposing on any member of the staff any of the penalties specified at (iv) to (vii) above shall be passed by any authority subordinate to that by which he was appointed and except after an enquiry has been held and the member of the staff has been given reasonable opportunity of showing cause of the action proposed to be taken in regard to him.

No order imposing on any member of the staff any of the penalties specified at (i) to (iii) above shall be passed by any authority subordinate to that by which he was appointed and unless the member of the staff concerned has been given an opportunity to make a representation to the Appointing Authority.

Notwithstanding the above provisions, it shall not be necessary to follow the procedure mentioned above in the following cases :

- (a) where an employee is dismissed or removed or reduced in rank on the ground of conduct which has led to his conviction on a criminal charge;
- (b) where the authority empowered to dismiss or remove the person or to reduce him in rank is satisfied that, for some reason to be recorded by that authority in writing, it is not reasonably practicable to give that person an opportunity of showing cause; or
- (c) where the Visitor is satisfied that, in the interest of the security of the State, it is not expedient to give that person such an opportunity.

If any question arises whether it is reasonably practicable to give any person an opportunity of showing cause under clause (b) above, the decision thereon of the authority empowered to dismiss or remove such person or to reduce him in rank, as the case may be, shall be final.

- (10) A member of the staff aggrieved by any order imposing penalty passed

by the Director against him shall be entitled to prefer an appeal to the Board against the order and there shall be no further appeal from the decision of the Board and a member of the staff aggrieved by any order passed by the Board against him inflicting a penalty on him shall be entitled to prefer an appeal to the Visitor against the order.

No appeal under this sub-statute shall be entertained, unless it is submitted within a period of three months from the date on which the appellant receives a copy of the order appealed against, provided that the Appellate Authority may entertain the appeal after the expiry of the said period, if it is satisfied that the appellant has sufficient cause for not submitting the appeal in time.

(11) The authority to whom an appeal against an order imposing penalty lies under sub-statute (10) may, of its own motion or otherwise, call for the records of the case in a disciplinary proceeding, review any order passed in such a case and pass such orders as it deems fit as if the member of the staff concerned had preferred an appeal against such order.

Provided that no action under this sub-statute shall be initiated more than six months after the date of the order to be reviewed.

(12) Notwithstanding anything contained in this Statute, the Visitor may, on his own motion or otherwise, after calling for the records of the case, review any order which is made under this Statute or is appealable thereunder, and

- (a) confirm, modify or set aside the order;
- (b) impose any penalty or set aside, reduce, confirm or enhance the penalty imposed by the order;
- (c) remit the case to the authority which made the order or to any other Authority directing such further action or enquiry as he considers proper in the circumstances of the case; or
- (d) pass such other orders as he deems fit.

Provided that—

- (i) an order imposing or enhancing a penalty shall not be passed unless the person concerned has been given an opportunity of making any representation which he may wish to make against such enhanced penalty;
- (ii) if the Visitor proposes to impose any of the penalties specified in clause (iv) to (vii) of sub-statute (9) in a case where proper enquiry has not been held and thereafter, on consideration of the proceedings of such enquiry and after giving the member of the staff concerned an opportunity of making any representation which he may wish to make against such penalty, pass such orders as he deems fit.

(13) The decision of the Appellate Authority under sub-statute (10) or (11) shall, subject to the provisions of sub-statute (12), be final.

- (14) (i) When a member of the staff of the Institute who has been dismissed, removed or suspended is reinstated, the authority competent to order the reinstatement shall consider and make a specific order :
- (a) regarding the pay and allowances to be paid to the member of the staff of the Institute for the period of his absence from duty; and
 - (b) whether or not the said period shall be treated as a period spent on duty.
- (ii) Where such competent authority holds that the member of the staff of the Institute has been fully exonerated, or in the case of suspension, that it was wholly unjustified, the member of the staff of the Institute shall be given the full pay to which he would have been entitled had he not been dismissed, removed or suspended, as the case may be, together with any allowance of which he was in receipt prior to his dismissal, removal or suspension.
- (iii) In other cases, the member of the staff of the Institute shall be given such proportion of such pay and allowances as such competent authority may prescribe.

Provided that the payment of allowance under clause (ii) or clause (iii) shall be subject to all other conditions under which such allowances are admissible.

- (iv) In cases falling under clause (ii) the period of absence from duty shall be treated as a period spent on duty for all purposes.
- (v) In cases falling under clause (iii) the period of absence from duty shall not be treated as a period spent on duty, unless such competent authority specifically directs that it shall be so treated for any specified purpose.

(15) The employees of the Institute shall be entitled to travelling and daily allowances according to the scales laid down by the Board from time to time.

(16) The employees of the Institute shall be entitled to reimbursement of medical expenses incurred on themselves and their families as set out in Schedule 'AA'.

(17) The employees of the Institute shall be governed by the Conduct Rules as laid down in Schedule 'B'.

(18) It shall be for the Council to decide as to the class of employees of the Institute who shall be entitled to vacation.

14. Terms and Conditions of Service of Temporary Employees

- (i) The service of a temporary employee shall be liable to termination at any time by notice in writing given either by the employee to the appointing authority, or by the appointing authority to the employee. The period of such notice shall be one month, unless otherwise agreed to by the Institute and the employee.
- (ii) The other terms and conditions of service of such employee shall be

such as may be specified by the appointing authority in his letter of appointment.

15. Appointment on Contracts

(1) Notwithstanding anything contained in these Statutes, the Board may, in special circumstances, appoint an eminent person on contract for a period not exceeding five years, with a provision of renewal for further period, provided that every such appointment and the terms thereof shall be subject to the prior approval of the Visitor.

(2) Subject to the provisions contained in the Act, the Board may appoint any person on contract in the prescribed scales of pay and on the terms and conditions applicable to the relevant post for a period not exceeding five years with a provision of renewal for further period. For making such appointments, the Chairman may, at his discretion, constitute such *ad hoc* selection committees, as the circumstances of each case may require.

* (3) Notwithstanding anything contained in these Statutes, the Council may appoint an eminent person as Director on contract for a period not exceeding five years, with a provision for renewal for further periods provided that every such appointment and terms thereof shall be subject to the prior approval of the Visitor.

16. Contributory Provident Fund

(1) A Compulsory Contributory Provident Fund shall be constituted, maintained and administered for the employees of the Institute in accordance with the provisions set out in Schedule 'C'. All accumulations of the subscribers in the Contributory Provident Fund, maintained for the benefit of the employees of the Institute immediately before the commencement of these Statutes, shall stand transferred to the Compulsory Provident Fund constituted under the Statute and shall be credited to the accounts of the employees entitled thereto in the Fund so constituted. A subscriber shall contribute to the Fund so constituted an amount not less than $8\frac{1}{3}\%$ of his emoluments but the contribution of the Institute to the said Fund shall be limited to $8\frac{1}{3}\%$ of the emoluments of the subscriber.

†(2) Subject to the provision contained in Schedule 'C', all permanent employees of the Institute who are appointed or re-appointed before 1st January, 1971 and who have not otherwise exercised an option to join the CPF-cum-Gratuity Scheme referred to in Statute 16A or the GPF-cum-Pension-cum-Gratuity scheme referred to in Statute 16B, shall join the Contributory Provident Fund.

(3) No employee of the Institute shall be entitled to the benefits of the Contributory Provident Fund whose services in the Institute entitle him to a pension and gratuity,

* Added vide Ministry of Education letter No. F.11-10/68-T. 6, dated 24th May, 1969. Effective from May 22, 1969.

† Amended vide Ministry of Education letter No. F.11-2/71-T. 6, dated 24th November, 1971. Effective from January 1, 1971.

or on whose account the Institute contributes towards pension, or who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits of the Provident Fund.

* (4) Save as otherwise provided in Statute 16A or Statute 16B in the case of an employee leaving the Institute or Central University to join any of the other Institutes or any Central University his accumulation in the Contributory Provident Fund shall be transferred to the Institute or, as the case may be, the University he joins.

(16A) Contributory Provident Fund-cum-Gratuity Scheme

(1) Every employee of the Institute—

- (i) who is referred to in clause (2) of Statute 16, or
- (ii) who holds an appointment on a temporary basis but is subscribing or is required to subscribe to the Contributory Provident Fund in terms of sub-paragraph (2A) of Schedule 'C', or
- (iii) who may be appointed either for the first time or re-appointed on or after the 1st January 1971, may exercise option to join the Contributory Provident Fund-cum-Gratuity Scheme sponsored by the Institute for the benefit of its employee.

Provided that no such option shall be exercised by an employee who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits of the Contributory Provident Fund or who has exercised an option for the General Provident Fund-cum-Pension-cum-Gratuity Scheme referred to in Statute 16B.

†(2) Any such option shall be exercised in Form 1 prescribed for the purpose in Appendix 1 to Schedule 'E' :

‡(i) In case of an employee referred to in sub-clause (i) (other than a permanent employee appointed or re-appointed prior to 1st April, 1962) or sub-clause (ii) within a period of three months from the 1st January, 1971;

** (ia) In case of an employee appointed or re-appointed before the 1st April, 1962, within a period of three months from the 1st December, 1971, and

* Substituted vide Ministry of Education letter No. F.10-20/78-T. 6, dated 20th February, 1979. Effective from February 15, 1979.

† Amended vide Ministry of Education letter No. F.11-6/76-T.6, dated 16th July, 1978. Effective from July 11, 1978.

‡ Amended vide Ministry of Education letter No. F.11-2/71-T.6, dated 24th November, 1971. Effective from January 1, 1971.

** Inserted vide Ministry of Education letter No. F.11-2/71-T.6, dated 24th November, 1971. Effective from January 1, 1971.

- (ii) In case of an employee referred to in sub-clause (iii), within a period of three months from the date of completion of one year's temporary continuous service or confirmation whichever is earlier.

(3) On receipt of such option from any of the employees referred to in sub-clause (i) or (ii) all accumulations of any such employee in the Contributory Provident Fund maintained for the benefit of the employees of the Institute immediately before such option was exercised shall stand transferred to the new Contributory Provident Fund less one-third per cent of the contribution of the Institute, together with interest thereon which shall revert to the Institute and be credited to its fund.

***(3A) (a) Every employee of the Institute :**

- (i) who is governed by Statute 16 or who has exercised option under sub-statutes (1) and (2) of Statute 16B, or
- (ii) who may be appointed either for the first time or re-appointed on or after the 1.7.1977 may exercise an option to join the Contributory Provident Fund-cum-Gratuity Scheme sponsored by the Institute for the benefit of its employees.

Provided that no such option shall be exercised by an employee who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits of the retirement benefit schemes.

(b) Any such option shall be exercised in Form I prescribed for the purpose in Appendix I to Schedule E within a period of three months from the date of issue of this notification and any such option once exercised shall be final.

(c) On receipt of such option from any of the employee referred to in sub-clause (i) or (ii) of clause (a), all accumulations of any such employee in the CPF, or GPF-cum-Pension-cum-Gratuity Schemes, maintained for the benefit of the employees of the Institute immediately before such option was exercised, shall stand transferred to the Contributory Provident Fund less one-third per cent of the contribution of the Institute together with interest thereon from Contributory Provident Fund of those governed by Statute 16 shall revert to the Institute and be credited to its Fund.

(4) Any such employee shall contribute to the Fund so constituted an amount not less than eight and one-third per cent of his emoluments but the contribution of the Institute to the said Fund shall be restricted to eight per cent of his emoluments.

†(5) Any such employee shall, in addition, be also entitled to gratuity, equal to one-fourth of his emoluments for each completed six-monthly period of service subject

* Inserted vide Ministry of Education letter No. F.11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

† Substituted vide Ministry of Education letter No. F.11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

to a maximum of sixteen and a half times the emoluments or rupees thirty thousand whichever is less.

* (6) Any such employee leaving the Institute or Central University to join any of the other Institutes or any Central University shall join the corresponding scheme of the new Institute or, as the case may be, the University and his accumulations in the Fund shall be transferred to the corresponding fund of new Institute or University.

(7) The liability of total gratuity ultimately payable to any such employee shall be distributed between the Institute in proportion to the length of qualifying service at each Institute.

(8) Save as otherwise provided in this Statute, in all other respects the provisions as contained in the Schedule 'E' to these Statutes shall be applicable for the purposes of this Scheme.

16B. General Provident Fund-cum-Pension-cum-Gratuity Scheme

(1) Every employee of the Institute—

- (i) who is referred to in clause (2) of Statute 16, or
- (ii) who holds an appointment on a temporary basis but is subscribing or is required to subscribe to the Contributory Provident Fund in terms of sub-paragraph (2A) of Schedule 'C', or
- (iii) who may be appointed either for the first time or re-appointed on or after the 1st January, 1971, or
- (iv) who was earlier employed in the Delhi Polytechnic prior to his transfer to the Indian Institute of Technology, Delhi and who had opted to be governed by the rules in that behalf applicable to the Central Government employees;

may exercise an option to join the General Provident Fund-cum-Pension-cum-Gratuity Scheme, sponsored by the Institute for the benefit of its employees.

Provided that no such option shall be exercised by an employee who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits of the Contributory Provident Fund Scheme or who has exercised an option for the Contributory Provident Fund-cum-Gratuity Scheme referred to in Statute 16A.

Provided further that if an employee referred to in sub-clause (iv) (for Kharagpur/Delhi only) fails to exercise an option within the specified period in favour of the General Provident Fund-cum-Pension-cum-Gratuity Scheme referred to in this Statute shall be deemed to have exercised his option for the Scheme.

* Substituted vide Ministry of Education letter No. F.10-20/76-T. 6, dated 20th February, 1979. Effective from February 15, 1979.

* (2) Any such option shall be exercised in Form 1 prescribed for the purpose in Appendix I to Schedule F—

- † (i) in case of an employee referred to in sub-clause (i) (other than a permanent employee appointed or re-appointed prior to 1st April, 1962) or sub-clause (ii), within a period of three months from the 1st January, 1971;
- ‡ (ia) in case of an employee appointed or re-appointed before the 1st April, 1962, within a period of three months from the 1st December, 1971; and
- (ii) in the case of an employee referred to in sub-clause (iii), within a period of three months from the date of completion of one year's temporary service or confirmation whichever is earlier.

(3) On receipt of such option from any of the employees referred to in sub-clause (i) or (ii) the amount of the contribution of the Institute with interest thereon standing to the credit of the employee in the Contributory Provident Fund shall revert to the Institute and be credited to its Fund and the amount of the employees' own contribution to the Contributory Provident Fund after adjustment of advances, if any, taken from the said fund, shall, together with interest thereon, be maintained as his contribution to General Provident Fund to be opened by the Institute for the purpose.

** (3A) (a) Every employee of the Institute :

- (i) who is governed by Statute 16 or who has exercised an option under sub-statutes (1) and (2) of Statute 16A, or
- (ii) who may be appointed either for the first time or re-appointed on or after the 1.7.1977 may exercise an option to join the General Provident Fund-cum-Pension-cum-Gratuity Scheme, sponsored by the Institute for the benefit of the employees;

Provided that no such option shall be exercised by an employee who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits or the retirement benefit schemes.

- (b) Any such option shall be exercised in Form 1 prescribed for the purpose in Appendix I to Schedule F within a period of three months from the date of issue of this notification and any such option once exercised shall be final.
- (c) On receipt of such option from any of the employees referred to in sub-clause (i) or (ii) of clause (a) the amount of the contribution of the Institute

* Amended vide Ministry of Education letter No. F.11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

† Amended vide Ministry of Education letter No. F.11-2/71-T. 6, dated 24th November, 1971. Effective from January 1, 1971.

‡ Inserted vide Ministry of Education letter No. F.11-2/71-T. 6, dated 24th November, 1971. Effective from January 1, 1971.

** Inserted vide Ministry of Education letter No. F.11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

with interest thereon standing to the credit of the employee in the CPF or CPF-cum-Gratuity Scheme shall revert to the Institute and be credited to its fund and the amount of the employees own contribution to the CPF or CPF-cum-Gratuity after adjustment of advances, if any, taken from the said fund, shall together with interest thereon, be maintained as his contribution to the GPF opened by the Institute for the purpose.

(4) A permanent employee or an employee referred to in sub-clause (ii) of clause (1) who has retired or retires with the Contributory Provident Fund benefits on or after the 1st April, 1970, but before the 1st January, 1971 shall be granted the benefit of the General Provident Fund-cum-Pension-cum-Gratuity Scheme, if he exercises an option in Form II prescribed for the purpose in Appendix I to Schedule F within three months from the 1st January, 1971, the contribution of the Institute to his Provident Fund together with interest thereon, if already paid, being adjusted against the Death-cum-Retirement Gratuity admissible to him under the said Scheme and the balance, if any, being refunded to the Institute in cash.

* (5) Any such employee shall, in addition, be also entitled to gratuity, equal to one-fourth of his emoluments for each completed six-monthly period of service subject to a maximum of sixteen and a half times emoluments or rupees thirty thousand whichever is less.

(6) Any such employee leaving the Institute to join any of the other Institutes incorporated under the Act shall join the corresponding Scheme of the new Institute and his accumulations in the Fund shall be transferred to the corresponding Fund of the new Institute.

†(7) The liability of total gratuity and pension ultimately payable to such an employee shall be distributed between the Institute or University in proportion to the length of qualifying service at each Institute or the Institute and the University.

(8) Save as otherwise provided in the Statute in all other respects the provisions as contained in Schedule F to these Statutes shall be applicable for the purpose of this Scheme :

Provided that respective payments towards policies of life insurance from subscriptions to the General Provident Fund, the provisions in this behalf contained in Schedule E shall be applicable.

17. Vacation and Leave

(1) Employees of the Institute shall be entitled to vacation and leave as laid down in Schedule 'D'.

* Substituted vide Ministry of Education letter No. F.11-6/76-T.6, dated 16th July, 1978. Effective from July 11, 1978.

† Substituted vide Ministry of Education letter No. F.10-20/76-T.6, dated 20th February, 1979. Effective from February 15, 1979.

(2) The amount of accumulated leave at the credit of a member of the staff in the service of the Institute immediately before the 1st April, 1962 shall become available to him after the date subject to the prescribed limit of leave.

* (3) When an employee joins the Institute or Central University from any of the other Institutes or any Central University, the leave to his credit on the date immediately before the date of such joining shall be carried forward and credited to his leave account in the Institute or Central University which he joins subject to the prescribed limit of accumulation of leave.

18. Residential Accommodation for Staff

†(1) Every employee of the Institute may be allotted an unfurnished house within the campus of the Institute for residential use, if available, in which he shall be required to reside, subject to such conditions as may be laid down by the Board.

‡(2) ‡(a) An employee of the Institute who has been allotted house for residential use, shall be charged licence fee at the rate of ten per cent of his total emoluments or six per cent per annum of the capital cost (including municipal charges) of the house occupied by him, whichever is less :

Provided that in respect of an employee who draws pay in the revised scale of pay and whose emoluments are below Rs. 440 per mensem, the licence fee shall be recovered at the rate of seven and a half per cent of his total emoluments or six per cent per annum of the capital cost (including municipal charges) of the house occupied by him, whichever is less.

‡‡Provided further that in respect of an employee whose total emoluments are not less than Rs. 440 per mensem in the revised scale of pay, the net emoluments after deduction of licence fee shall not be less than Rs. 421.55.

(b) In addition to the licence fee, charges for water, electricity and any other service rendered shall be recovered from an employee at such rates as may be determined by the Director from time to time and in the case of Director, by the Board.

††(3) The Board may allot furnished or unfurnished accommodation without levying a licence fee or levying such fee at concessional rates to any category of staff, if it considers it necessary to do so in the interest of the Institute.

Explanation : For the purpose of this Statute the expression "Allot" means to grant

* Substituted vide Ministry of Education letter No. F.10-20/76-T.6, dated 20th February, 1979. Effective from February 15, 1979.

† Substituted vide Ministry of Education letter No. F.11-2/76-T.6, dated 24th June, 1971. Effective from June 19, 1971.

‡ Substituted vide Ministry of Education letter No. F.11-2/70-T.6, dated 24th June, 1971. Effective from June 19, 1971.

‡‡Amended vide Ministry of Education letter No. 11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

††Amended vide Ministry of Education letter No. 11-7/76-T. 6, dated 26th October, 1977. Effective from October 22, 1977.

a licence to an employee of the Institute to occupy a house or a portion thereof, owned or leased by the Institute, for use by him as residence.

19. Departments

The Institute shall have the following Departments :

- (a) Applied Mechanics
- (b) Chemical Engineering
- (c) Chemistry
- (d) Civil Engineering
- (e) Electrical Engineering
- * (f) Humanities and Social Sciences
- (g) Mathematics
- (h) Mechanical Engineering
- (i) Physics
- (j) Textile Technology
- † (k) Computer Science and Engineering

†† Provided that in addition the Board may establish or abolish one or more schools or centres of research on the recommendation of the Senate.

20. Head of the Department

(1) Each Department of the Institute shall be placed in charge of a Head who shall be selected by the Director from amongst the Professors, Associate Professors and Assistant Professors.

** Provided that when in the opinion of the Director the situation so demands, the Director may himself take temporary charge of a Department or place under the charge of the Deputy Director or a Professor from another Department for a period not exceeding six months.

(2) The Head of Department shall be responsible for the entire working of the Department, subject to the general control of the Director.

(3) It shall be the duty of the Head of the Department to see that the decisions of the authorities of the Institute and of the Director are faithfully carried out. He shall perform such other duties as may be assigned to him by the Director.

* Amended vide Ministry of Education letter No. 11-7/66-T. 6, dated 30th July, 1966.

† Added vide Ministry of Education letter No. F.11-3/82-T. 6, dated 30th March, 1983. Effective from March 24, 1983.

†† Added vide Ministry of Education letter No. 11-7/76-T. 6, dated 26th October, 1977. Effective from October 22, 1977.

** Added vide Ministry of Education letter No. F, 24-43/64-T. 6, dated 4th/6th December, 1965.

21. Institution of Fellowships, Scholarships, Exhibitions, Medals and Prizes

The following fellowships, scholarships, free studentships, exhibitions, medals and prizes shall be instituted by the Institute;

(1) Scholarships of the value of Rs.75 per mensem each will be awarded to 25% of the students admitted to the undergraduate courses and postgraduate courses in Science leading to Master's degree in accordance with the provisions made in the Ordinances in this behalf.

(2) (a) All scholarships awarded by the Institute in the undergraduate courses and postgraduate courses in Science leading to Master's degree shall carry the privilege of free tuition.

(b) A further 10% of the total number of students admitted to the undergraduate courses and postgraduate courses in Science leading to Master's degree will be awarded free studentship on consideration of means alone.

The awards shall be made in accordance with the provisions made in the Ordinances in this behalf.

(3) Postgraduate scholarships of the value of Rs.250 per mensem will be awarded to all students admitted to the postgraduate courses in Engineering and Technology at the Institute.

The scholarships will be subject to such conditions as may be laid down in the Ordinances.

(4) Practical Training stipend of the value of Rs.150 per mensem each will be awarded by the Institute with effect from 1st August, 1965 to graduates who have been previously in receipt of the Institute scholarship in the final year class. The stipends will be tenable for a period of one year and shall be subject to such conditions as may be laid down in the Ordinances.

(5) Research scholarship of the value mentioned below will be awarded to all research scholars admitted to the Institute :

(a) Research workers in engineering and technological subjects, provided the scholars have successfully completed a Master's degree in Engineering/Technology of two years' duration or have spent 2 years in study/research approved by the Institute after obtaining a Bachelor's degree in Engineering/Technology and have been registered by the Institute for Ph.D. degree

Rs.400 per mensem

* Substituted vide Ministry of Education letter No. F.24-26/65-T. 6, dated 27th April, 1966.

- * (b) (i) Research workers in Science and other subjects, provided the scholars have had a Master's degree in the appropriate field Rs. 300 per mensem
- (ii) Research workers in Engineering and Technological subjects, provided the scholars have had a Bachelor's degree in Engineering/Technology Rs. 300 per mensem

The scholarships will be tenable for the duration of research, subject to such conditions as may be laid down in the Ordinances.

- † (6) Post-doctoral Fellowship of the value of Rs. 500 p.m. shall be awarded to research fellows for the duration of their work at the Institute.

The award shall be made in accordance with the provisions made in the Ordinances and shall be subject to such conditions as may be laid down therein.

- (7) The Board may, on the recommendations of the Senate, institute such exhibitions, medals and prizes as it considers desirable. The awards shall be made in accordance with the provision made in this behalf.

22. Fees

- (1) The following shall be the fees charged by the Institute :
- (a) Registration fee for undergraduate courses only payable in advance as application fee Rs.15
- ‡ Provided that no registration fee shall be charged from any candidate belonging to the Scheduled Caste or Scheduled Tribe.
- (b) Admission fee for undergraduate courses and postgraduate courses payable at the time of admission Rs.10
- (c) (i) Tuition fee for undergraduate courses and postgraduate courses in Science leading to Master's degree payable in eight equal instalments Rs. 200 per annum

* Substituted vide Ministry of Education letter No. F.11-2/68-T. 6, dated 14th February, 1974. Effective from July 1, 1972.

† Substituted vide Ministry of Education letter No. F.11-1/71-T. 6, dated 15th December, 1971. Effective from December 15, 1971.

‡ Added vide Ministry of Education letter No. F.11-2/78, T. 6, dated 8th July, 1978. Effective from June 30, 1978.

- | | | |
|-------|---|----------------------|
| (ii) | Tuition fee for postgraduate courses in Engineering and Technology payable in eight equal instalments | Rs. 300
per annum |
| (iii) | Tuition fee for working for Ph.D. payable in eight equal instalments by the Research Workers | Rs. 300
per annum |

The Institute staff members registered for the courses are being exempted from payment of the fee.

- *(d) Seat rent inclusive of electricity and water in Halls of Residence wherein students reside :

	<u>Undergraduate</u>	<u>Postgraduate</u>
(i)	I semester, payable in four equal instalments	Rs. 40
(ii)	II semester, payable in four equal instalments	Rs. 80
(iii)	Summer vacation, for those who are required to stay in Hall during vacation with the permission of Institute, in one instalment	Rs. 15
(iv)	Winter vacation, for those who are required to stay in Hall during vacation with the permission of Institute, in one instalment	Rs. 5
(e)	(i) Medical examination fee	Rs. 2 per annum
	(ii) Gymkhana fee	Rs. 20 per annum
	(iii) Medical fund payable at the time of admission and, in the case of students already in the institute along with the first instalment of the tuition fees	Rs. 5 per annum
†(f)	Examination fee for the Master's degree— Postgraduate Diploma Course	Rs. 100
	The Higher Degree	Rs. 200

* Substituted vide Ministry of Education letter No. F. 11-4/79-T. 6, dated 4th May, 1982. Effective from April 19, 1982.

† Amended vide Ministry of Education letter No. F. 11-1/67-T. 6, dated 23rd March, 1968.

(g) Fee for the Diplomas, if awarded in absentia— for all Students, Scholars and Fellows	Rs. 10
(h) Fee for Grade Card	Rs. 5
(i) Registration fee for Ph.D.degree	Rs. 5
(j) [*] (i) Registration fee for post graduate courses payable in advance as application fee	Rs. 5
(ii) Registration fee for Research Scholars and Post-Doctorate Fellows payable at the time of admission	Rs. 5
(k) Fee for issue of Migration Certificate	Rs. 5
(l) Fee for issue of crossed list	Rs. 5
(m) Fee for re-checking of answer books for the Institute Examination per paper	Rs. 5
(n) Fee for issue of duplicate Grade Card	Rs. 3
(o) Fee for issue of a duplicate diploma	Rs. 10
(p) Fee for issue of a duplicate migration certificate	Rs. 3
(q) Fee for issue of a duplicate cross list	Rs. 2
(r) Caution Money :	
(i) For undergraduate and postgraduate students payable in advance	Rs. 25
(ii) For research scholars and post-doctorate fellows in advance	Rs. 100
†(s) Fee for courses not provided above	As laid down by the Board

The recovery of caution money deposit from research scholars and fellows may be waived by the Director in special cases, subject to the production of surety from a responsible permanent employee of the Institute or Government.

The caution money is refundable to students, scholars and fellows after deduction of relevant dues, if any, within four years of their leaving the Institute. If no claim for refund is received within the period, the caution money shall be credited to the Institute Fund. The Director may, for sufficient reasons investigate and entertain claims for refund of caution money after the expiry of this period.

‡(2) If a student, scholar or a fellow fails to deposit his dues by the dates notified, he shall be liable to pay a delay fine of Re.1 provided he clears his dues before the end

* Substituted vide Ministry of Education letter No. F. 24-50/65-T.6, dated 28th October, 1968.

† Added vide Ministry of Education letter No. F. 11-3/70-T.6, dated 31st May, 1971. Effective from May 27, 1971.

‡ Substituted vide Ministry of Education letter No.11-7/76-T.6, dated 26th October, 1977. Effective from October 22, 1977.

of the month in which the dues were payable and a fine of Rs. 5 if he clears the dues by the 15th of the following month.

*The student's name be struck off after this date and he may be re-admitted on payment of re-admission fee and no delay fine be charged.

The Director may waive the recovery of delay fines and re-admission fees in deserving cases. He may also delegate this authority to the Registrar and prescribe such condition as he may consider necessary for the purpose.

(3) All fees and deposits are required to be paid in cash, by crossed postal orders, by crossed bank drafts or by crossed cheques on the State Bank of India. Dues of the Institute may also be paid by money order, the date of remittance being regarded as the date of payment.

23. Halls and Hostels

(1) The Institute shall be a residential institution and all students, research scholars and research fellows shall reside in the Halls of Residence and Hostels built by the Institute for the purpose.

In exceptional cases, the Director may permit a student, scholar or fellow to reside with his parent or guardian, but where any such permission is accorded to a student, scholar or fellow, such student, scholar or fellow, as the case may be, shall be liable for the payment of such seat rent as he would have been liable for the payment of seat rent had he resided in the Hostel.

(2) Every resident in the Halls and Hostels shall conform to the rules laid down by the Senate for the purpose.

(3) For each Hall of Residence there shall be a Warden and such number of Assistant Wardens and other staff as may be determined by the Board from time to time.

(4) The offices of Warden and Assistant Warden shall be held by the members of the academic staff of the Institute. The appointments shall be made by the Director.

(5) Wardens and Assistant Wardens shall be entitled to rent-free unfurnished quarters corresponding to the type of quarters to which they are normally entitled as teachers of the Institute. In addition, they shall be paid an allowance of Rs. 50 per mensem, provided that in case a Professor is appointed as Warden, he shall not be entitled to receive any allowance.

(6) The management of the Halls of Residence and Hostels shall be in accordance with the rules laid down by the Director.

24. Conferment of Honorary Degrees

All proposals for the conferment of honorary degrees shall be made by the Senate and shall require the assent of the Board before submission to the Visitor for confirmation. Provided that in cases of urgency, the Chairman may submit on behalf of the Board, such proposal to the Visitor.

* Added vide Ministry of Education letter No. F.11-3/70-T.6, dated 31st May, 1971. Effective from May 27, 1971.

CONTRACT OF SERVICE

[See Statute 7(3) 9(3) in case of Kharagpur]

An Agreement for service made this.....day of.....one thousand nine hundred.....between.....(hereinafter called the appointee) of the one part and the Indian Institute of Technology, Kharagpur/Bombay/Madras/Kanpur/Delhi, incorporated under the Institutes of Technology Act 1961 (Act 59 of 1961) as amended by the Institutes of Technology (Amendment) Act, 1963 (Act 29 of 1963) (hereinafter called the Institute).

WHEREAS in terms of Section 17(1) of the Institute of Technology Act, 1961 (hereinafter called the Act) and Statute 15(3) of the Statutes of the Institute 17(3) in case of Kharagpur (hereinafter called Statutes), the Council of the Institutes of Technology referred to in the Act (hereinafter called the Council) with the approval of the Visitor, has been pleased to approve the appointment of the appointee as the Director of the Institute on contract for.....years and the appointee has accepted such appointment upon the terms and conditions hereinafter appearing NOW THESE PRESENTS WITNESSETH and the parties hereto respectively agree as follows :

(1) This agreement of service shall be deemed to have been entered into subject at all times to the provisions of the Act and Statutes covering the Institutes as in force from time to time as applicable to permanent confirmed employees.

(2) The appointee shall be in service under the agreement for a period of..... years with effect from that is, date of joining the post. Provided that if the appointee on conclusion of the period of service mentioned above is below 60 years of age, his service shall continue till the 30th June of the academic year in which the appointee concludes the said period of service or till he attains the age of 60, whichever is earlier.

(3) The appointee shall be the Principal Academic and Executive Officer of the Institute and serve the Institute as the whole time Director of the Institute with powers and duties provided in the said Act and Statutes.

(4) The appointee shall devote his whole time to the service of the Institute and will be subject to the Conduct Rules and other provisions of the said Act and Statutes. Any information obtained by appointee during or in connection with his service and the work upon which he is engaged shall be treated as secret and confidential and appointee shall be deemed in all respects, to be subject to the Indian Official Secrets Act, 1923, as amended from time to time.

* Incorporated vide Ministry of Education letter No. F.10-1/75-76, dated 26th November, 1976. Effective from November 20, 1976.

(5) During the period of his service except in respect of any period of suspension and also of any period of leave without pay, the appointee shall be entitled subject to the Indian Income Tax to an initial pay of Rs.....in the scale of Rs.....provided that if any time the appointee proceeds on deputation out of India his pay and allowances during the period of his deputation will be such as may be decided by the Board of Governors. In addition, the appointee shall draw allowances like Dearness Allowance, City Compensatory Allowance etc. as may be admissible from time to time as per rules of the Institute.

(6) During his service under these presents the appointee shall subscribe to the Contributory Provident Fund-cum-Gratuity of the Institute according to the provisions made in the Statutes and subject to such modifications in these provisions as may be made from time to time and shall also be entitled to the contribution of the Institute as admissible to the permanent confirmed employees as per the Statutes. In the event of the appointee being employer of any other IIT and enjoying the benefits either under C.P.F-cum-Pension-cum-Gratuity Scheme or G.P. Fund-cum-Pension-cum-Gratuity Scheme, he shall join the corresponding Scheme of the Institute with transfer of his accumulation as admissible under the Statutes.

In case the appointee is the employee of the Institute he shall continue to be governed by Contributory Provident Fund-cum-Gratuity Scheme or General Provident Fund-cum-Pension-cum-Gratuity Scheme as immediately prior to this contract appointment and shall be entitled to benefits of the scheme for the period of his service under this contract like other permanent employees of the Institute as per the Statutes.

(7) Notwithstanding anything hereinbefore contained, the appointee shall unless otherwise decided by the Institute be entitled to receive the whole or in part as may be determined by the Institute the benefits of any improvements in the revision of scale of pay and in retirement benefits that may be effected by the Institute subject to the date of these presents in the terms and conditions of the service of members of the branch Institute, service to which he may for the time being belong and the decision of the Institute in respect of such improvement in the terms and conditions of their service of appointee shall operate so as to modify to that extent the provisions of these presents.

(8) The appointee shall be entitled to leave as admissible to permanent non-vacation employees of the Institute under the Statutes.

(9) The appointee shall be entitled to furnished free of licence fee accommodation in the Campus of the Institute as may be sanctioned by the Board of Governors of the Institute.

(10) The appointee shall be eligible for privilege in relation to medical attendance and treatment as provided for in the Statutes.

(11) The appointee shall be paid travelling expenses for joining the Institute as admissible to an Officer of the Central Government of equivalent rank under the Transfer T.A. Rules of the Central Government deeming the appointment of the appointee as on transfer in the public interest.

If the appointee is required to travel in the interests of Institute work, he shall be entitled to travelling allowance on the scale provided for in the T.A. Rules of the Institute in force from time to time. Similarly, the appointee shall be entitled to leave travel concession for visiting his home town as per the Rules of the Institute.

(12) Any amount received by the appointee from books and articles published by him at his cost shall be left to him as an encouragement for continuing his work in that line. He would also be allowed to do consultancy and retain benefits of the same as per rules laid down by the Board from time to time.

(13) The services of appointee may during the period of contract, be terminated by the Institute at any time by three calendar months notice in writing given at any time during service under this contract without any cause assigned. Provided always the Institute may in lieu of the notice herein provided to give the appointee a sum equivalent to the amount of his basic pay for three months.

The appointee may terminate his service by giving to the Institute three calendar months notice in writing.

(14) The appointee will be allowed the status of Professor of.....to take part in teaching and research in the Department of.....subject to his convenience.

(15) In respect of any matter for which no provision has been made in this agreement the appointee will be governed by the said Institute of Technology Act, 1961 or any modification thereof for the time being in force and the Statutes made thereunder for time being in force.

IN WITNESS WHEREOF on the day and the year first above written, the Chairman of the Board of Governors of the Institute has hereinto set his hand and the appointee has hereinto set his hand.

Signed and delivered for the
Indian Institute of Technology
.....by the Chairman, Board
of Governors of the Institute.

Chairman,
Board of Governors,
Indian Institute of
Technology.....

In the presence of Signature of witnesses with addresses.

Signed and delivered by the said
appointee in the presence of
Signature of witnesses with
addresses.

Director
I.I.T.....

1. _____

2. _____

INDIAN INSTITUTE OF TECHNOLOGY DELHI

Medical Attendance and Treatment including Reimbursement of Medical Expenses incurred by the Members of the Staff on themselves and their Families

[See Statute 13 (16)]

1. The provisions contained in this Schedule shall apply to all the employees of the Institute but they shall not apply to :

- (a) those members of the staff who are on leave or deputation abroad,
- (b) retired members of staff, and
- †(c) work-charged staff who have not put in continuous service of one year and are not employed on monthly rates of pay, staff paid from contingencies, daily labourers and part-time employees.

2. For purposes of reimbursement of medical expenses, members of the staff shall be grouped as under :

- (1) Those holding posts carrying a scale of pay, the initial salary of which is Rs. 400 p.m. or above except the Secretary to the Director and Superintendents of Sections } Group A
- (2) The Secretary to the Director, the Superintendents of Sections and all those holding posts carrying a scale of pay, the initial salary of which is Rs. 110 p.m. or above but less than Rs. 400 p.m. } Group B
- (3) Those holding posts carrying a scale of pay, the initial salary of which is less than Rs. 110 p.m. } Group C

3. In this Schedule unless there is anything repugnant in the subject or context—

(a) "Authorised Medical Attendant" means

- (1) In respect of members of the Institute belonging to Group A Medical Adviser of the Institute and in his absence the Medical Officer of the Institute.

* Re-lettered vide Ministry of Education letter No. F.10-1/75-T.6, dated 26th November, 1976. Effective from November 20, 1976.

† Substituted vide Ministry of Education letter No. 11-6/68-T,6, dated 14th January, 1969.

- | | |
|--|--|
| (2) In respect of members of the Institute belonging to Group B | Medical Officer of the Institute. |
| (3) In respect of members of the Institute belonging to Group C | (i) For those belonging to Group A of para 2 :
Chief or Principal Medical Officer of Govt. in a District or Presidency Surgeon or Govt. Medical Officer or equivalent rank in a city. |
| (4) In respect of members of the Institute on duty or on leave in India (Outside headquarters) | (ii) For those belonging to Groups B & C of para 2 :
Assistant Surgeon of Govt. in a District or Govt. Medical Officer or equivalent rank in a city. |

- (b) "Hospital" means the hospital recognized by the Board of Governors as hospital for the purpose of these provisions.
- (c) The term "family" shall mean wife or husband of a member of staff, as the case may be, and parents, children and step-children wholly dependent on the member of the staff.
- (d) The term "leave" includes vacation.

4. Cost of reimbursement of expenses incurred by the members of the staff in connection with medical attendance and treatment of themselves and their families will be reimbursed in accordance with the scale prescribed by the Board from time to time.

Note : An advance for medical treatment in respect of a member of the staff or of his family who is an indoor patient in a Hospital may be granted on the same terms and conditions as are mentioned above.

- 5. (i) Medical attendance includes attendance at the residence of the member of the staff or at the consulting room of the authorised medical attendant by arrangement with him.
- (ii) Medical treatment means the use of all medical and surgical facilities available at the hospital in which the individual is treated and it includes :
 - (a) employment of such pathological, bacteriological, radiological or other methods as are considered necessary by the authorised medical attendant;
 - (b) the supply of such medicines, vaccines, sera or other therapeutic substances as are ordinarily available in the hospital;

- (c) the supply of such medicines, vaccines sera or other therapeutic substances not available in hospital but can be had in the state or state-aided hospitals;
- (d) Such accommodation as is ordinarily provided in the hospital and is suited to his status;
- (e) such nursing as is ordinarily provided to in-patients by the hospital;
- (f) specialist consultation on the advice of the authorised medical attendant;
- (g) it does not include diet or provision at the request of the member of the staff of accommodation superior to that to which he is entitled in accordance with sub-clause (d) above.

- Notes :**
- (1) The refund of the cost of preparations which are not medicines but are primarily foods, tonics, toilet preparations or disinfectants as issued by Director General of Health Services from time to time is not admissible.
 - (2) Refund in respect of mixtures prescribed by the Authorised Medical attendant will be allowed till such time the Institute has its own dispensary for such purposes.
 - (3) In the case of hospitals the tariffs of which indicate a flat inclusive charge per diet, 40 per cent thereof should be reckoned as charges for board and lodging. Out of this 40 per cent, half should be considered as charges for diet and the other half for accommodation.
 - * (4) Diet charges paid at Hospitals for officials drawing pay less than Rs. 400 p.m. in ordinary cases and Rs. 640 p.m. for Tubercular and Mental diseases are allowed. The cost of any special articles of diet not ordinarily provided by the hospitals to its in-patients is, however, not refundable.

6. Dental treatment is not covered by the rules but if the diagnosis of the physiological or other disability from which a member of the staff is suffering indicates that teeth are the real source of disturbance, he is entitled to free dental treatment provided it is of a 'major' kind such as treatment of jaw bone disease wholesale removal of teeth, etc. It does not include scaling of teeth, treatment for pyorrhoea and gingivitis or the free supply of artificial denture or treatment from a private dentist or outside the hospital even on the advice of the authorised medical attendant.

7. No reimbursement of expenses for provision of spectacles is admissible.

8. No reimbursement of charges for special nursing will be admissible unless it is certified by the authorised medical attendant and medical superintendent of the hospital that their services were absolutely essential.

* Substituted vide Ministry of Education letter No. F. 11-3/78-T. 6, dated 1st October, 1980. Effective from September 29, 1980.

Note : Such cases of special nursing will be decided on merits having regard to the nature of the disease and where hardship is involved. In such cases a member of the staff should bear up to 25 per cent of his monthly pay for the period for which special nursing was necessary, the rest being borne by the Institute.

9. If the authorised medical attendant is of the opinion that the case of a patient is of such a serious or special nature as to require medical attendance by some person other than himself, he may :

- (a) Send the patient to the nearest specialist or other Govt. Medical Officer, by whom, in his opinion medical attendance is required for the patient, or
- (b) if the patient is too ill to travel, summon such specialist or other Govt. Medical Officer to attend upon the patient.

10. A patient sent under clause (a) of paragraph 9 shall on production of a certificate in writing by the authorised medical attendant in this behalf be entitled to travelling allowance for the journeys to and from the headquarters of the specialist or other Government Medical Officer.

11. A specialist or other Government Medical Officer summoned under clause (b) of paragraph 9 shall on production of a certificate in writing by the authorised medical attendant in this behalf be entitled to travelling allowance for the journeys to and from the place where the patient resides.

12. Travelling allowance admissible under paragraph 9 shall be calculated as for a journey on tour but to daily allowance for halts will be admissible. If an escort be necessary on the advice of the authorised medical attendant he may be paid T.A. as admissible under the Institute's T.A. Rules.

13. Where a member of the staff or the member of his family is entitled to treatment in a hospital free of charge under the Schedule on the advice of the authorised medical attendant any amount paid by him on account of such treatment shall, on production of such certificate in the Form prescribed by the Board of Governors in this behalf, be reimbursed to him by the Institute.

14. If the authorised medical attendant is of the opinion that owing to the severity of the illness, a patient (member of the staff) cannot be given treatment at the authorised hospitals the patient may receive treatment at his residence.

15. In the case of the individual receiving treatment at his residence referred to in paragraph 14 he shall be entitled to receive towards the cost of such treatment incurred by him a sum equivalent to the cost of such treatment as he would have been entitled, free of charge, to receive under his Schedule if he had not been treated at his residence.

Note : Claims for sums admissible under paragraph 15 shall be accompanied by a certificate in writing by the authorised medical attendant stating :

- (a) his reasons for the opinion referred to in paragraph 14, and
- (b) the cost of similar treatment referred to in paragraph 15.

16. Members of the staff and their families will also be entitled to the reimbursement of the expenses in connection with the treatment of tubercular diseases to the extent as is prescribed by the Board from time to time.

17. In the case of families of the members of the staff, the cost of special medicines (including mixture) will be reimburseable only when they are prescribed for the patient by the authorised medical attendant when the patient is attended to either in the hospital or at the consulting room of the authorised medical attendant or when the patient is undergoing treatment at the out-patient department or as in-patient of the hospital on the recommendation of the authorised medical attendant.

Notes : (1) Family of a member of the staff accompanying him on duty, leave/vacation may consult a Govt. doctor of the status of the authorised medical attendant the member of the staff as provided under paragraph 3(4) for the member of the staff himself.

- (2) The concession contained in note (1) above is not to be given in a case where a member of the staff while proceeding on tour, leave/vacation takes a member of his family along with him with the intention of obtaining treatment in a place other than at his headquarters.

18. Charges for services rendered in connection with medical attendance and/or treatment of a member of the family of a member of the staff should be paid by him to the hospital authorities. The Institute will reimburse the cost of medical attendance and/or treatment on the production of the hospital bills, duly countersigned, save in the case of such bills of Government hospital by the authorised medical attendant.

Note : The authorised medical attendant of the family of a member of the staff is the same as the authorised medical attendant of the member himself.

18A. The family of a member of the staff who could not be provided with living accommodation within the Institute Campus or who is on duty or on leave in India (outside headquarters) may receive medical treatment as an in-patient or out-patient in a State-aided hospital.

19. Medical attendance and treatment by arrangement with the authorised medical attendant at a consulting room maintained by him shall be deemed to be medical attendance and treatment at a hospital.

20. Medical treatment shall include confinement of a lady member of the staff or the wife of a male member of the staff in a hospital, pre-natal and post-natal treatment at the residence of the member of the staff is not allowed.

Note : Anaesthetic fees & charges for pre-natal and post-natal treatment received at the hospital or at the consulting room of the authorised medical attendant including the cost of medicines prescribed are reimburseable.

21. The following instructions shall also be adhered to in submitting claim bills for reimbursement of medical expenses, namely :

- (i) The bills should be duly supported by the requisite receipts, cash memos, prescriptions, essentiality certificates and other relevant documents as prescribed by the Board of Governors from time to time.
- (ii) It should be ensured that the reimbursement for the cost of those medicines that are included in the list of excluded medicines and preparations as shown in the Central Government Compilation of Medical Attendance Rules and Orders, as amended from time to time is not allowed.
- (iii) Necessary vouchers and receipts should be attached to the bills in support of claims for reimbursement of charges for tests conducted or treatment afforded in hospitals e.g. X-ray, blood tests, etc.
- (iv) It should be ensured that hospital bills for treatment as in-patient show the allocation of charges under medical attendance, bedding, diet, nursing, special nursing and medicines and that only cost of admissible items is claimed.
- (v) Reimbursement of the cost of medicines of Indian systems of medicine and homoeopathy is also admissible.

22. Bill for reimbursement of medical expenses from the members of the staff of the Institute shall be countersigned by the Director of the Institute and the Director, may, at his discretion delegate this work to the Dy. Director and the Registrar.

Note : The Director shall be the Controlling Authority in respect of his own medical attendance bills.

INDIAN INSTITUTE OF TECHNOLOGY DELHI

[See Statute 13 (17)]

Conduct Rules

1. Application

The provisions contained in this Schedule shall apply to all employees of the Institute.

2. Definitions

In this Schedule unless the context otherwise requires

(a) "Competent authority" means :

- (i) "The Board of Governors" in the case of Director.
- (ii) "The Director" in the case of all other employees.

(b) "Members of the family" in relation to an employee includes:

- (i) the wife, child or step-child of such employee residing with and dependent on him and in relation to an employee who is a woman, the husband residing with and dependent on her, and
- (ii) any other person related, whether by blood or by marriage to the employee or to such employee's wife or husband and wholly dependent on such Institute employee, but does not include a wife or husband legally separated from the employee or child or step-child who is no longer in any way dependent upon him or her, or whose custody the employee has been deprived of by law.

(c) "Service" means service under the Institute.

3. General

- (a) Every employee shall at all times maintain absolute integrity and devotion to duty, and also be strictly honest and impartial in his official dealings.
- (b) An employee should at all times be courteous in his dealings with other members of the staff, students and members of the public.
- (c) Unless otherwise stated specifically in the terms of appointment, every employee is a whole-time employee of the Institute, and may be called upon to perform such duties as may be assigned to him by the competent authority, beyond scheduled working hours and on closed holidays and Sundays. These duties *inter alia* shall include attendance at meetings of committees to which he may be appointed by the Institute.

- (d) An employee shall be required to observe the scheduled hours of work, during which he must be present at the place of his duty.
- (e) Except for valid reasons and/or unforeseen contingencies no employee shall be absent from duty without prior permission.
- (f) No employee shall leave station except with the previous permission of proper authority, even during leave or vacation.
- (g) Whenever leaving the station, an employee shall inform the Head of the Department to which he is attached, or Director if he is himself the Head of the Department, the address where he would be available during the period of his absence from station.

4. Taking Part In Politics and Elections

- (i) No employee shall take part in politics or be associated with any party or organisation which takes part in political activity, nor shall he subscribe in aid or assist in any manner any political movement or activity.
- (ii) No employee shall canvass or otherwise interfere or use his influence in connection with or take part in any election to legislative body or local authority.

Provided that an employee of the Institute qualified to vote at such election may exercise his right to vote but where he does so, he shall give no indication of the manner in which he proposes to vote or has voted.

5. Connection with Press or Radio or Patents

(1) No employee shall, except with the previous sanction of the competent authority, own wholly or in part, or conduct, or participate in the editing or managing of any newspaper or other periodical publications.

(2) No employee shall, except with the previous sanction of the competent authority or any other authority empowered by it in this behalf, or in the bonafide discharge of his duties, participate in a radio broadcast or contribute any article or write any letter either anonymously or in his own name or in the name of any other person to any newspaper or periodical.

Provided that no such sanction shall be required if such broadcast or such contribution is of a purely literary, artistic or scientific character.

Note : Subject to the restrictions noted below members of the staff are at liberty, without any sanction as contemplated in paragraph 5(2) above, to publish their original scientific works in journals of repute in India and abroad. If, however, they wish to indicate their official designations in the articles they want to publish, previous sanction of the competent authority will be necessary.

Such articles must be strictly confined to purely scientific subjects and should not touch upon administrative matters. They shall be free from all political things.

Publication of articles relating to India's boundary areas and the tribal population in such area is prohibited without previous permission of the competent authority.

6. Criticism of the Institute

No employee shall, in any radio broadcast or in any document published anonymously or in his own name or in the name of any other person or in any communication to the press or in any public utterance, make any statement of fact or opinion—

- (i) which has the effect of an adverse criticism of any current or recent policy or action of the Institute; or
- (ii) which is capable of embarrassing the relations between the Institute and the Central Government or any State Government or any other Institution or Organisation or members of the public.

Provided that nothing in this paragraph shall apply to any statements made or view expressed by an employee in his official capacity or in the due performance of the duties assigned to him.

7. Evidence before Committee or any other Authority

(1) Save as provided in sub-paragraph (3) below, no employee shall, except with the previous sanction of the competent authority, give evidence in connection with any inquiry conducted by any person, committee or authority.

(2) Where any sanction has been accorded under sub-paragraph (1) no employee giving such evidence shall criticise the policy or any action of the Institute or the Central Government or any State Government.

(3) Nothing in this paragraph shall apply to—

- (a) evidence given at any inquiry before any authority appointed by the Institute, by Parliament or by a State Legislature; or
- (b) evidence given in any judicial enquiry; or
- (c) evidence given in any departmental enquiry ordered by the Institute authorities.

8. Unauthorised Communication of Information

No employee shall, except in accordance with any general or special order of the competent authority or in the performance in good faith of the duties assigned to him, communicate, directly or indirectly, any official document or information to any person to whom he is not authorised to communicate such document or information.

9. Gifts

No employee shall, except with the previous sanction of the competent authority, accept or permit his wife or any other member of his family to accept from any person

Publication of articles relating to India's boundary areas and the tribal population in such area is prohibited without previous permission of the competent authority.

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- (i) which has the effect of an adverse criticism of any current or recent policy or action of the Institute; or
- (ii) which is capable of embarrassing the relations between the Institute and the Central Government or any State Government or any other Institution or Organisation or members of the public.

Provided that nothing in this paragraph shall apply to any statements made or view expressed by an employee in his official capacity or in the due performance of the duties assigned to him.

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(1) Save as provided in sub-paragraph (3) below, no employee shall, except with the previous sanction of the competent authority, give evidence in connection with any inquiry conducted by any person, committee or authority.

(2) Where any sanction has been accorded under sub-paragraph (1) no employee giving such evidence shall criticise the policy or any action of the Institute or the Central Government or any State Government.

(3) Nothing in this paragraph shall apply to—

- (a) evidence given at any inquiry before any authority appointed by the Institute, by Parliament or by a State Legislature; or
- (b) evidence given in any judicial enquiry; or
- (c) evidence given in any departmental enquiry ordered by the Institute authorities.

8. Unauthorised Communication of Information

No employee shall, except in accordance with any general or special order of the competent authority or in the performance in good faith of the duties assigned to him, communicate, directly or indirectly, any official document or information to any person to whom he is not authorised to communicate such document or information.

9. Gifts

No employee shall, except with the previous sanction of the competent authority, accept or permit his wife or any other member of his family to accept from any person

other than relations any gift or more than trifling value. The interpretation of the term 'trifling value' shall be the same as laid down in the Government Servants Conduct Rules.

10. Private Trade Employment

No employee shall, except with the previous permission of the competent authority, engage directly or indirectly, in any trade or business or any private tuition or undertake any employment outside his official assignments.

Provided that the above restrictions shall not apply to academic work and consultative practice undertaken with the prior permission of the competent authority which may be given subject to as regards acceptance of remuneration as may be laid down by the Board.

11. Investments, Lending & Borrowing

(1) No employee shall speculate in any business nor shall he make or permit his wife or any member of his family to make, any investment likely to embarrass or influence him in the discharge of his official duties.

(2) No employee shall lend money at interest to any person nor shall he borrow money from any person with whom he is likely to have official dealings.

12. Insolvency, Habitual Indebtedness and Criminal Proceedings

(1) An employee shall so manage his private affairs as to avoid habitual indebtedness or insolvency. When an employee is found liable to arrest for debt or has recourse to insolvency or when it is found that a moiety of his salary is continuously being attached, he may be liable to dismissal. An employee who becomes the subject of legal proceedings for insolvency shall forthwith report full facts to the Institute.

(2) An employee who gets involved in some criminal proceedings shall immediately inform the competent authority through the Head of the Department to which he is attached, irrespective of the fact whether he has been released on bail or not.

An employee who is detained in police custody whether on criminal charge or otherwise for a period longer than 8 hours shall not join his duties in the Institute unless he has obtained written permission to that effect from the Head of the Institute.

13. Moveable, Immoveable and Valueable Property

Every member of the staff shall, on first appointment in the Institute service and thereafter at such intervals as may be prescribed by general or special orders of the competent authority submit return in such form as the Institute may prescribe in this behalf of all immoveable property owned, acquired or inherited by him or held by him on lease or mortgage, either in his own name or in the name of any member of his family or in the name of any other person.

14. Vindication of Acts and Character of Employees

No employee shall, except with the previous sanction of the competent authority, have recourse to any court of law or to the press for the vindication of any official act which has been the subject matter of adverse criticism or an attack of defamatory character.

Provided nothing in this rule shall be deemed to prohibit an employee from vindicating his private character or any act done by him in his private capacity.

15. Marriages etc.

An employee intending to marry a person who holds a citizenship of another foreign country shall seek prior permission of the competent authority.

No employee who has wife living shall contract another marriage without first obtaining the permission of the Board notwithstanding that a subsequent marriage is permissible under the personal and religious law for the time being applicable to him and violation of these rules will lead to immediate dismissal from the Institute service.

16. Representations

(a) Whenever an employee wishes to put forth any claim, or seeks redress of any grievance or of any wrong done to him, he must forward his case through proper channel, and shall not forward such advance copies of his application to any higher authority, unless the lower authority has rejected the claim, or refused relief, or the disposal of the matter is delayed by more than three months.

(b) No employee shall be signatory to any joint representation addressed to the authorities for redress of any grievance or for any other matter.

17. Punishment, Appeals, etc.

An employee shall be governed by the provisions of the relevant rules regarding imposition of penalties for breach of any of these rules, and preference of appeals against any such action taken against him.

18. Interpretation

The decision of the Board on all questions relating to the interpretation of these provisions shall be final.

SCHEDULE C

INDIAN INSTITUTE OF TECHNOLOGY DELHI

[See Statute 16(1)]

Contributory Provident Fund of the Indian Institute of Technology Delhi

1. Application

- (1) The provisions contained in this Schedule shall apply to :
- (a) every employee of the Institute who is permanent as on the date of commencement of this schedule;
 - (b) persons appointed on contract, the terms, whereof make such persons eligible for contributing to the Fund;
 - * (c) re-employed pensioners subject to the conditions prescribed by the Government of India from time to time.

Provided that no employee of the Institute shall be entitled to the benefits of the Fund, whose services in the Institute entitle him to a pension and gratuity or on whose account the Institute contributes towards pension or who has been appointed by the Institute on a consolidated salary or on special terms which exclude the benefits of this Fund.

- (2) A person appointed on probation against a substantive vacancy shall be entitled to subscribe to the Fund from the date of his appointment. The Institute's contribution shall, however, be credited with retrospective effect to his account after he has been confirmed.

† Arrears of subscriptions in such cases may be paid in not more than 12 monthly instalments for each year of service. The Institute's contribution is to be credited to the account of the subscriber at the end of each financial year to the extent of his own subscription during the year subject to final adjustment after arrears are realised in full.

‡ A person appointed on temporary basis shall also be entitled to subscribe to the Fund after he completes continuous service for one year. The subscriptions in such a case shall, however, commence from the actual date of the subscriber joining the Fund.

* Inserted vide Ministry of Education letter No. F. 7-7/63-T, 6, dated 15th March, 1965.

† Amended vide Ministry of Education letter No. F. 7-7/63-T, 6, dated 15th March, 1965.

‡ Added vide Ministry of Education letter No. F. 24-44/66-T, 6 dated 12th December, 1966. Effective from December 2, 1966

- * (3) If an employee admitted to the benefit of the Fund was previously a subscriber to any Contributory/Non-contributory Provident Fund of the Central Government/State Government or of a body corporate owned or controlled by Government or an autonomous organisation registered under the Societies Registration Act, 1860, the amount of his accumulations in such Contributory or the Non-contributory Provident Fund, shall be transferred to his credit in the Fund.**
- (4) Every employee of the institute entitled to the benefits of the Fund shall be required to sign a written declaration in the form set forth in Appendix I that he has read this schedule and agreed to abide by the provisions contained in it.**

2. Definitions

In this schedule, unless the context otherwise requires—

- (i) "Accounts Officer" means the Accounts Officer of the Institute;**
- (ii) "Audit Officer" means the (Internal) Audit Officer of the Institute;**
- (iii) "Emoluments" means pay including dearness pay, if any, leave salary or subsistence grant and includes any remuneration of the nature of pay (including dearness pay, if any) received in respect of foreign service;**
- (iv) "Family" means—**
- (a) in the case of a male subscriber the wife or wives and children of a subscriber, and the widow, or widows and children of a deceased son of the subscriber;**
Provided that if a subscriber proves that his wife has been judicially separated from him or has ceased under the customary law of the community to which she belongs to be entitled to maintenance she shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which this schedule relates, unless, the subscriber subsequently indicates by express notification in writing to the Registrar that she shall continue to be so regarded;
- (b) in the case of a female subscriber, the husband and children of the subscriber, and the widow or widows and children of a deceased son of the subscriber;**
Provided that if a subscriber by notification in writing to the Registrar expresses her desire to exclude her husband from her family, the husband shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which this schedule relates, unless the subscriber subsequently cancels formally in writing her notification excluding him.

*** Substituted vide Ministry of Education letter No. F. 11-7/68-T. 6, dated 9th May, 1969. Effective from May 7, 1969.**

- Notes :**
- I. "Children" means legitimate children.
 - II. "An adopted child" shall be considered to be a child when the Registrar, or if any doubt arises in the mind of the Registrar, the Law Officer of the Institute, is satisfied that under the personal law of the subscriber, adoption is legally recognised as conferring the status of a natural child, but in this case only.
- (v) "Foreign Service" means the service in which an employee of the Institute receives his substantive pay with the sanction of the Board from any source other than the fund of the Institute;
 - (vi) "Fund" means the Contributory Provident Fund of the Institute;
 - (vii) "Leave" means any variety of leave provided for in Schedule 'D' as may be applicable to the subscriber;
 - (viii) "Pay" means the amount drawn monthly by an employee of the Institute as—
 - (a) the pay, other than special pay or pay granted in view of his personal qualifications, which has been sanctioned for a post held by him substantively or in an officiating capacity;
 - (b) special pay and personal pay; and
 - (c) any other remuneration which may be specially classed as pay by the Board.
 - (ix) "Subscription" means the amount paid by the subscriber and "Contribution" means the amount contributed by the Institute;
 - (x) "Year" means a financial year.

3. Constitution and Management of the Fund

- (1) The Fund, which shall be maintained in rupees shall be constituted with subscriptions paid by the subscribers and contributions made by the institute and shall include interest paid to the credit of the account of the subscribers under sub-paragraph (l) of paragraph 10.
- (2) The management of the Fund is vested in the Board. Subject to the control and direction of the Board, the Director shall administer the Fund for and on behalf of the Board.
- (3) The Fund shall be deposited, in the name of the Fund, with the State Bank of India. The deposits shall be made as soon as possible after the monthly accounts are closed.

* Substituted vide Ministry of Education letter No. 11-5/68-T. 6, dated 6th May, 1969. Effective from May 3, 1969.

- * (4) The Institute may invest such part of the funds, as may be considered expedient, in the Government securities/certificates, negotiable Government guaranteed bonds, and in such deposit schemes of the Central Government as may be notified in this regard from time to time, the interest or profit realized on such investments being credited to the Institute as miscellaneous receipts. All investments and securities shall be held in the name of the Institute.

4. Nomination

- (1) A subscriber shall, at the time of joining the Fund, send to the Registrar a nomination conferring on one or more persons the right to receive the amount that may stand to his credit in the Fund, in the event of his death before that amount has become payable or having become payable, has not been paid.

Provided that if, at the time of making the nomination the subscriber has a family, the nomination shall not be in favour of any person or persons other than the members of his family.

Provided further that the nomination made by the subscriber in respect of any other Provident Fund to which he was subscribing before joining the Fund, shall, if the amount to his credit in such other fund has been transferred to his credit in this Fund, be deemed to be a nomination duly made under this rule until he makes a nomination in accordance with this sub-para.

† Note : In this rule, unless the context otherwise requires, "person" or "persons" shall include a company or association or body of individuals, whether incorporated or not.

- (2) If a subscriber nominates more than one person under sub-para (1), he shall specify in the nomination the amount or share payable to each of the nominees in such manner as to cover the whole of the amount that may stand to his credit in the Fund at any time.
- (3) Every nomination shall be in such one of the forms set forth in Appendix II as is appropriate in the circumstances.
- (4) A subscriber may, at any time, cancel his nomination by sending a notice in writing to the Registrar.

Provided that the subscriber shall along with such notice send a fresh nomination made in accordance with the provisions of this para.

* Substituted vide Ministry of Education letter No. 11-5/69-T.6, dated 6th May 1969. Effective from May 3, 1969. Re-substituted vide Ministry of Education letter No. J. 11011/7777/T. 6, dated 20th July, 1979. Effective from June 25, 1979.

† Inserted vide Ministry of Education letter No. 11-1/66-T.8, dated 1st/3rd February, 1967.

- (5) A subscriber may provide in a nomination—
- (a) in respect of any specified nominee that in the event of his nominee predeceasing the subscriber, the right conferred upon that nominee shall pass to such other person as may be specified in the nomination.
- Provided such other person or persons shall if the subscriber has other members of his family, be such other member or members. Where the subscriber confers such a right on more than one person under this clause, he shall specify the amount or share payable to each of such persons in such a manner as to cover the whole of the amount payable to the nominee.
- (b) that the nomination shall become invalid in the event of the happening of a contingency specified therein; provided that if at the time of making the nomination the subscriber has no family, he shall provide in the nomination that it shall become invalid in the event of his subsequently acquiring a family.
- Provided further that if at the time of making the nomination the subscriber has only one member of the family, he shall provide in the nomination that the right conferred upon the alternate nominee under clause (a) shall become invalid in the event of his subsequently acquiring other members or member in his family.
- (6) Immediately on the death of a nominee in respect of whom no special provision has been made in the nomination under clause (a) of sub-para (5) or on the occurrence of any event by reason of which the nomination becomes invalid in pursuance of clause (b) of sub-para (5) or the provisions thereto, the subscriber shall send to the Registrar a notice in writing cancelling the nomination together with a fresh nomination made in accordance with the provisions of this para.
- (7) Every nomination made and every notice of cancellation given by a subscriber shall to the extent that it is valid, take effect, on the date on which it is received by the Institute.
- (8) An up-to-date Register shall be maintained by the Institute to record all nominations.

5. Subscriber's Accounts

An account shall be opened in the name of each subscriber in the Form set forth in Appendix III, in which shall be shown :

- (i) the subscriber's subscriptions;
- (ii) contributions made under para 9 by the Institute to his account;
- (iii) interest, as provided by para 10, on subscription;

- (iv) interest, as provided by para 10, on contributions; and
- (v) advances and withdrawals from his account.

6. Conditions and Rates of Subscriptions

- (1) Every subscriber shall subscribe monthly to the Fund when on duty or on foreign service but not during a period of suspension. Provided that a subscriber on re-instatement after a period passed under suspension shall be allowed the option of paying in one sum, or in instalments, any sum not exceeding the maximum amount of arrears of subscriptions permissible for that period.
- (2) A subscriber may, at his option, not subscribe during leave other than leave on average pay or earned leave of less than 30 days duration by sending a notice in writing to the Registrar before or soon after proceeding on leave. Failure to make due and timely intimation shall be deemed to constitute an election to subscribe. The option of a subscriber intimated under this sub-para shall be final.
- (3) A subscriber who has, under para 29, withdrawn the amount of subscriptions and interest thereon, shall not subscribe to the Fund after such withdrawal, unless he returns to duty.

- 7. (1) The amount of subscriptions shall be fixed subject to the following conditions :**
- (a) It shall be expressed in whole rupees (50 Naye Paise and above counting as the next higher rupee).
 - (b) It may be any sum, not less than $\frac{1}{3}$ % of emoluments of the subscriber and not more than his emoluments.
- (2) For the purposes of clause (b) of sub-para (1) the emoluments of a subscriber shall be—**
- (a) in the case of a subscriber who has in permanent service of the Institute on the 31st March of the preceding year, the emoluments to which he was entitled on that date;
 - (b) in the case of a subscriber who was not in permanent service of the Institute on the 31st March of the preceding year, the emoluments to which he was entitled on the first day of his permanent service.
- (3) The amount of subscription so fixed may be enhanced or reduced only once during the course of a year. Provided that if a subscriber is on duty for a part of a month and on leave for the remainder of the month and if he has elected not to subscribe during the leave the amount of subscription payable shall be proportionate to the number of days spent on duty in the month.**

- (4) When a subscriber is temporarily transferred to foreign service (elsewhere) or sent out of India, he shall remain, subject to the provisions contained in this schedule in the same manner as if he were not so transferred or sent out.

8. Realisation of Subscriptions

- (1) When emoluments are drawn from the Funds of the Institute, recovery of subscriptions on account of these emoluments and of the principal and interest of advances shall be made from the emoluments themselves.
- (2) When emoluments are drawn from any other source, the subscriber shall forward his dues monthly to the Institute.

9. Contributions by the Institute

- (1) The Institute shall, with effect from the 31st March of each year, make a contribution to the account of each subscriber.

Provided that if a subscriber quits the service or dies during a year, contribution shall be credited to his account for the period between the close of the preceding year and the date of the casualty.

Provided further that no contribution shall be payable in respect of any period for which the subscriber is permitted under this Schedule not to, or does not, subscribe to the Fund.

- (2) The contribution shall be a sum representing $8\frac{1}{3}$ per cent of the emoluments of the subscriber, drawn on duty during the year or for a period in the year as the case may be.
- (3) Should a subscriber elect to subscribe during leave, his leave salary shall, for the purpose of this rule be deemed to be emoluments drawn on duty.
- (4) The amount of any contribution payable in respect of a period of foreign service shall, unless it is recovered from the employer, be recovered by the Institute from the subscriber.
- (5) The amount of contribution payable shall be rounded to the nearest whole rupee (50 Naya Paise and above counting as the next higher rupee).

10. Interest

- (1) The Institute shall pay to the credit of the accounts of a subscriber interest at such rate as the Central Government may, from time to time, prescribe in the case of their employees.
- (2) Interest shall be credited with effect from the 31st March of each year in the following manner :
- (i) on the amount of the credit of a subscriber on the 31st March of the preceding year, less any sums withdrawn during the current year-interest for twelve months;

- (ii) on sums withdrawn during the current year-interest from the 1st April of the current year up to the last day of the month preceding the month of withdrawal;
- (iii) on all sums credited to the subscriber's account after the 31st March of the preceding year, interest from the date of deposit up to the 31st March of the current year;
- (iv) the total amount of interest shall be rounded to the nearest rupee in the manner provided in sub-para (5) of para (9).

Provided that when the amount standing to the credit of a subscriber has become payable, interest shall thereupon be credited under this sub-para in respect only of the period from the beginning of the current year or from the date of credit as the case may be up to the date on which the amount standing to the credit of the subscriber becomes payable.

- (3) For the purpose of this para the date of credit shall be deemed to be the first day of the month in which it is credited.

Provided that where there has been a delay in the drawal of pay or leave salary and allowances of the subscriber and consequently in the recovery of this subscription towards the Fund, the interest on such subscriptions shall be payable from the month in which the pay or leave salary of the subscriber was due, irrespective of the month in which it was actually drawn.

- (4) In all cases interest will be paid in respect of balance to the credit of a subscriber up to the close of the month preceding that in which payment is made or up to the end of sixth month after the month in which amount became payable whichever of these periods is less.
- (5) Subject to the provisions of sub-para (4) no interest shall be paid in respect of any period after the date which the Registrar has intimated to that person or his agent as the date on which he is prepared to make payments.

11. Advance from the Fund

A temporary advance may be granted to a subscriber from the amount standing to his credit in the Fund at the discretion of the authority specified in para 12 subject to the following conditions :

- (a) No advance shall be granted unless the sanctioning authority is satisfied that the applicant's pecuniary circumstances justify it, and that it will be expended on the following object or objects and not otherwise :
 - (i) to pay expenses in connection with the prolonged illness or confinement of the applicant or any person actually dependent on him;
 - (ii) to pay for the overseas passage for reasons of health or education of the applicant or any person actually dependent on him;

- (iii) to pay obligatory expenses on a scale appropriate to the applicant's status in connection with marriages, funerals or ceremonies which by religion it is incumbent on him to perform.
- (iv) to pay for expenses outside India in connection with the education, beyond high school stage, of the applicant or any person actually dependent on him.
- (v) to pay for expenses of the applicant or any person actually dependent on him in connection with any medical, engineering or other technical or specialised course or other general higher education in India beyond the high-school stage.
Provided that the duration of the course of study is not less than three years.
- (vi) to meet the cost of his defence where the subscriber is prosecuted by the Government or Institute in any court of law or where the subscriber engages any legal practitioner to defend him in an enquiry in respect of any alleged official misconduct on his part;
- (vii) to meet the cost of legal proceedings instituted by the subscriber for vindicating his position in regard to any allegations made against him in respect of any act done or purporting to have been done by him in the discharge of his official duty;
- *(viii) To meet the cost of a plot or construction of a house or a ready built flat for his residence or to make any payment towards the allotment of a plot or a ready built flat by a State Housing Board or House Building Co-operative Society.

Note : An advance under sub-clause (vi) above shall be available to the applicant in addition to any advance admissible for the same purpose from any other Government source but advance under the said sub-clause shall not be admissible to a subscriber either in respect of any legal proceedings instituted by him in any court of law against the Government/Institute as regards any penalty imposed on him or any condition of service or in respect of any legal proceedings in regard to any matter unconnected with his official duties.

- †(a) The sanctioning authority may, in special circumstances, sanction the payment to any subscriber of an advance if he is satisfied that the subscriber concerned requires the advance for reasons other than those mentioned in clause (a);
- (b) Any advance shall not, except for special reasons, exceed three months' pay, and shall in no case exceed the amount of subscription

* Added vide Ministry of Education letter No. F-11-3/80-T.6, dated 24th March, 1982. Effective from March 15, 1982.

† Inserted vide Ministry of Education letter No. F-11-L/70-T.6, dated 29th June, 1971. Effective from June 22, 1971.

and interest thereon standing to the credit of the subscriber in the Fund.

- *(c) An advance shall not, except for special reasons, be granted until after the final repayment of all previous advances together with interest thereon, have elapsed.
- (d) The sanctioning authority shall record in writing the special reasons where advance is sanctioned for such reasons.
- (e) An application for temporary advance from the Fund shall be submitted in the form set forth in Appendix IV.

- 12. (1) A temporary advance from the Fund to the subscribers other than the Director will be sanctioned by the Director, who may, at his discretion, delegate this work to the Deputy Director and the Registrar.
- (2) A temporary advance from the Fund to the Director shall require the sanction of the Chairman.
- 13. (1) An advance shall be recovered from the subscriber in such number of equal monthly instalments as the sanctioning authority may direct; but such number shall not be less than twelve unless the subscriber so elects, or in any case more than twenty four.

A subscriber may, at his option, make repayment in a smaller number of instalments than that prescribed. Each instalment shall be a number of whole rupees, the amount of advance being raised or reduced, if necessary to admit of the fixation of such instalment.

- ** (2) Recovery shall be made in the manner provided in paragraph 8 for the realisation of subscription and shall commence with issue of pay for the month following the one in which the advance was drawn.

Recovery shall not be made, except with the subscriber's consent while he is on leave or in receipt of subsistence grant and may be postponed by the sanctioning authority during the recovery of the advance of pay granted to the subscriber.

- (3) If more than one advance has been made to a subscriber, each advance shall be treated separately for the purpose of recovery.
- (4) After the principal of the advance has been fully repaid, interest shall be paid thereon at the rate of one-fifth per cent of the principal for each month or broken part of a month during the period between the withdrawal and complete repayment of the principal.

† Amended vide Ministry of Education letter No. F. 11-L/70-T. 6, dated 29th June, 1971. Effective from June 22, 1971.

** Substituted vide Ministry of Education letter No. F. 24-3/65-T. 8, dated 10th January, 1969.

- (5) Interest shall ordinarily be recovered in one instalment in the month after complete repayment of the principal; but if the period referred to in sub-para (4) exceeds twenty months, interest may, if the subscriber so desired be recovered in two equal monthly instalments. The method of recovery shall be that provided in sub-para (2). Payment shall be rounded to the nearest rupee in the manner provided in sub-para (5) of para 9.
- (6) Recoveries made under this rule shall be credited as they are made, to the account of the subscriber in the Fund.

14. Withdrawal from the Fund

*Subject to the conditions specified hereunder, in the case of withdrawal made by the Director from the Fund may be sanctioned by the Chairman and by the Director in any other case at any time :

- (a) after the completion of twenty years of service (including broken periods of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier from the amount of subscription and interest thereon standing to the credit of the subscriber in the Fund for one or more of the following purposes, namely :
 - (i) for meeting the cost of higher education, including where necessary, the travelling expenses of the subscriber or any child of the subscriber in the following cases namely :
 - (a) for education outside India for academic, technical, professional or vocational course beyond the High School stage; and
 - (b) for any medical, engineering or other technical or specialised course in India beyond the High School stage;
 - (ii) for meeting the expenditure in connection with the betrothal/marriage of the subscriber on his sons or daughters, and any other female relation actually dependent on him;
 - (iii) for meeting the expenses in connection with the illness including where necessary, the travelling expenses, of the subscriber and members of his family or any person actually dependent on him;
- (b) after the completion of fifteen years of service (including broken period of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier, from the amount standing to his credit in the Fund for one or more of the following purposes, namely :

* Substituted vide Ministry of Education letter No. F-11-3/80-T. 6, dated 24th March, 1982. Effective from March 15, 1982.

- (I) for constructing or acquiring a suitable house or a ready built flat for his residence including the cost of the land;
 - (II) for repaying an outstanding amount on account of loan expressly taken for constructing or acquiring a suitable house or a ready built flat for his residence;
 - (III) for purchasing a plot of land for constructing a house thereon for his residence or repaying any outstanding amount on account of loan expressly taken for this purpose;
 - (IV) for reconstructing or making additions or alterations to a house or a ready built flat already owned or acquired by the subscriber;
 - (V) for renovating, making additions or alterations or upkeep of an ancestral house at a place other than the place of duty or to a house built with the assistance of loan from Government at a place other than the place of duty;
 - (VI) for constructing a house on a plot of land purchased under clause (c);
- (c) within six months before the date of the subscriber's retirement, from the amount standing to his credit in the Fund for the purpose of acquiring a farm land or business premises or both.
15. (1) Any sum withdrawn by a subscriber at any one time for one or more of the purposes specified in para 14 from the amount standing to his credit in the Fund shall not ordinarily exceed one-half of the amount of subscriptions and interest thereon standing to the credit of the subscriber in the Fund or 6 months pay, whichever is less. The sanctioning authority may, however, sanction the withdrawal of an amount in excess of this limit up to three-fourths of the amount of subscriptions and interest thereon standing to the credit of the subscriber having due regard to (i) the object for which the withdrawal is made, (ii) the status of the subscriber; and (iii) the amount of subscriptions and interest thereon standing to the credit of the subscriber in the Fund.
- (2) A subscriber who had been permitted to withdraw money from the Fund under para 14 shall satisfy the sanctioning authority within a reasonable period as may be specified by that authority till the money has been utilised for the purpose for which it was withdrawn, and if he fails to do so, the whole of the sum so withdrawn or so much thereof as has not been applied for the purpose for which it was withdrawn shall forthwith be repaid in one lump sum together with interest thereon at the rate determined under para 10 by the subscriber to the Fund and in default of such payment, it shall be ordered by the sanctioning authority to be recovered from his emoluments either in a lump sum or in such number of monthly instalments as may be determined by the Institute.

16. A subscriber who has already drawn or may draw in future an advance under para 11 for any of the purposes specified in clause (a), (b) and (c) of sub-para (1) of para 14 may convert, at his discretion, by written request addressed to the Accounts Officer through the sanctioning authority the balance outstanding against it into a final withdrawal on his satisfying the conditions laid down in paras 14 and 15.

17. Payments towards Insurance Policies and Family Pension Funds

On written application from a subscriber to the Fund and subject to the conditions contained in paras 18 to 22.

- (a) (i) subscriptions to a family pension Fund; and
- (ii) payments towards an insurance policy, may be substituted for the whole or part of subscriptions to the Fund.
- (b) The amount of subscriptions with interest thereon standing to the credit of a subscriber in the Fund may be withdrawn to meet :
 - (i) payments towards an insurance policy;
 - (ii) purchase of a single payment insurance policy; and
 - (iii) payment of a single premium or subscriptions to a Family Pension Fund.

Provided that both in respect of (a) and (b) the family pension is (i) approved by the Board; and (ii) insurance policy is such as may be legally assigned by the subscriber himself in favour of the Institute and is so assigned by him and is delivered to the Registrar as a security against payment made from the Fund.

- 18. (1) An insurance policy effected by the subscriber himself on his own life or on the joint lives of the subscriber and his wife which shall be deemed to be a policy on the life of the subscriber himself, may be accepted for assignments in favour of the Institute.
- (2) A policy which has been assigned to the subscriber's wife shall not be accepted unless either the policy is first reassigned to the subscriber or the subscriber and his wife both join in an appropriate assignment.
- (3) An insurance policy shall be assigned to the Institute by means of an endorsement made on the policy itself in Form (1) or Form (3) or the Forms given in Appendix V according as the policy is on the life of the subscriber or on the joint lives of the subscriber and his wife or the policy has previously been assigned to the subscriber's wife.
- (4) Notice of assignment of a policy shall be given by the subscriber to the Insurance Company, and the acknowledgement of the notice by the Insurance Company shall be sent to the Registrar within three months of the date of assignment.

- (5) Where an Insurance Policy has been assigned to the Institute the Registrar shall satisfy himself by referring to the Insurance Company, where possible that no prior assignment of the policy exists.
19. (1) Except in the cases of the Hindu Family (Pension) Annuity Fund and the Postal Life Assurance Policies in respect of which subscriptions or premiums which are paid by the Institute to the extent of recoveries actually made from the monthly salary bills, the Institute will not make any payment on behalf of subscribers to Insurance Companies, nor take steps to keep a policy alive.
- (2) A subscriber who desires to substitute his Fund subscriptions in whole or part for payment to a Family Pension Fund or Insurance under clause (a) or para 17 may reduce his subscriptions to the Fund within its limit.
- Provided that except in the cases of subscriptions or premiums mentioned in sub-para (1) the subscribers shall send to the Registrar, within a period of two months from the date of payment, receipts or certified copies of receipts in order to satisfy that the amount by which the subscriptions to the Fund has been reduced was duly applied for the purposes specified in clause (a) of para 17.
- (3) A subscriber who desires to withdraw any amount under clause (b) of para 17 within the limit of his subscription in the Fund shall make arrangements with the Registrar for the withdrawal of the amount to be paid from his subscription in the Fund.
- Provided that the subscriber shall send to the Registrar, within a period of two months from the date of payment, receipts or certified copies of receipts in order to satisfy that the amount withdrawn was duly applied for the purposes specified in clause (b) of para 17.
- (4) Any amount withdrawn under clause (a) or (b) of para 17 shall be paid in whole rupees rounded to the nearest in the manner provided in sub-para (5) of para 9.
20. (1) If the total amount of any subscriptions or payments substituted under clause (a) or para 17 is less than the amount of minimum subscription payable to the Fund under para 7, the difference should be rounded off in the nearest rupee in the manner provided in sub-para (5) of para 9 and paid by the subscriber as a subscription to the Fund.
- (2) If the subscriber withdraws any amount standing to his credit in the Fund for any of the purposes specified in clause (b) of para 17 he shall continue to pay to the Fund the subscriptions payable under para 7.
21. Once an Insurance Policy has been accepted for the purposes of being financed from the Fund, the terms of the policy shall not be altered nor shall the Policy be exchanged for another Policy without the prior consent of the Director. Further the

premium of Life Insurance Policies assigned under this provision shall not be payable otherwise than annually.

22. The subscriber shall not during the currency of the Policy draw any bonus the drawal of which during such currency is optional under the terms of the policy and the amount of any bonus which under the terms of the policy and the subscriber has no option to refrain from drawing during its currency shall be paid forthwith into the Funds by the subscriber or in default recovered by reduction from his emoluments by instalments or otherwise as the Board may direct.

23. (1) Save as provided in sub-para (2) of para 25 when the subscriber :

- (a) quits the service, or
- (b) has proceeded on leave preparatory to retirement and applied to the Institute for reassignment or return of Policy, or
- (c) while on leave, has been permitted to retire or declared by competent medical authority to be unfit for further service and applies to the Institute for reassignment or return of policy, or
- (d) pays or repays to the Fund the whole of any amount withheld or withdrawn from the Fund for any of the purposes mentioned in sub-clause (ii) of clause (a) of para 17 and sub-clauses (i) and (ii) of clause (b) of para 17 with interest thereon at the rate provided in para 10.

The Registrar shall, if the policy has been assigned in favour of the Institute under para 18 reassign the policy in the first Form set forth in Appendix VI to the subscriber, or to the subscriber and the joint assured, as the case may be, and make it over to the subscriber, together with a signed notice of the reassignment addressed to the Insurance Company.

(2) Save as provided in sub-para (2) of para 25, when the subscriber dies before quitting the service, the Registrar shall reassign the policy in the second Form set forth in Appendix VI to such person as may be legally entitled to receive it, and shall make over the policy to such person together with a signed notice of the reassignment addressed to the Insurance Company.

24. If a policy assigned in favour of the Institute under para 18 matures before the subscriber quits the service, or if a policy on the joint lives of a subscriber and his wife, assigned under the said para falls due for payment by reason of the wife's death, the full amount of the policy shall, on realisation, be credited to the Fund of the subscriber.

25. (1) If the interest of the subscriber in the Family Pension Fund ceases in whole or part from any cause whatsoever, the provident fund account of the subscriber shall forthwith be reimbursed by the amount of the refund, if any, secured by the subscriber from the Family Pension Fund which amount shall, in default of the reimbursement, be deducted from the subscriber's emoluments by instalments or otherwise, as the Board may direct.

- (2) If the Institute receives notice of—
- (a) an assignment (other than an assignment in favour of the Institute under para 18), or
 - (b) a charge of encumbrance, or
 - (c) an order of a Court restraining dealings with the policy or any amount realised thereon, the Registrar shall not—
 - (i) re-assign or take over the policy as provided in para 23,
 - (ii) realise the amount assured by the policy, as provided in para 24, but shall forthwith refer the matter to the Board.

26. Notwithstanding anything contained in this schedule, if the sanctioning authority is satisfied that money withheld or withdrawn from the Fund under clause (a) or clause (b) or para 17 has been utilised for a purpose other than that for which sanction was given to the withholding or withdrawal of the money from the Fund, the amount in question, shall, with interest at the rate provided in para 10, forthwith be paid by the subscriber to the Fund, or in default, be ordered to be recovered by deduction in one sum from the emoluments of the subscriber, even if he be on leave. If the total amount to be paid is more than one-half the subscriber's emoluments, recoveries shall be made in monthly instalments of moieties of his emoluments till the entire amount recoverable is paid by him.

Note : The term emoluments as used in this rule does not include subsistence grant.

27. Restrictions of the Provisions relating to Financing of Policies

The provisions contained in paragraph 17 to 26 shall apply only to subscribers who, before the date from which the Statutes came into force, have been substituting in whole or in part, payments towards policies of life insurance for subscriptions to the Fund or making withdrawals from the Fund for such payments;

Provided that such subscribers shall not be permitted to substitute such payments for subscriptions due to the Fund or to withdraw from the Fund for making such payments in respect of any new policy.

28. Circumstances in which Accumulations are Payable

When a subscriber quits the service, the amount standing to his credit in the Fund, shall subject to any deduction under para 31, become payable to him :

Provided that a subscriber, who has been dismissed from the service and is subsequently reinstated in the service, shall, if required to do so by the Institute, repay any amount paid to him from the Fund in pursuance of this para with interest thereon at the rate provided in para 10 in the manner provided in the proviso to para 29. The amount so repaid shall be credited to his account in the Fund, the part which represents his

subscriptions and interest thereon, and the part which represents the Institute contribution with interest thereon being accounted for in the manner provided in para 5.

29. When a subscriber—

- (a) has proceeded on leave preparatory to retirement or if he is employed in a vacation department, on leave preparatory to retirement combined with vacation, or
- (b) while on leave, has been permitted to retire or declared by competent medical authority to be unfit for further service,

the amount of subscriptions and interest thereon standing to his credit in the Fund shall, upon application made by him in that behalf to the Director, become payable to the subscriber.

Provided that the subscriber, if he returns to duty, shall, if required to do so by the Institute, repay to the Fund, for credit to his account, the whole or part of any amount paid to him from the Fund in pursuance of this rule, with interest thereon at the rate provided in para 10, in cash or securities, or partly in cash and partly in securities, by instalments or otherwise, as the Institute may direct.

30. Subject to any deduction under para 31, on the death of a subscriber before the amount standing to his credit has become payable or where the amount has become payable, before payment has been made.

When the subscriber leaves a family—

- (a) If a nomination made by the subscriber in accordance with the provisions of para 4 in favour of a member or members of his family subsists, the amount standing to his credit in the Fund or the part thereof, to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination;
- (b) If no such nomination in favour of a member or members of the family of the subscriber subsists, or if such nomination relates only to a part of the amount standing to his credit in the Fund, the whole amount or the part thereof to which the nomination does not relate, as the case may be, shall notwithstanding any nomination purporting to be in favour of any person or persons other than a member or members of his family, become payable to the member of his family in equal shares :

Provided that no share shall be payable to—

- (1) sons who have attained majority;
- (2) sons of a deceased son who have attained majority;
- (3) married daughters whose husbands are alive;
- (4) married daughters of a deceased son whose husbands are alive if

there is any member of the family other than those specified in clauses (1), (2), (3) and (4);

Provided also that the widow or widows and the child or children of a deceased son shall receive between them in equal parts only the share which that son would have received if he had survived the subscriber and had been exempted from the provisions of clause (1) of the first proviso.

Note : (i) Any sum payable under these rules to a member of the family of a subscriber vests in such member under sub-section (2) of section (3) of the Provident Funds Act, 1925;

(ii) when the subscriber leaves no family, if a nomination made by him in accordance with the provisions of para 4 in favour of any person or persons subsists, the amount standing to his credit in the Fund or the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination;

Note : When a nominee is a dependent of the subscriber as defined in clause (c) of section 2 of the Provident Funds Act, 1925, the amount vests in such nominee under sub-section (2) of section 3 of that Act.

When a subscriber leaves no family and no nomination made by him in accordance with the provisions of para 4 subsists, or if such nomination relates only to part of the amount standing to his credit in the Fund, the relevant provisions of clause (b) and of sub-clause (ii) of clause (c) of sub-section (1) of section 4 of the Provident Funds Act, 1925, are applicable to the whole amount or the part thereof to which the nomination does not relate.

***30A Deposit Linked Insurance Scheme**

On the death of a subscriber, the person entitled to receive the amount standing to the credit of the subscriber shall be paid by the Accounts Officer an additional amount equal to the average amount of subscription and interest thereon at the credit in the account during the 3 years immediately preceding the death of such subscriber, subject to the condition that—

- (a) the balance representing subscription with interest thereon at the credit of such subscriber shall not at any time during the 3 years preceding the month of death have fallen below the limits of—
- (i) Rs. 4000/- in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 1300/- or more;
 - (ii) Rs. 2500/- in the case of a subscriber who has held, for the greater part

* Inserted vide Ministry of Education letter No. F. 16-24/78-T.6, dated 1st March, 1979. Effective from the same date from which it is applicable to Government servants.

- of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 900/- or more but less than Rs. 1300/-;
- (iii) Rs. 1500/- in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 291/- or more but less than Rs. 900/-;
 - (iv) Rs. 1000/- in the case of a subscriber who has held for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is less than Rs. 291/-;
- (b) the additional amount payable under this rule shall not exceed Rs.10,000/-;
 - (c) the subscriber has put in at least 5 years service at the time of his death.

- Notes :**
1. The average balance shall be worked out on the basis of the balance at the credit of the subscriber at the end of each 36 months preceding the month in which the death occurs. For this purpose, as also for checking the minimum balances prescribed above—
 - (a) the balance at the end of March shall include the annual interest on subscription credited in terms of paragraph 10; and
 - (b) If the last of the aforesaid 36 months is not March, the balance at the end of the said last month shall include interest on subscription in respect of the period from the beginning of the financial year in which death occurs to the end of the last month.
 2. Payments under this scheme should be in whole rupees. If an amount due includes a fraction of a rupee, it should be rounded to the nearest rupee, (50 paise counting as the next higher rupee).
 3. Any sum payable under this scheme is in the nature of insurance money and, therefore, the statutory protection given by section 3 of the Provident Funds Act, 1925 (Act 19 of 1925) does not apply to sums payable under this scheme.
 4. This scheme also applies to those subscribers to the Fund who are transferred to an autonomous organisation consequent upon conversion of a Government Department into such a body and who, on such transfer, opt, in terms of options given to them to subscribe to this Fund in accordance with these rules.
 5. (a) In case of employee of the Institute who has been admitted to the benefits of the Fund under Statute 16(2)/Statute 16A(1), but dies before completion of three years service or, as the case may be, five years service from the date of his admission to the Fund, that period of his service under the previous employer in respect whereof the

amount of his subscriptions and the employer's contribution, if any, together with interest have been received, shall count for purposes of clauses of clause (a) and clause (c).

- (b) In case of persons appointed on tenure basis and in the case of re-employed pensioners, service rendered from the date of such appointment or re-employment, as the case may be, only will count for purposes of this rule.
 - (c) This scheme does not apply to persons appointed on contract basis.
6. The budget estimates of expenditure in respect of this scheme will be prepared by the Accounts Officers responsible for maintenance of the accounts of the Fund having regard to the trend of expenditure, in the same manner as estimates are prepared for other retirement benefits.

31. Deduction

Subject to the conditions that no deduction may be made which reduces the credit by more than the amount of any contribution by the Institute with interest thereof credited under paras 9 and 10, before the amount standing to the credit of a subscriber in the Fund is paid out of the Fund, the Board may direct the deduction therefrom and payment to the Institute of—

(a) any amount, if a subscriber has been dismissed from the service for grave misconduct; provided that, if the order of dismissal is subsequently cancelled the amount so deducted shall on his reinstatement in the service, be replaced at his credit in the Fund;

(b) any amount, if a subscriber resigns his employment with the Institute within five years of the commencement thereof or ceases to be an employee of the Institute, otherwise than by reasons of superannuation or a declaration made by competent medical authority that he is unfit for further service.

Provided that in the case of an employee on contract, the Institute's contribution towards the Provident Fund and other benefits shall be payable—

(i) in full, if the full period of the contract is served;

(ii) in proportion, if the contract is terminated earlier, provided the termination of the contract is in accordance with the terms provided in it.

(c) any amount due under a liability incurred by the subscriber to the institute.

32. (1) (a) When the amount standing to the credit of a subscriber in the Fund or the balance thereof after any deduction under para 31 becomes

* Substituted vide Ministry of Education letter No. F. 11-3/78-T.6, dated 7th June, 1980. Effective from June 3, 1980.

payable, it shall be the duty of the Registrar, after obtaining the sanction of the Director and after satisfying himself, when no such deduction has been directed under that para that no deduction is to be made, to make the payment as provided in Section 4 of the Provident Funds Act, 1925.

- (b) In the case of final payment to the Director from the Contributory Provident Fund, the competent authority to sanction the payment shall be the Chairman, Board of Governors.
- (2) If the person to whom, under this schedule any amount or policy is to be paid, assigned, reassigned or delivered is a lunatic for whose estate a manager has been appointed in this behalf, the payment or reassignment or delivery will be made to such a manager appointed under the provisions of the Indian Lunacy Act, 1912 and not to the lunatic.
- (3) Any person who desires to claim payment under this para shall send a written application in that behalf to the Director. Payment of amounts withdrawn shall be made in India only. The persons to whom the amounts are payable shall make their own arrangements to receive payment in India.

Note : When the amount standing to the credit of a subscriber has become payable under para 28, 29 or 30 the Institute shall make arrangement for prompt payment of that portion of the amount standing to the credit of a subscriber in regard to which there is no dispute or doubt, the balance being adjusted as soon after as may be.

33. Procedure

Accumulations in the Fund of which payment has not been taken within six months after they become payable under this schedule shall be transferred to "Deposits" after the 31st March of the year and treated under the provisions relating to deposits.

34. When paying a subscription in India either by deduction from emoluments or in cash, a subscriber shall quote the number of his account in the Fund, which shall be communicated to him by the Accounts Officer. Any change in the number shall similarly be communicated to the subscriber by the Accounts Officer.

35. (1) As soon as possible after the 31st March of each year and after the Fund accounts have been audited by the Audit Officer, the Accounts Officer shall send to each subscriber a statement of his account in the Fund in the Form set forth in Appendix VII showing the opening balance as on the 1st April of the year, the total amount of deposits during the year and the closing balance on that date.

The Accounts Officer shall attach to the statement of account on enquiry whether the subscriber—

- (a) desires to make any alteration in any nomination made under para 4;

- (b) has acquired a family (In cases where the subscriber has made nomination in favour of a member of his family under the provision sub-para (1) of para (4).
- (2) Subscribers should satisfy themselves as to the correctness of the annual statement, and errors should be brought to the notice of the Accounts Officer within three months from the date of receipt of the statement. If no intimation is received from the subscriber within this period it shall be assumed that he has accepted the statement.
- (3) Where errors in the annual statement are brought to notice, it shall be the responsibility of the Accounts Officer to reconcile the same for settlement to the satisfaction of the subscriber.

APPENDIX I

[See para 1(4)]

Form of Declaration

I(the subscriber) a permanent employee of the Indian Institute of Technology at.....do hereby declare that I have read the provisions governing the Contributory Provident Fund of the Indian Institute of Technology..... and agree to abide by them.

Signature of subscriber

Dated this..... day of 19

Two witnesses to signature :

1.....

2.....

APPENDIX II

Forms of Declaration

I. When the subscriber has a family and wishes to nominate one member thereof.

I hereby nominate the person mentioned below, who is a member of my family as defined in para 2 of the provisions governing the Contributory Provident Fund of the Indian Institute of Technology to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable or having become payable has not been paid :

Name and address of the nominee	Relationship with subscriber	Age	Contingencies on the happening of which the nomination shall become invalid	Name, address, relationship of the person, if any, to whom the right of the nominee shall pass in the event of predeceasing the subscriber
---------------------------------	------------------------------	-----	---	--

Dated this..... day of..... 19
at.....

Two witnesses to signature :
1.....
2.....

Signature of subscriber

II. When the subscriber has a family and wishes to nominate more than one member thereof.

I hereby nominate the persons mentioned below, who are members of my family as defined in para 2 of the provisions governing the Contributory Provident Fund of the Indian Institute of Technology to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable has not been paid and direct that the said amount shall be distributed among the said persons in the manner shown below against their names;

Names and addresses of the nominees	Relation-ship with subscriber	Age	*Amount of share of accumulation to be paid to each	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the persons, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber
-------------------------------------	-------------------------------	-----	---	---	--

Dated this..... day of..... 19

at,.....

Signature of subscriber

Two witnesses to signature :

1.....

2.....

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

III. When the subscriber has no family and wishes to nominate one person.

I, having no family as defined in para 2 of the provisions governing the Contributory Provident Fund of the Indian Institute of Technology hereby nominate the person mentioned below to receive the amount that may stand to my credit in the Fund; in the event of my death before that amount has become payable, or having become payable has not been paid.

Name and address of the nominee	Relationship with subscriber	Age	*Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber
---------------------------------	------------------------------	-----	--	---

Dated this..... day of..... 19
at.....

Signature of subscriber

Two witnesses to signature :

- 1.....
- 2.....

* Where a subscriber who has no family makes a nomination, he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

IV. When the subscriber has no family and wishes to nominate more than one person.

I, having no family as defined in para 2 of the provisions governing the Contributory Provident Fund of the Indian Institute of Technology hereby nominate the persons mentioned below to receive the amount that may stand to my credit in the Fund in the event of my death before that amount has become payable, or having become payable has not been paid, and direct that the said amount shall be distributed among the said persons in the manner shown below against their names :

Names and addresses of the nominees	Relationship with subscriber	Age	*Amount of share of accumulations, to be paid to each	**Contingencies on happening of which the nomination shall become valid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this..... day of..... 19

at.....

Signature of subscriber

Two witnesses to signature :

1.....

2.....

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

** Where a subscriber who has no family makes a nomination shall become invalid in the event of his subsequently acquiring a family.

APPENDIX

21A
Contributory Provident Fund

Account No.....
Date of receipt of nomination..... Name.....

YEARLY SUBSCRIPTION					INSTITUTE'S CONT.				
Month	Emolu- ments	Subs- cription	Refunds or with- drawals	Total	With- drawals	Monthly balance on which interest is calcu- lated	Please see be- low	With- draw- als	Remarks
April									
May									
June									
July									
August									
September									
October									
November									
December									
January									
February									
March									
Journal Entries									
Total									

Subscriber's emoluments drawn on duty or

Balance from 19 -19.....	.....	Institute's cont. on Rs.....	.....
Deposits and refunds as above	.....	@ 8-1/3%	.....
Interest for 19 -19	.....	Balance from 19 -19.....	.....
Total	.....	Interest for 19 -19	.....
Deduct withdrawals as above	.....	Total	.....
Balance as on March 31, 19	.....	Deduct withdrawals as above	.....
	.....	Balance as on March 31, 19	.....
	.....	Balance from 19 -19.....	.....
	.....	Calculated by.....	.....
	.....	Checked by.....	.....

III

Ledger)

(See para 5)

Designation..... Joined on.....

YEARLY INSTITUTE'S CONT.					SUBSCRIPTIONS			Remarks
Emolu- ments	Subscrip- tion	Refund or with- drawals	Total	With- drawals	Monthly balance on which interest is calcu- lated	Please see below	Withdra- wals	

during leave or on deputation abroad

Deposits and refunds as above	.....	Institute's cont.	
Interest for 19 -19	.....	on Rs.....	
	.....	@ .8-1/3%	.....
Total	.....	Balance from 19 -19	.....
Deduct withdrawals as above	.....	Interest for 19 -19	.....
Balance as on March 31, 19	.....	Total	.....
		Deduct withdrawals	
		as above	.....
		Balance as on	
		March 31, 19	.....
		Calculated by.....	
		Checked by.....	

APPENDIX IV

(See para 11)

**Form of application for a temporary advance from the
Contributory Provident Fund**

1. Name of the subscriber and his account number.
2. Designation.
3. Pay.
4. Balance of subscription at credit of the subscriber on the date of application.
5. Amount of advance required.
6. Purpose for which the advance is required—Para 11(a) of the Contributory Provident Fund Rules.
7. Number (and amount) of monthly instalments in which the advance is proposed to be repaid.
8. Amount of advance or advances last taken, if any. State particulars of the advance, date on which taken, instalments of repayment and balance outstanding.
9. Whether any advance last taken is in course of repayment of 12 months have not elapsed since its complete repayment together with interest.
10. Full particulars of the pecuniary circumstances of the subscriber justifying the application for the temporary withdrawal.

Signature of the applicant

The particulars against items 3,4,8 and 9
have been verified to be correct.

Signature.....

Designation: Accounts Officer.

APPENDIX IV (Contd.)

(Remarks of the Recommending Authority)

No. _____

Dated, the _____

Forwarded to the _____

I am satisfied that the pecuniary circumstances of the official justify the grant of advance applied for which is admissible under para 11 of the provisions governing the Contributory Provident Fund and is recommended, as a special case, for the _____
sanction under para 12 *ibid*.

The advance is recoverable in _____
instalments of Rs. _____ per month with one/two additional instalments representing interest at the prescribed rate.

Signature _____

Designation _____

No. _____

Dated, the _____

Sanction of the _____ is conveyed to the grant of an advance of Rs. _____ to be recovered in _____ monthly instalments of Rs. _____ each with one/two additional instalments representing interest at the prescribed rate.

Signature _____

Designation _____

- Note* :
- (i) The application should in the first instance be submitted to the Registrar, who, after obtaining necessary certificate from the Accounts Officer, submit the application with his recommendations to the Director for sanction or submit it to the higher authority, after obtaining the Director's recommendations, as the case may be.
 - (ii) The application, when sanctioned, should be sent to the Accounts Section for necessary further action.

APPENDIX V

(See para 18)

Forms of Assignment

(1)

I, _____ of _____ hereby assign unto the Indian Institute of Technology, _____ within policy of assurance as security for payment of all sums which under the provisions governing the Contributory Provident Fund of the Indian Institute of Technology, _____. I may hereafter become liable to pay to the Contributory Provident Fund of the Indian Institute of Technology, _____.

I hereby certify that no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

Station _____

One witness to signature

Signature of subscriber

(2)

We, _____ (the subscribers) of _____ and _____ (the joint assured) of _____ in consideration of the Indian Institute of Technology, _____ agreeing to our request to accept payment towards the _____ within policy of assurance in substitution for the subscriptions payable by me the said _____ to the Contributory Provident Fund, Indian Institute of Technology, _____ to accept the withdrawal of the sum of Rs. _____ from the sum to the credit of the said _____ in the Contributory Provident Fund, Indian Institute of Technology, _____ for payment of the premium of the within policy of assurance, hereby jointly and severally assign unto the said Indian Institute of Technology, _____ the within policy of assurance as security for payment of all sums which under the rules of the said Fund the said _____ may hereafter become liable to pay to that Fund.

We hereby certify that no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

Station _____

One witness to signature

Signature of subscribers and the joint assured.

Note : The assignment may be executed on the policy itself either in the subscriber's handwriting or in type, or alternatively a typed or printed slip containing the assignment may be pasted on the blank space provided for the purpose on the policy. A typed or printed endorsement must be duly signed and if pasted on the policy it must be initialed across all the four margins.

(3)

I, _____ wife of _____ and the assignee of the within policy, having at the request of _____, the assured, agree to release my interest in the policy in favour of _____ in order that _____ may assign the policy to the Indian Institute of Technology, _____ which body has agreed to accept payments towards the within policy of assurance in substitution for the subscriptions payable by _____ to the Contributory Provident Fund hereby at the request and by the direction of _____ assign and I the said _____ assign and confirm unto the Indian Institute of Technology, _____ the within policy of assurance as security for payment of all sums which under the rules of the said Fund, the said _____ may hereafter become liable to pay to the Fund.

We hereby certify that no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

Station _____

One witness to signature.

Signature of the assignee and
the subscriber

(4)

Form of assignment to be used in cases where a subscriber to the General Provident Fund who has effected an insurance policy under the rules of that Fund is admitted to the Contributory Provident Fund, Indian Institute of Technology.

I, _____ of _____ hereby further assign unto the Indian Institute of Technology, _____ (the within policy of assurance as security for payment of all sums which under the provisions governing the Contributory Provident Fund of the Indian Institute of Technology; _____ I may hereafter become liable to pay to the Contributory Provident Fund of the Indian Institute of Technology _____.

I hereby certify that except an assignment to the President of India as security for payment of all sums which I have become liable to pay under the General Provident Fund Rules, no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

One witness to signature

Signature of subscriber

APPENDIX VI

(See para 23)

Forms of Reassignment and Assignment by the Indian Institute of Technology,

(1)

All sums which have become payable by the above named _____ under the provisions governing the Contributory Provident Fund, Indian Institute of Technology _____ having been paid and all liability for payment by him of any such sums in the future having ceased the Institute do hereby reassign the within policy of assurance to the said _____

Dated this _____ day of _____ 19 .

Executed by _____

_____ Registrar of the Institute for and on behalf of the Indian Institute of Technology, _____

Signature of the Registrar

(One witness who should add his designation and address)

(2)

The above-named _____ having died on the _____ day of _____ 19 , the Indian Institute of Technology, _____ do hereby assign the within policy of assurance to* _____

Dated this _____ day of _____ 19 .

Executed by _____

_____ Registrar of the Institute for and on behalf of the Indian Institute of Technology, _____

(One witness who should add his designation and address)

Signature of the Registrar

*. Fill in particulars of persons legally entitled to receive the policy.

(3)

The Indian Institute of Technology, _____ do hereby reassign the
within policy to the said _____.

Dated this _____ day of _____, 19

Executed by _____

_____. Registrar of the Institute for and on behalf of the Indian Institute
of Technology, _____

Signature of the Registrar

(One witness who should add his
designation and address)

APPENDIX VII

(See para 34)

Subscriber's Statement of Account for the year ending 31.3.19

Name of subscriber _____

Number of Account _____

Particulars	Opening balance	Deposits	Interest	Total	Withdrawals	Closing Balance
Subscriptions and refund of withdrawals Institute contributions						
TOTAL						

- Note :**
- (i) The subscriber should satisfy himself as to the correctness of the statement and to bring errors, if any, to the notice of the Accounts Officer within 3 months from the date of receipt of the statement. If no intimation is received from the subscriber within this period it will be assumed that he has accepted the statement.
 - (ii) The subscriber should state whether he desires to make any alteration in any nomination made under the rules of the Fund.
 - (iii) In cases where the subscriber has made no nomination in favour of a member of his family owing to his having no family at the time but acquired a family thereafter the fact should be reported to the Registrar forthwith.

Dated.....

Accounts Officer
Indian Institute of Technology

(Portion to be returned to the Accounts Officer)

I hereby acknowledge receipt of the Annual Statement of my Contributory Provident Fund Account for the year 19..... and/but do not accept the balance shown therein as correct for the reason given overleaf.

Reasons, if any, for the non-acceptance of the balance with particulars necessary support.

SCHEDULE D

INDIAN INSTITUTE OF TECHNOLOGY DELHI

[See Statute 17(i)]

LEAVE PROVISIONS

1. Applicability

The provisions contained in this Schedule shall apply to all employees of the Institute.

2. Definitions

In this Schedule unless the context otherwise requires :

- (a) "Commuted Leave" means leaves as provided under paragraph 17.
- (b) "Completed years of service" means continuous service of the specified duration under the Institute and includes periods spent on duty as well as on deputation and extraordinary leave.
- (c) "Earned Leave" means leave earned in respect of periods spent on duty.
- (d) "Half Pay Leave" means leave earned in respect of completed years of service calculated according to the provisions hereinafter contained.
- * (e) "Leave" includes earned leave, half-pay leave, commuted leave, leave not due and extraordinary leave.
- † (f) "Sabbatical Leave" means leave granted to any member of the academic staff referred to in clause (a) of Statute 11 for any of the objects mentioned in paragraph 21-C.

3. Right of Leave

Leave cannot be claimed as of right and when the exigencies so demand leave of any description may be refused or revoked by the authority empowered to sanction the leave.

4. Authority empowered to sanction Leave

- (1) Applications for leave shall be addressed to the Board by the Director and to the Director by the other members of the staff.
- (2) Leave may be sanctioned by the Director or by a member of the staff to whom the power has been delegated by the Director.

* Substituted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

† inserted vide Ministry of Education letter No. F. 24-42/63-T. 6 (Vol. II), dated 26th February, 1976. Effective from February 25, 1976.

- (3) The Board may sanction leave to the Director, but the Director can avail himself of casual leave on his own authority.

5. Commencement and Termination of Leave

- (1) Leave ordinarily begins from the date on which leave as such is actually availed of and ends on the day preceding the one on which duty is resumed.
- (2) Sundays and other holidays or the vacation may be prefixed as well as suffixed to leave, subject to any limit of absence on leave prescribed under each category of leave.

6. Combination of Leave

Except as otherwise provided in this Schedule, any kind of leave under these provisions may be granted in combination with or in continuation of any other kind of leave, subject to any limit on the aggregate period of absence as may be prescribed in such cases.

7. Grant of Leave beyond the Date of Retirement and in the event of Resignation

- (1) No leave shall be granted beyond the date on which a member of the staff must compulsorily retire.

Provided that the authority empowered to grant leave may allow any member of the staff who had been denied earned leave in whole or in part on account of exigencies of service, the whole or any portion of the earned leave so denied even though it extends to a date beyond the date on which such member of the staff must compulsorily retire.

Provided further that a member of the staff whose service has been extended in the interest of public service beyond the date of his compulsory retirement, may be granted earned leave as under :

- (i) during the period of extension any earned leave due in respect of the period of such extension, and to the extent necessary the earned leave which would have been granted to him under the preceding proviso had he retired on the date of compulsory retirement;
- (ii) after the expiry of the period of extension —
 - (a) the earned leave which could have been granted to him under the preceding proviso, had he retired on the date of compulsory retirement, diminished by the amount of such leave as availed of during the period of extension; and
 - (b) any leave earned during the period of extension as has been formally applied for as preparatory to final cessation of his duties in sufficient time during the period of extension and refused to him on account of exigencies of public service;

- (iii) In determining the amount of earned leave due during the period of extension, the earned leave, if any, admissible under the preceding proviso shall be taken into account.

Note : For the purpose of this paragraph, a member of the staff may be deemed to have been denied leave only if a sufficient time before the date on which he must compulsorily retire or the date on which his duties finally cease he has either formally applied for leave and been refused it on the ground of exigencies of service or has ascertained in writing from the sanctioning authority that leave if applied for would not be granted on the aforesaid ground.

- (2) If any employee of the Institute resigns, he shall not be granted either prior or subsequent to his resignation, any leave due to his credit provided that the Director, may, in any case, grant leave to an employee prior to his resignation if, in the opinion of the Director, the circumstances of the case justify such grant of leave.

8. Conversion of one kind of leave into another kind

- *1. At the request of a member of the staff the sanctioning authority may convert any kind of leave including extraordinary leave, retrospectively into leave of a different kind which may be admissible as on the day on which the member of staff proceeded on leave; but the member of the staff cannot claim such conversion as a matter of right.
2. If one kind of leave is converted into another, the amount of leave salary and allowances admissible shall be recalculated and the arrears of leave salary and allowances paid or amount overdrawn recovered, as the case may be.

9. Rejoining of Duty on return from Leave on Medical Grounds

A member of the staff who has been granted leave on medical certificate shall be required to produce a medical certificate of fitness before resuming duty.

10. Rejoining of Duty before the Expiry of Leave

Except with the permission of the authority which granted the leave, no member of the staff on leave may return to duty before the expiry of the period of leave granted to him.

11. General

- (1) Leave should always be applied for and sanctioned before it is taken, except in cases of emergency and for satisfactory reasons.
- (2) Continuous temporary service followed by permanent service without any break shall be included in permanent service for the purpose of computation of leave.

* Amended vide Ministry of Education letter No. F. 25-1/64-T. 5, dated 16th July, 1969. Effective from May 9, 1969.

12. Kinds of Leave

The following kinds of leave shall be admissible to members of the staff :

- (a) Casual Leave
- (b) Special Casual Leave
- (c) Special Leave
- (d) Half-Pay Leave
- (e) Commuted Leave
- (f) Earned Leave
- (g) Extraordinary Leave
- (h) Maternity Leave
- (i) Hospital Leave
- * (j) Quarantine Leave
- * (k) Leave not due
- † (l) Sabbatical Leave

13. Casual Leave

- ‡ (1) Casual leave is not earned by duty. A member of the staff on casual leave is not treated as absent from duty and his pay is not intermitted. Casual leave cannot be claimed as of right and its grant is always subject to the exigencies of service and subject to a maximum of 12 days in the aggregate in a calendar year.
- ** (2) Casual leave may be granted at the discretion of the sanctioning authority as and when occasion arises, provided that the total period of absence including Sundays and other holidays intervening, prefixed or suffixed shall not ordinarily exceed eight days at a time. Sundays and holidays, whether intervening, prefixed or suffixed, shall not be counted as casual leave.
- (3) Casual leave cannot be combined with any other kind of leave.
- †† (4) Omitted

* Added vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

† Inserted vide Ministry of Education letter No. F. 24-42/63. T.8 (Vol. II), dated 26th February, 1976. Effective from February 25, 1976.

‡ Amended vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

** Substituted vide Ministry of Education letter No. F. 25-1/64-T.6, dated 16th July, 1969. Effective from May 9, 1969.

†† Omitted vide Ministry of Education letter No. 24-39/65-T. 6, dated 14th January, 1969.

14. Special Casual Leave

- * (1) Special casual leave, not counting towards ordinary casual leave, may be granted to a member of the staff when he is—
- (i) summoned to serve as a Juror or Assessor or to give evidence before a court of law as a witness in a civil or a criminal case in which his private interests are not at issue;
 - (ii) deputed to attend a reference library of other institutes or conferences and scientific gatherings of learned and professional societies in the interest of the Institute;
 - (iii) required to be absent for any other purposes approved by the Board of Governors.
- (2) The periods of such leave admissible in a year shall ordinarily not exceed fifteen days but should, however, be sufficient to cover the period of absence necessary. The conditions under which such leave will be granted will, if necessary, be laid down by the Board.

15. Special Leave

Members of the staff deputed for practical training in or out of India shall be entitled to special leave as may be determined by the Board in each case.

† Provided that Sabbatical Leave shall be admissible to a member of the academic staff—

- (i) After the completion of six years' continuous service, or more, with the Institute.
- (ii) Where he avails of special leave, after the completion of six years' service or more with the Institute after his return from such special leave; but in any case such leave shall not exceed three times (inclusive of special leave in case such leave has been granted) during the entire service of such member.

16. Half Pay Leave

- (1) The half pay leave admissible to a member of the staff in respect of each completed year of service shall be 20 days.
- (2) Half pay leave may be granted to a member of the staff on medical certificate or on private affairs. No half pay leave may be granted to a member of the staff in temporary appointment except on medical certificate.

* Substituted vide Ministry of Education letter No. 24-39/65-T. 6, dated 14th January, 1969.

† Inserted vide Ministry of Education letter No. F-24-42/63-T. 6 (Vol. II), dated 26th February 1975. Effective from February 28, 1976.

[†](3) Omitted

Provided that in case of a temporary member of staff, no half pay leave will be granted unless the authority competent to sanction leave is ready to believe that the officer will return to duty on the expiry of the leave, except in the case of an officer who has been declared completely and permanently incapacitated for further service by medical authorities.

17. Commuted Leave

[†](1) Commuted leave not exceeding half the amount of half pay leave may be granted on medical certificate to a member of the staff subject to the following conditions :

[‡](a) Omitted

(a) When commuted leave is granted, twice the amount of such leave shall be debited against half pay leave due.

^{**}(b) The Total duration of earned leave and commuted leave taken in conjunction shall not exceed 240 days provided that no commuted leave may be granted under this provision unless the authority competent to sanction leave has reason to believe that the officer will return to duty on its expiry.

^{‡‡}(2) Half pay leave up to a maximum of 180 days may be allowed to be commuted during the entire service where such leave is utilised for an approved course of study such as a course which is certified to be in public interest by the leave sanctioning authority.

18. Earned Leave

Earned Leave admissible to Members of the Vacation Staff

(1) During the period of academic year, the period of vacation for an employee entitled to it will be 60 days.

(2) In case such a member of staff is required to return on duty during the whole or any part of the vacation, he shall be eligible to the following amount of earned leave on full pay :

* Omitted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

[†] Amended vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

[‡] Omitted vide Ministry of Education letter No. F.11-5/78-T. 6, dated 23rd February, 1979 and No. F. 11-5/78-T. 6, dated 22nd March, 1979. Effective from February 16, 1979.

^{**} Re-lettered as clause (a) and clause (b) vide Ministry of Education letter No. F. 11-5/78-T. 6, dated 23rd February, 1979 and No. 11-5/78-T. 6, dated 22nd March, 1979. Effective from February 16, 1979.

^{‡‡} Inserted vide Ministry of Education letter No. F. 11-5/76- T. 6, dated 16th July, 1978. Effective from July 11, 1978.

<u>Duration of duty during vacation</u>	<u>Eligibility to earned leave on full pay</u>
Entire vacation	30 days
Part of vacation	$30 \times \frac{\text{No. of days of vacation not availed of}}{\text{No. of days of the entire vacation}}$

Earned Leave admissible to Members of the Non-vacation Staff

- * (3) The earned leave admissible to a member of the staff other than vacation staff, shall be 30 days in a calendar year.
- † (4) The leave account of every employee shall be credited with earned leave in advance in two instalments of 15 days each on the first January and first July every year.
- ‡ (5) The leave at the credit of an employee at the close of the previous half year shall be carried forward to the next half year, subject to the condition that the leave so carried forward plus the credit for the half year do not exceed the maximum limit of 180 days.

Limits of Accumulation and Grant (applicable to all members of the staff)

- (6) A member of the staff shall cease to earn such leave when the earned leave amounts to 180 days.
- (7) The maximum amount of earned leave that can be granted to a member of the staff at a time shall be 120 days. Earned leave may be granted for a period exceeding 120 days if the entire leave so granted or any portion thereof is spent outside India, Burma, Ceylon, Nepal and Pakistan, provided that when earned leave exceeding 120 days is so granted the period of such leave spent within India, Burma, Ceylon, Nepal and Pakistan, shall not in the aggregate exceed 120 days.

19. Extraordinary Leave

- ‡ (1) Extraordinary leave shall always be without leave salary and may be granted when no other kind of leave is admissible or when other leave being admissible, the member of the staff concerned specifically applied in writing for the grant of extraordinary leave.

* Amended vide Ministry of Education letter No. F. 11-4/68-T. 6, dated 15th July, 1970. Effective from March 9, 1970.

† Substituted vide Ministry of Education letter No. F. 11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

‡ Amended vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

- * (2)** The period of extraordinary leave shall not count for increment except when such leave is granted due to sickness on medical certificate or for pursuing higher studies, provided that in case of any doubt whether the extraordinary leave taken was for pursuing higher studies or not, the decision of the Chairman shall be final.
- (3)(a)** Except in the case of a permanent employee, the duration of extraordinary leave on any one occasion shall not exceed the following limits :
- (i)** three months;
 - (ii)** six months, in case of employee who has completed three years continuous service on the date of expiry of the leave admissible to him under the rules and his request for such leave is supported by a Medical Certificate;
 - (iii)** eighteen months where the employee is suffering from tuberculosis or leprosy and undergoing treatment in a recognised clinic or under a specialist.
- (b)** Where an employee other than a permanent employee fails to resume duty on expiry of the maximum amount of extraordinary leave granted to him or where such an employee who was granted a lesser amount of extraordinary leave than the maximum amount admissible to him, remains absent from duty for any period which, together with the period of extraordinary leave granted to him exceeds the limit up to which he could have been granted extraordinary leave under sub-rule (a), he shall, unless the Board in view of the exceptional circumstances of the case otherwise determine, be deemed to have resigned his appointment and shall cease to be in Institute employment.
- (4)** The authority empowered to grant leave may commute retrospectively the period of absence without leave into extraordinary leave.

Note : The power of commuting retrospectively periods of absence without leave into extraordinary leave is absolute and not subject to the conditions mentioned in (1) above.

20. Maternity Leave

- †(1) (a)** Maternity leave may be granted to a woman member of the staff on full pay for a period up to 90 days from the date of its commencement.
- (b)** Maternity leave may also be granted on full pay in cases of miscarriage

* Substituted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

† Substituted vide Ministry of Education letter No. F. 11-1/80-T.6, dated 3rd November, 1980. Effective from November 1, 1980.

including abortion, subject to the condition that the leave applied for does not exceed six weeks and the application for leave is supported by medical certificate.

- (2) Maternity leave shall not be debited to the leave account.
- (3) Maternity leave may be combined with leave of any other kind except casual leave but any leave applied for in continuation of maternity leave may be granted only if the application is supported by a medical certificate.

21. Hospital Leave

- * (1) Hospital leave may be granted to a member of the staff under medical treatment for illness or injury if such illness or injury is directly due to risks incurred in the course of his official duty. This concession will be available to such members of the staff, the nature of whose duties exposes them to such illness or injury and whose appointing authority is the Director.
- * (2) Hospital leave may be granted on leave salary, either average or half average as the authority granting it may consider necessary.
- † (3) Member of staff eligible for Hospital leave will be entitled to such leave without any restriction on the quantum of leave and the leave can be granted for such period as is considered necessary by the authority competent to grant it.
- (4) Hospital leave is not debited against the leave account and may be combined with any other leave which may be admissible, provided that the total period of leave after such combination shall not exceed 28 months.

‡21-A Quarantine Leave

- (1) Quarantine leave is granted when a member of staff is precluded under orders of the competent medical authority from attending office in consequence of an infectious disease in his family or household. Such leave can be granted only on the certificate of a medical or public health officer. Maximum duration of Quarantine leave is ordinarily twenty one days and may be extended up to thirty days in exceptional circumstances. Any absence beyond these limits has to be treated as regular leave. A member of staff on Quarantine leave is not treated as absent from duty and his pay is not interrupted.

* Amended vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

† Substituted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

‡ Inserted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

- (2) Quarantine leave is not admissible if the member of staff himself is suffering from an infectious disease.
- (3) Cholera, Small-pox, Plague, Diphtheria, Typhus fever and Cerebrospinal Meningitis can be treated as infectious diseases for the grant of Quarantine leave. In the case of Chicken-pox, however, no Quarantine leave can be granted unless the Health Officer considers that in view of some doubt about the nature of the disease there is reason for grant of such leave.

*21-B Leave Not Due

- (1) Save as in the case of leave preparatory to retirement, leave not due may be granted to a permanent member of staff both on medical certificate and on private affairs for a period not exceeding 360 days during his entire service out of which not more than 180 days in all can be on private affairs.
- (2) Leave not due shall be granted to a member of staff only if the sanctioning authority is satisfied that there is reasonable chance of the member of staff returning to duty on expiry of leave and shall be limited to half pay leave which he is likely to earn thereafter.
- (3) Leave not due is admissible when no other kind of leave is due and admissible.
- (4) A member of staff while on leave not due is entitled to the same leave salary as during half pay leave.

†21-C Sabbatical Leave

- (1) Sabbatical leave may be granted for one or more of the following objects, namely :
 - (a) to conduct research or advanced studies in India or abroad;
 - (b) to write textbooks, standards, works and other literature;
 - (c) to visit or work in Industrial concerns and technical departments of Government to gain practical experience in their respective fields;
 - (d) to visit or work in a University, Industry or Government research laboratories in India and abroad; and
 - (e) any other purpose for the academic development of the staff member, as approved by the Board of Governors.

* Inserted vide Ministry of Education letter No. F. 25-1/64-T. 6, dated 16th July, 1969. Effective from May 9, 1969.

† Inserted vide Ministry of Education letter No. F.24-42/63-T. 6 (Vol. II), dated February, 1976. Effective from February 25, 1976.

- (2) The grant of sabbatical leave shall be subject to the following conditions, namely :
- (a) the period of sabbatical leave shall not exceed one year at a time including vacations, if any, but the Board may grant in addition any other leave up to a maximum of 120 days which the member might have earned during the service at the Institute.
 - (b) a member of the academic staff shall, during the period of sabbatical leave, be paid full salary and allowances as admissible under the normal rules but he shall not be entitled to any travelling allowance or any extra allowances in India or abroad;
 - (c) no substitute shall be appointed in the vacancy and his work shall be shared by the other members of the faculty;
 - (d) a member of the academic staff shall not undertake during the period of sabbatical leave, any regular appointment under any other organisation in India or abroad; he shall, however, be free to receive a scholarship or fellowship or bursary or any other *ad hoc* honorarium other than his regular employment;
 - (e) a member of the academic staff availing sabbatical leave shall furnish a bond in the prescribed form to serve the Institute for a minimum period of three years on return to duty.

22. Vacation and Leave Salary

- (1) An employee of the Institute entitled to vacation shall be eligible for pay and allowances at full rates during the period of vacation.
- ^{*}(2) (a) Except as provided in sub-para 22(2)(b) below, a member of staff on earned leave, is entitled to the leave salary equal to average monthly pay drawn during the 10 complete months immediately preceding the month in which the leave commences or the substantive pay to which he is entitled immediately before the commencement of the leave, whichever is greater.
- ^{**}(b) A member of the staff who proceeds on earned leave shall be entitled to leave salary equal to the pay drawn immediately before proceeding on leave.
- ^{*}(3) A member of staff on half pay leave is entitled to leave salary equal to the half amount specified in sub-para (2)(a) or (2)(b) as the case may be subject

^{*} Substituted vide Ministry of Education letter No. F. 11/8/68-T. 6, dated 18th January, 1969 and 4th February, 1969.

^{**} Substituted vide Ministry of Education letter No. F. 11-5/78-T. 6, dated 23rd February, 1979. Effective from February 16, 1979.

to a maximum of Rs. 750/- provided that the limit will not apply if the leave is on medical certificate.

- (4) A member of the staff on commuted leave is entitled to leave salary equal to twice the amount admissible under sub-rule (3).

23. Increment during Leave

If the increment falls due during the leave other than casual leave, the effect of increase in pay shall be given from the day following the date of expiry (last day) of the leave as such, without prejudice to the normal date of increment.

24. Limit of Total Absence

A member of staff ceases to be in the service of the Institute if he is continuously absent from duty for five years, whether with or without leave, unless such absence is absence on foreign service in India.

***25. Cash equivalent of Leave Salary in Certain Cases**

In case an employee dies while he is in service, the cash equivalent of the leave salary that the deceased employee would have got had he gone on earned leave on the date of death shall be given to his family subject to a maximum of leave salary for 180 days.

†26. Cash Payment In lieu of Unutilised Earned Leave on the Date of Retirement.

An employee may be paid cash equivalent of leave salary admissible in respect of the period of earned leave at his credit at the time of retirement on superannuation in one lump sum as a one time settlement subject to a maximum of 180 days, and further subject to other conditions laid down by the Government from time to time.

* Inserted vide Ministry of Education letter No. F. 11-6/78-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

† Inserted vide Ministry of Education letter No. F. 11-5/78-T. 6, dated 23rd February, 1979. Effective from February 16, 1979.

INDIAN INSTITUTE OF TECHNOLOGY DELHI

(See Statute 10A)

**Contributory Provident Fund-cum-Gratuity Scheme of the
Indian Institute of Technology Delhi**

1. Application, etc.

- (1) The provisions contained in this Schedule shall apply to the employees specified in clause (1) of Statute 16A.
- (2) If an employee admitted to the benefit of the Fund was previously a subscriber to any Contributory/non-Contributory Provident Fund of the Central Government/State Government or of a body corporate owned or controlled by Government or an autonomous organisation registered under the Societies Registration Act, 1860, the amount of his accumulations in the Contributory or non-Contributory Provident Fund shall be transferred to his credit in the Fund.
- (3) Every employee of the Institute entitled to the benefits of the Fund shall be required to sign a written declaration in the Form set forth in Appendix I that he has read this Schedule and agreed to abide by the provisions contained in it.

2. Definitions

In this Schedule, unless the context otherwise requires :

- (i) "Accounts Officer" means the Accounts Officer of the Institute;
- (ii) "Audit Officer" means the (Internal) Audit Officer of the Institute;
- (iii) "Emoluments" means pay including dearness pay, if any, leave salary, or subsistence grant and includes any remuneration of the nature of pay (including dearness pay, if any) received in respect of foreign service;
- (iv) "Family" means—
 - (a) In the case of male subscriber, the wife or wives and children of a subscriber, and the widow or widows and children of a deceased son of the subscriber.

Provided that, if a subscriber proves that his wife has been judicially separated from him or has ceased under the customary law of the community to which she belongs to be entitled to maintenance she shall henceforth be deemed to be no longer a member of the subscriber's family in matter to which this schedule relates unless the

subscriber subsequently indicates by express notification in writing to the Registrar that she shall continue to be so regarded;

- (b) In the case of female subscriber, the husband and children of the subscriber, and the widow or widows and children of a deceased son of the subscriber.

Provided that if a subscriber by notification in writing to the Registrar expresses her desire to exclude her husband from her family the husband shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which this schedule relates, unless the subscriber subsequently cancels formally in writing her notification excluding him.

Notes : I. "Children" means legitimate children.

- II. An adopted child shall be considered to be a child when the Registrar, or if any doubt arises in the mind of the Registrar, the Law Officer of the Institute, is satisfied that under the personal law of the subscriber, adoption is legally recognised as conferring the status of a natural child, but in this case only.

(v) "Foreign Service" means service in which an employee of the Institute receives his substantive pay with the sanction of the Board from any source other than the fund of the Institute;

(vi) "Fund" means the New Contributory Provident Fund of the Institute;

(vii) "Leave" means any variety of leave provided for in Schedule "D" as may be applicable to the subscriber;

(viii) "Pay" means the amount drawn monthly by an employee of the Institute as—

(i) the pay, other than special pay or pay granted in view of his personal qualification, which has been sanctioned for a post held by him substantively or in an officiating capacity,

(ii) special pay and personal pay, and

(iii) any other remuneration which may be specially classed as pay by the Board;

(ix) "Subscription" means the amount paid by the subscriber and "Contribution" means the amount contributed by the Institute;

(x) "Year" means a financial year.

3. Constitution and Management of the Fund

- (1) The Fund, which shall be maintained in rupees, shall be constituted with subscriptions paid by the subscribers and contributions made by the

Institute and shall include interest paid to the credit of the account of the subscribers under sub-paragraph (1) of paragraph 10.

- (2) The management of the Fund is vested in the Board. Subject to the control and direction of the Board, the Director shall administer the Fund for and on behalf of the Board.
- (3) The Fund shall be deposited, in the name of the Fund, with the State Bank of India. The deposit be made as soon as possible after the monthly accounts are closed.
- * (4) The Institute may invest such part of the funds, as may be considered expedient, in the Government securities/certificates, negotiable Government guaranteed bonds, and in such deposit schemes of the Central Government as may be notified in this regard from time to time, the interest or profit realised on such investments being credited to the Institute as miscellaneous receipts. All investments and securities shall be held in the name of the Institute.

4. Nomination

- (1) A subscriber shall, at the time of joining the Fund, send to the Registrar a nomination, conferring on one or more persons the right to receive the amount that may stand to his credit in the Fund, in the event of his death before that amount has become payable, or having become payable, has not been paid.

Provided that if, at the time of making the nomination the subscriber has a family, the nomination shall not be in favour of any person or persons other than the member of his family.

Provided further that the nomination made by the subscriber in respect of any other Provident Fund to which he was subscribing before joining the Fund, shall, if the amount to his credit in such other fund has been transferred to his credit in this fund, be deemed to be a nomination duly made under this rule until he makes a nomination in accordance with this sub-paragraph.

Note : In this paragraph, unless the context otherwise requires, "person" or "persons" shall include a Company or Association or body of individuals whether incorporated or not.

- (2) If a subscriber nominates more than one person under sub-paragraph (1), he shall specify in the nomination the amount or share payable to each of the nominee in such manner as to cover the whole of the amount that may stand to his credit in the Fund at any time.

* Substituted vide Ministry of Education letter No. J. 11011/7/77-T. 6, dated 20th July, 1979. Effective from June 25, 1979.

(3) Every nomination shall be in such one of the Forms set forth in Appendix II as is appropriate in the circumstances.

(4) A subscriber may, at any time, cancel his nomination by sending a notice in writing to the Registrar.

Provided that the subscriber shall along with such notice send a fresh nomination made in accordance with the provisions of this paragraph.

(5) A subscriber may provide in a nomination—

(a) in respect of any specified nominee that in the event of his nominee predeceasing the subscriber, the right conferred upon that nominee shall pass to such other person as may be specified in the nomination.

Provided such other person or persons shall, if the subscriber has other members of his family, be such other member or members. Where the subscriber confers such a right on more than one person under this clause, he shall specify the amount or share payable to each of such persons in such a manner as to cover the whole of the amount payable to the nominee.

(b) that the nomination shall become invalid in the event of the happening of a contingency specified therein.

Provided that if at the time of making nomination the subscriber has no family, he shall provide in the nomination that it shall become invalid in the event of his subsequently acquiring a family.

Provided further that if at the time of making the nomination the subscriber has only one member of the family, he shall provide in the nomination that the right conferred upon the alternate nominee under clause (a) shall become invalid in the event of his subsequently acquiring other member or members in his family.

(6) Immediately on the death of a nominee in respect of whom no special provision has been made in the nomination under clause (a) of sub-para (5) or on the occurrence of any event by reasons of which the nomination becomes invalid in pursuance of clause (b) of sub-para (5) or the proviso thereto, the subscriber shall send to the Registrar a notice in writing cancelling the nomination together with a fresh nomination made in accordance with the provisions of this paragraph.

(7) Every nomination made and every notice of cancellation given by a subscriber shall, to the extent that it is valid, take effect, on the date on which it is received by the Institute.

(8) An up-to-date Register shall be maintained by the Institute to record all nominations.

5. Subscribers' Accounts

All accounts shall be opened in the name of each subscriber in the Form set forth in Appendix III, in which shall be shown—

- (i) the subscriber's subscription;
- (ii) contributions made under paragraph 9 by the Institute to his account;
- (iii) interest, as provided by paragraph 10, on subscription;
- (iv) interest, as provided by paragraph 10, on contributions;
- (v) advance and withdrawals from his account.

6. Condition and Rates of Subscription

- (1) Every subscriber shall subscribe monthly to the Fund when on duty or on foreign service but not during a period of suspension.

Provided that a subscriber on reinstatement after a period passed under suspension shall be allowed the option of paying in one sum, or in instalments, any sum not exceeding the maximum amount of arrears of subscription permissible for that period.

- (2) A subscriber may, at his option, not subscribe during leave other than leave on average pay or earned leave of less than 30 days' duration by sending a notice in writing to the Registrar before or soon after proceeding on leave.

Failure to make due and timely intimation shall be deemed to constitute an election to subscribe.

The option of the subscriber intimated under this sub-paragraph shall be final.

- (3) A subscriber who has, under paragraph 29, withdrawn the amount of subscriptions and interest thereon, shall not subscribe to the Fund after such withdrawal, unless he returns to duty.

7. (1) The amount of subscription shall be fixed, subject to the following conditions :

- (a) It shall be expressed in whole rupees (50 paise and above counting as the next higher rupee).

- (b) It may be any sum, not less than $8\frac{1}{3}$ per cent of the emoluments.

- (2) For the purposes of clause (b) of sub-para (1) the emoluments of subscriber shall be—

the emoluments to which he was entitled on the 31st March of the preceding year.

- (3) The amount of subscription so fixed may be enhanced or reduced only once during the course of a year.

Provided that if a subscriber is on duty for a part of a month and on leave for

the remainder of the month and if he has elected not to subscribe during the leave the amount of subscription payable shall be proportionate to the number of days spent on duty in the month.

- (4) When a subscriber is temporarily transferred to foreign service (elsewhere) or sent out of India, he shall remain, subject to the provisions contained in this schedule in the same manner as if he were not so transferred or sent out.

8. Realisation of Subscriptions

- (1) When emoluments are drawn from the funds of the Institute, recovery of subscriptions on account of these emoluments and of the principal and interest of advance shall be made from the emoluments themselves.
- (2) When emoluments are drawn from any other source, the subscriber shall forward his dues monthly to the Institute.

9. Contribution by the Institute

- (1) The Institute shall, with effect from the 31st March of each year, make a contribution to the account of each subscriber.
Provided that if a subscriber quits the service or dies during a year, contribution shall be credited to his account for the period between the close of the preceding year and the date of the casualty.
Provided further that no contribution shall be payable in respect of any period for which the subscriber is permitted under this Schedule not to, or does not, subscribe to the Fund.
- (2) The contribution shall be a sum representing 8 per cent of the emoluments of the subscriber drawn on duty during the year or for a period in the year as the case may be.
- (3) Should a subscriber elect to subscribe during leave, his leave salary shall, for the purpose of this rule, be deemed to be emoluments drawn on duty.
- (4) The amount of any contribution payable in respect of a period of foreign service, shall, unless it is recovered from the employer, be recovered by the Institute from the subscriber.
- (5) The amount of contribution payable shall be rounded to the nearest whole rupee (50 paise and above counting as the next higher rupee).

10. Interest

- (1) The Institute shall pay to the credit of the account of a subscriber interest at such rate as the Central Government may, from time to time, prescribe in the case of their employees.
- (2) Interest shall be credited with effect from the 31st March of each year in the following manner :
 - (i) on the amount at the credit of a subscriber on the 31st March of the

preceding year, less any sum withdrawn during the current year — interest for twelve months;

- (ii) on sums withdrawn during the current year—interest from the 1st April of the current year up to the last day of the month preceding the month of withdrawal;
- (iii) on all sums credited to the subscriber's account after the 31st March of the preceding year—interest from the date of deposit up to the 31st March of the current year;
- (iv) the total amount of interest shall be rounded to the nearest rupee in the manner provided in sub-paragraph (5) of paragraph 9.

Provided that when the amount standing at the credit of a subscriber has become payable, interest shall thereupon be credited under this sub-paragraph in respect only of the period from the beginning of the current year or from the date of credit as the case may be up to the date on which the amount standing at the credit of the subscriber becomes payable.

- (3) For the purpose of this paragraph, the date of credit shall be deemed to be first day of the month in which it is credited.

Provided that where there has been a delay in the drawal of pay or leave salary and allowance of a subscriber and consequently in the recovery of his subscription towards the Fund, the interest on such subscriptions shall be payable from the month in which the pay or leave salary of the subscriber was due, irrespective of the month in which it was actually drawn.

- (4) In the cases interest will be paid in respect of balance at the credit of a subscriber up to the close of the month preceding that in which payment is made or up to the end of sixth month after the month in which such amount became payable whichever of these periods be less.
- (5) Subject to the provision of sub-paragraph (4), no interest shall be paid in respect of any period after the date which the Registrar has intimated to that person or his agent as the date on which he is prepared to make payments.

11. Advance from the Fund

A temporary advance may be granted to a subscriber from the amount standing to his credit in the Fund at the discretion of the authority specified in paragraph 12 subject to the following conditions :

- (a) No advance shall be granted unless the sanctioning authority is satisfied that the applicant's pecuniary circumstances justify it, and that it will be extended on the following object or objects and not otherwise :
 - (i) to pay expenses in connection with the prolonged illness or confinement of the applicant or any person actually dependent on him;

- (ii) to pay for the overseas passage for reasons of health or education of the applicant or any person actually dependent on him;
- (iii) to pay obligatory expenses on a scale appropriate to the applicant's status in connection with marriages, funerals or ceremonies which by religion it is incumbent on him to perform;
- (iv) to pay for expenses outside India in connection with the education, beyond high school stage, of the applicant or any person actually dependent on him;
- (v) to pay for expenses of the applicant or any person actually dependent on him in connection with any medical, engineering or other technical or specialised course or other general higher education in India beyond the high-school stage;
Provided that the duration of the course of study is not less than three years;
- (vi) to meet cost of his defence where the subscriber is prosecuted by the Government or Institute in any court of law or where the subscriber engages any legal practitioner to defend him in any enquiry in respect of any alleged official misconduct on his part;
- (vii) to meet the cost of legal proceedings instituted by the subscriber for vindicating his position in regard to any allegations made against him in respect of any act done or purporting to have been done by him in the discharge of his official duty;
- *(viii) to meet the cost of a plot or construction of a house or a ready built flat for his residence or to make any payment towards the allotment of a plot or a ready built flat by a State Housing Board or House, Building Co-operative Society.

Note : An advance under sub-clause (vi) shall be available to the applicant in addition to any advance.

- (a) An advance shall be admissible for the same purpose from any other Government source but the advance under the said sub-clause shall not be admissible to a subscriber either in respect of any legal proceedings instituted by him in any court of law against the Government/Institute as regards any penalty imposed on him or any condition of service or in respect of any legal proceedings in regard to any matter unconnected with his official duties.
- (b) An advance shall not, except for special reasons, exceed three months' pay, and shall in no case exceed the amount of subscription and interest thereon standing to the credit of the subscriber in the Fund.

* Added vide Ministry of Education letter No. F.11-3/80-T. 6, dated 24th March, 1982. Effective from March 15, 1982.

- (c) An advance shall not, except for special reasons, be granted until at least twelve months after the final repayment of all previous advances together with interest thereon.
 - (d) The sanctioning authority shall record in writing the special reasons where advance is sanctioned for such reasons.
 - (e) An application for temporary advance from the Fund shall be submitted in the Form set forth in Appendix IV.
12. (1) A temporary advance from the Fund to the subscriber other than the Director shall be sanctioned by the Director, who may, at his discretion, delegate this work to the Deputy Director and the Registrar.
- (2) A temporary advance from the Fund to the Director shall require the sanction of the Chairman.
13. (1) An advance shall be recovered from the subscriber in such number of equal monthly instalments as the sanctioning authority may direct; but such number shall not be less than twelve unless the subscriber so elects, or in any case not more than twenty-four.
- A subscriber may, at his option, make repayment in a smaller number of instalments than that prescribed. Each instalment shall be a number of whole rupees, the amount of the advance being raised or reduced, if necessary, to admit of the fixation of such instalments.
- (2) (a) Recovery shall be made in the manner provided in paragraph 8 for the realisation of subscription and shall commence with the issue of pay for the month following the one in which the advance was drawn.
 - (b) Recovery shall not be made, except with the subscriber's consent while he is on leave or in receipt of subsistence grant and may be postponed by the sanctioning authority during the recovery of the advance of pay granted to the subscriber.
- (3) If more than one advance has been made to a subscriber, each advance shall be treated separately for the purpose of recovery.
- (4) After the principal of the advance has been fully repaid, interest shall be paid thereon at the rate of one-fifth per cent of the principal for each month or broken portion of a month during the period between the drawal and complete repayment of the principal.
- (5) (a) Interest shall ordinarily be recovered in one instalment in the month after complete repayment of the principal; but if the period referred to in sub-paragraph (4) exceeds twenty months, interest may, if the subscriber so desires be recovered in two equal monthly instalments and the rest of recovery shall be that provided in sub-paragraph (2).

- (b) Payment shall be rounded off to the nearest rupee in the manner provided in sub-paragraph (5) of paragraph 9.
- (6) Recoveries made under this paragraph shall be credited as they are made, to the account of the subscriber in the Fund.

***14. Withdrawal from the Fund**

Subject to the conditions specified hereunder, in the case of withdrawal by the Director from the Fund it shall be sanctioned by the Chairman and by the Director in any other case at any time :

- (a) After the completion of twenty years of service (including broken periods of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier from the amount of subscription and interest thereon standing to the credit of the subscriber in the Fund for one or more of the following purposes, namely :
 - (i) for meeting the cost of higher education, including where necessary, the travelling expenses of the subscriber or any child of the subscriber in the following cases, namely :
 - (a) for education outside India for academic, technical, professional or vocational course beyond the High School stage, and
 - (b) for any medical, engineering or other technical or specialised course in India beyond the High School Stage;
 - (ii) for meeting the expenditure in connection with the betrothal/marriage of the subscriber or his sons or daughters, and any other female relation actually dependent on him;
 - (iii) for meeting the expenses in connection with the illness, including where necessary, the travelling expenses, of the subscriber and members of his family or any person actually dependent on him.
- (b) "After the completion of fifteen years of service (including broken periods of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier, from the amount standing to his credit in the Fund for one or more of the following purposes, namely :
 - (i) for constructing or acquiring a suitable house or a ready built flat for his residence including the cost of the land;
 - (ii) for repaying an outstanding amount on account of loan expressly taken for constructing or acquiring a suitable house or a ready built flat for his residence;
 - (iii) for purchasing a plot of land for constructing a house thereon for his residence or repaying any outstanding amount on account of loan expressly taken for this purpose;

* Substituted vide Ministry of Education letter No. F.11-3/80-T. 6, dated 24th March, 1982. Effective from March 15, 1982.

- (iv) for reconstructing or making additions or alterations to a house or a ready built flat already owned or acquired by the subscriber;
 - (v) for renovating, making additions or alterations or upkeep of an ancestral house at a place other than the place of duty or to a house built with the assistance of loan from Government at a place other than the place of duty;
 - (vi) for constructing a house on a plot of land purchased under clause (c).
- (c) Within six months before the date of the subscriber's retirement from the amount standing to his credit in the Fund for the purchase of acquiring a farm land or business-premises or both.
15. (1) Any sum withdrawn by a subscriber at any one time for one or more of the purposes specified in paragraph 14 from the amount standing to his credit in the Fund shall not ordinarily exceed one-half of the amount of subscriptions and interest thereon standing to the credit of the subscriber in the Fund or 6 months' pay whichever is less. The sanctioning authority may, however, sanction the withdrawal of an amount in excess of this limit up to three-fourths of the amount of subscriptions and interest thereon standing to the credit of the subscriber having due regard to (i) the object for which the withdrawal is being made, (ii) the status of the subscriber, and (iii) the amount of subscriptions and interest thereon standing to the credit of the subscriber in the Fund.
- (2) A subscriber who has been permitted to withdraw money from the Fund under paragraph 14 shall satisfy the sanctioning authority within a reasonable period as may be specified by that authority that the money has been utilised for the purpose for which it was withdrawn, and if he fails to do so, the whole of the sum so withdrawn, or so much thereof as has not been applied for the purpose for which it was withdrawn, shall forthwith be repaid in one lump sum together with interest thereon at the rate determined under paragraph 10 by the subscriber to the Fund and in default of such payment, it shall be ordered by the sanctioning authority to be recovered from his emoluments either in a lump sum or in such number of monthly instalments, as may be determined by the Institute.

16. A subscriber who has already drawn or may draw in future an advance under paragraph 11 for any of the purposes specified in clauses (a), (b) and (c) of subparagraph (1) of paragraph 14 may convert, at his discretion, by written request addressed to the Accounts Officer through the sanctioning authority the balance outstanding against it into a final withdrawal on his satisfying the conditions laid down in paragraph 14 and 15.

17. Payments towards Insurance Policies and Family Pension Funds

On written application from a subscriber to the Fund and subject to the conditions contained in paragraph 18 and 25 —

- (a) (i) subscriptions to a family pension fund; and
 - (ii) payments towards an insurance policy, may be substituted for the whole or part of subscriptions to the Fund.
 - (b) the amount of subscriptions with interest thereon standing to the credit of a subscriber in the Fund may be withdrawn to meet :
 - (i) payments towards an insurance policy;
 - (ii) purchase of a single payment insurance policy;
 - (iii) payment of a single premium or subscriptions to a family pension fund.

Provided that both in respect of (a) and (b) the family pension is (i) approved by the Board; and (ii) insurance policy is such as may be legally assigned by the subscriber himself in favour of the Institute and is so assigned by him and is delivered to the Registrar as a security against payment made from the Fund.
18. (1) An insurance policy effected by the subscriber himself on his own life or on the joint lives of the subscriber and his wife which shall be deemed to be a policy on the life of the subscriber himself, may be accepted for assignment in favour of the Institute.
- (2) A policy which has been assigned to the subscriber's wife shall not be accepted unless either the policy is first reassigned to the subscriber or the subscriber and his wife both join in an appropriate assignment.
- (3) An Insurance Policy shall be assigned to the Institute by means of an endorsement made on the policy itself in Form (1) or Form (2) or Form (3) of the Forms given in Appendix V according as the policy is on the life of the subscriber or on the joint lives of the subscriber and his wife or the policy has previously been assigned to the subscriber's wife.
- (4) Notice of assignment of a policy shall be given by the subscriber to the Insurance Company, and the acknowledgement of the notice by the Insurance Company shall be sent to the Registrar within three months of the date of assignment.
- (5) Where an Insurance policy has been assigned to the Institute, the Registrar shall satisfy himself by referring to the Insurance Company, where possible, that no prior assignment for the policy exists.
19. (1) Except in the cases of the Hindu Family (Pension) Annuity Fund and the Postal Life Insurance Policies in respect of which subscriptions or premiums which are paid by the Institute to the extent of recoveries actually made from the monthly salary bills, the Institute shall not make any payment on behalf of subscribers to Insurance Companies, nor take steps to keep a policy alive.
- (2) A subscriber who desires to substitute his Fund subscriptions in whole or part for payment to a Family Pension Fund or Insurance under clause (a) of paragraph 17 may reduce his subscription to the Fund within its limit.

Provided that except in the cases of subscriptions or premiums mentioned in sub-paragraph (1) the subscriber shall send to the Registrar, within a period of two months from the date of payment, receipts or certified copies of receipts in order to satisfy that the amount by which the subscription to the Fund has been reduced was duly applied for the purposes specified in clause (a) of paragraph 17.

- (3) A subscriber who desired to withdraw any amount under clause (b) of paragraph 17 within limit of his subscription in the Fund shall make arrangements with the Registrar for the withdrawal of the amount to be paid from his subscription in the Funds.

Provided that the subscriber shall send to the Registrar, within a period of two months from the date of payment, receipt or certified copies of receipts in order to satisfy that the amount withdrawn was duly applied for the purposes specified in clause (b) of paragraph 17.

- (4) Any amount withdrawn under clause (a) or (b) of paragraph 17 shall be paid in the whole rupees rounded off to the nearest rupee in the manner provided in sub-para (5) of paragraph 9.

20. (1) If the total amount of any subscriptions or payments substituted under clause (a) of paragraph 17 is less than the amount of minimum subscription payable to the Fund under paragraph 7, the difference should be rounded off to the nearest rupee in the manner provided in sub-paragraph (5) of paragraph 9 and paid by the subscriber as a subscription to the Fund.

- (2) If the subscriber withdraws any amount standing to his credit in the Fund for any of the purposes specified in clause (b) of paragraph 17 he shall continue to pay to the Fund the subscriptions payable under paragraph 7.

21. Once an Insurance Policy has been accepted for the purposes of being financed from the Fund, the terms of the Policy shall not be altered nor shall the Policy be exchanged for another Policy without the prior consent of the Director. Further the premium of Life Insurance Policies assigned under this provision shall not be payable otherwise than annually.

22. The subscriber shall not during the currency of the Policy draw any bonus the drawal of which during such currency is optional under the terms of the policy and the amount of any bonus which under the terms of the policy the subscriber has no option to refrain from drawing during its currency shall be paid forthwith into the Funds by the subscriber or in default recovered by reduction from his emoluments by instalments or otherwise as the Board may direct.

23. (1) Save as provided in sub-paragraph (2) of paragraph 25 when the subscriber :

- (a) quits the service, or
- (b) has proceeded on leave preparatory to retirement and applies to the Institute for reassignment or return of the Policy, or

- (c) while on leave, has been permitted to retire or declared by competent medical authority to be unfit for further service and applies to the Institute for reassignment or return of the Policy, or
- (d) pays or repays to the Fund the whole or any amount withheld or withdrawn from the Fund for any of the purposes mentioned in sub-clause (ii) of clause (a) of paragraph 17 and sub-clauses (1) and (ii) of clause (b) of paragraph 17 with interest thereon at the rate provided in paragraph 10,

the Registrar shall, if the Policy has been assigned in favour of the Institute under paragraph 18 reassign the policy in the first Form set forth in Appendix VI to the subscriber, or to the subscriber and the joint assured as the case may be, and make it over to the subscriber, together with a signed notice of the reassignment addressed to the Insurance Company.

- (2) Save as provided by sub-paragraph (2) of paragraph 25, when the subscriber dies before quitting the service, the Registrar shall reassign the policy in the Second Form set forth in Appendix VI to such person as may be legally entitled to receive it, and shall make over the policy to such person together with a signed notice of the reassignment addressed to the Insurance Company.

24. If a policy assigned in favour of the Institute under paragraph 18 matures before the subscriber quits the service, or if a policy on the joint lives of a subscriber and his wife, assigned under the said paragraph falls due for payment by reason of the wife's death, the full amount of the policy shall, on realisation, be credited to the Fund of the subscriber.

25. (1) If the interest of the subscriber in the family pension fund ceases in whole or part for any cause whatsoever, the provident fund account of the subscriber shall forthwith be reimbursed by the amount of the refund, if any, secured by the subscriber from the family pension fund which amount shall, in default of re-imbursement, be deducted from the subscriber's emoluments by instalments or otherwise, as the Board may direct.

(2) If the Institute receives notice of—

- (a) an assignment (other than an assignment in favour of the Institute under paragraph 18), or
- (b) a charge of encumbrance on, or
- (c) an order of a Court restraining dealing with the policy or any amount realised thereon, the Registrar shall not—
 - (i) reassign or make over the policy as provided in paragraph 23.
 - (ii) realise the amount assured by the policy, as provided in paragraph 24, but shall forthwith refer the matter to the Board.

26. Notwithstanding anything contained in this Schedule, if the sanctioning authority is satisfied that money withheld or withdrawn from the Fund under clause (a) or clause (b) of paragraph 17 has been utilised for a purpose other than that for which sanction was given to the withholding or withdrawal of the money from the Fund, the amount in question, shall, with interest at the rate provided in paragraph 10, forthwith be paid by the subscriber to the Fund, or in default, be ordered to be recovered by deduction in one sum from the emoluments of the subscriber even if he be on leave. If the total amount to be paid is more than one-half the subscriber's emoluments, recoveries shall be made in monthly instalments of moieties of his emoluments till the entire amount recoverable is paid by him.

Note : The term 'emoluments' as used in this paragraph does not include subsistence grant.

27. Restriction of the Provisions relating to Financing of Policies

The provisions contained in paragraphs 17 to 26 shall apply only to subscribers who have been substituting in whole or in part, payments towards policies of life insurance for subscription to the Fund or making withdrawals from the Fund for such payments prior to the 6th November, 1962.

Provided that such subscribers shall not be permitted to substitute such payments for subscriptions due to the Fund or to withdraw from the Fund for making such payments in respect of any new policy.

28. Circumstances in which Accumulations are Payable

When a subscriber quits the service, the amount standing to his credit in the Fund shall, subject to any deduction under paragraph 31, become payable to him.

Provided that a subscriber, who has been dismissed from the service and is subsequently reinstated in the service, shall, if required to do so by the Institute, repay any amount paid to him from the Fund in pursuance of this para with interest thereon at the rate provided in paragraph 10 in the manner provided in the proviso to paragraph 29. The amount so repaid shall be credited to his account in the Fund, the part which represents his subscriptions and interest thereon, and the part which represents the Institute contribution with interest thereon being accounted for in the manner provided in paragraph 5.

29. When a subscriber—

- (a) has proceeded on leave preparatory to retirement or if he is employed in a vacation department, on leave preparatory to retirement combined with vacation, or
- (b) while on leave, has been permitted to retire or declared by competent medical authority to be unfit for further service, the amount of subscriptions and interest thereon standing to his credit in the Fund shall, upon application made by him in that behalf to the Director, become payable to the subscriber.

Provided that the subscriber, if he returns to duty, shall, if required to do so by the Institute, repay to the Fund, for credit to his account, the whole or part of any amount paid to him from the Fund in pursuance of this rule, with interest thereon at the rate provided in paragraph 10, in cash or securities, or partly in cash and partly in securities, by instalments or otherwise, as the Institute may direct.

30. Subject to any deduction under paragraph 31 on the death of a subscriber before the amount standing to his credit has become payable or where the amount has become payable, before payment has been made.

(1) When the subscriber leaves a family—

- (a) If a nomination made by the subscriber in accordance with the provisions of paragraph 4 in favour of a member or members of his family subsists, the amount standing to his credit in the Fund or the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination.
- (b) If no such nomination in favour of a member or members of the family of the subscriber subsists, or if such nomination relates only to a part of the amount standing to his credit in the Fund, the whole amount or the part thereof to which the nomination does not relate, as the case may be, shall, notwithstanding any nomination purporting to be in favour of any person or persons other than a member or members of his family, become payable to the members of his family in equal shares.

Provided that no share shall be payable to—

- (1) Sons who have attained majority;
- (2) Sons of a deceased son who have attained majority;
- (3) Married daughters whose husbands are alive;
- (4) Married daughters of a deceased son whose husbands are alive if there is any member of the family other than those specified in clause (1), (2) (3) and (4).

Provided also that the widow or widows and the child or children of a deceased son shall receive between them in equal parts only the share which that son would have received if he had survived the subscriber and had been exempted from the provisions of clause (1) of the first proviso;

- Note :*
- (i) Any sum payable under this paragraph to a member of the family of a subscriber vests in such member under sub-section (2) of Section 3 of the Provident Funds Act, 1925.
 - (ii) When the subscriber leaves no family if a nomination made by him in accordance with the provisions of paragraph 4, in favour of any person or persons subsists, the amount standing to his credit in the Fund or

the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination.

- Note : ii*
- (i) When a nominee is a dependent of the subscriber as defined in clause (c) of section 2 of the Provident Funds Act, 1925, the amount vests in such nominee under sub-section (2) of section 3 of that Act.
 - (ii) When the subscriber leaves no family and no nomination made by him in accordance with provisions of paragraph 4 subsists, or if such nomination relates only to part of the amount standing to his credit in the Fund, the relevant provisions of clause (b) and of sub-clause (ii) of clause (c) of sub-section (1) of section 4 of the Provident Funds Act, 1925, are applicable to the whole amount or the part thereof to which the nomination does not relate.

***30 A. Deposit Linked Insurance Scheme**

On the death of a subscriber, the person entitled to receive the amount standing to the credit of the subscriber shall be paid by the Accounts Officer an additional amount equal to the average amount of subscription and interest thereon at the credit in the account during the 3 years immediately preceding the death of such subscriber, subject to the condition that—

- (a) the balance representing subscription with interest thereon at the credit of such subscriber shall not at any time during the 3 years preceding the month of death have fallen below the limits of—
 - (i) Rs. 4000 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 1300 or more;
 - (ii) Rs. 2500 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 900 or more but less than Rs. 1300;
 - (iii) Rs. 1500 in the case of subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 291 or more but less than Rs. 900;
 - (iv) Rs. 1000 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is less than Rs. 291;
- (b) the additional amount payable under this rule shall not exceed Rs.10,000;
- (c) the subscriber has put in at least 5 years service at the time of his death.

* Inserted vide Ministry of Education letter No. F. 16-24/78-T. 6, dated 1st March, 1979. Effective from the same date from which it is applicable to Government servants.

- Notes :**
1. The average balance shall be worked out on the basis of the balance at the credit of the subscriber at the end of each of the 36 months preceding the month in which the death occurs. For this purpose, as also for checking the minimum balances prescribed above—
 - (a) the balance at the end of March shall include the annual interest on subscription credited in terms of paragraph 10; and
 - (b) if the last of the aforesaid 36 months is not March, the balance at the end of the said last month shall include interest on subscription in respect of the period from the beginning of the financial year in which death occurs to the end of the last month.
 2. Payments under this scheme should be in whole rupees. If an amount due includes a fraction of a rupee, it should be rounded to the nearest rupee (50 paise counting as the next higher rupee).
 3. Any sum payable under this scheme is in the nature of insurance money and, therefore, the statutory protection given by section 3 of the Provident Funds Act, 1925 (Act 19 of 1925) does not apply to sums payable under this scheme.
 4. This scheme also applies to those subscribers to the Fund who are transferred to an autonomous organisation consequent upon conversion of a Government Department into such a body and who, on such transfer, opt, in terms of option given to them to subscribe to this Fund in accordance with these rules.
 5.
 - (a) In case of employee of the Institute who has been admitted to the benefits of the Fund under Statute 16(2)/Statute 16A(1), but dies before completion of three years' service or, as the case may be, five years' service from date of his admission to the Fund, that period of his service under the previous employer in respect whereof the amount of his subscriptions and the employer's contribution, if any, together with interest have been received, shall count for purposes of clause (a) and clause (c).
 - (b) In case of persons appointed on tenure basis and in the case of re-employed pensioners, service rendered from the date of such appointment or re-employment as the case may be, only will count for purposes of this rule.
 - (c) This scheme does not apply to persons appointed on contract basis.
 6. The budget estimates of expenditure in respect of this scheme will be prepared by the Accounts Officer responsible for maintenance of the accounts of the Fund having regard to the trend of expenditure, in the same manner as estimates are prepared for other retirement benefits.

31. Deductions

Subject to the conditions that no deduction may be made which reduces the credit by more than the amount of any contribution by the Institute with interest thereon credited under paragraphs 9 and 10, before the amount standing to the credit of a subscriber in the Fund is paid out of the Fund, the Board may direct the deduction therefrom and payment to the Institute of—

- (a) any amount, if a subscriber has been dismissed from the service for grave misconduct.

Provided that, if the order of dismissal is subsequently cancelled, the amount so deducted shall, on his reinstatement in the service, be replaced at his credit in the Fund.

- * (b) Any amount, if a subscriber resigns his employment with the Institute within five years of the commencement thereof or ceases to be an employee of the Institute, otherwise than by reasons of superannuation or a declaration made by competent medical authority that he is unfit for further service.

Provided that in the case of an employee on contract, the Institute's contribution towards the Provident Fund and other benefits shall be payable—

- (i) in full, if the full period of the contract is served;
- (ii) in proportion, if the contract is terminated earlier provided the termination of the contract is in accordance with the terms provided in it.

- (c) any amount due under liability incurred by the subscriber to the Institute.

32. (1) (a) When the amount standing to the credit of a subscriber in the Fund or the balance thereof after any deduction under paragraph 31 becomes payable, it shall be the duty of the Registrar, after obtaining the sanction of the Director and after satisfying himself, when no such deduction has been directed under the paragraph that no deduction is to be made, to make the payment as provided in section 4 of the Provident Funds Act, 1925.
- (b) In the case of final payment to the Director from the Contributory Provident Fund, the competent authority to sanction the payment shall be the Chairman.
- (2) If the person to whom, under this Schedule, any amount or policy is to be paid, assigned, reassigned or delivered is a lunatic for whose estate a manager has been appointed in this behalf, the payment or reassignment or delivery will be made to such manager appointed under the provisions of the Indian Lunacy Act, 1912, and not to the lunatic.

* Substituted vide Ministry of Education letter No. F. 11-3/78-T. 6, dated 7th June, 1980. Effective from June 3, 1980.

- (3) Any person who desires to claim payment under this paragraph shall send a written application in that behalf to the Director. Payment of amounts withdrawn shall be made in India only. The persons to whom the amounts are payable shall make their own arrangements to receive payments in India.

Note : When the amount standing to the credit of a subscriber has become payable under paragraph 28, 29 or 30, the Institute shall make arrangement for prompt payment of that portion of the amount standing to the credit of a subscriber in regard to which there is no dispute or doubt, the balance being adjusted as soon after as may be.

33. Procedure

Accumulations in the Fund of which payment has not been taken within six months after they become payable under this Schedule shall be transferred to "Deposits" after the 31st March of the year and treated under the provisions relating to deposits.

34. When paying a subscription in India either by deduction from emoluments or in cash, a subscriber shall quote the number of his account in the Fund, which shall be communicated to him by the Accounts Officer. Any change in the number shall similarly be communicated to the subscriber by the Accounts Officer.

35. (1) As soon as possible after the 31st March of each year and after the Fund accounts have been audited by the Audit Officer, the Accounts Officer shall send to each subscriber a statement of his account in the Fund in the Form set forth in Appendix VII showing the opening balance as on the 1st April of the year, the total amount of deposits during the year and the closing balance on that date.

The Accounts Officer shall attach to the statement of account an enquiry whether the subscriber—

- (a) desires to make any alteration in any nomination made under paragraph 4;
 - (b) has acquired a family in cases where the subscriber has made no nomination in favour of a member of his family under the provision of sub-paragraph (1) of paragraph 4.
- (2) Subscribers should satisfy themselves as to the correctness of the annual statement, and errors should be brought to the notice of the Accounts Officer within three months from the date of receipt of the statement. If no intimation is received from the subscriber within this period it shall be assumed that he has accepted the statement.
- (3) Where errors in the annual statement are brought to notice, it shall be the responsibility of the Accounts Officer to reconcile the same for settlement to the satisfaction of the subscriber.

36. Gratuity

- (a) Gratuity shall be granted for good, efficient and faithful service to whole time employees of the Institute and shall exclude the following :
- (i) casual and non-regular employees;
 - (ii) employees on deputation;
 - (iii) employees on contract basis;
 - (iv) apprentices and trainees; and
 - (v) re-employed persons.
- (b) It shall be granted in the following circumstances :
- (i) discharge on abolition of post;
 - (ii) permanent incapacity due to bodily or mental infirmity;
 - (iii) superannuation at the age of 60 years as provided in the Statute 15(2)/13(2); and
 - (iv) retirement after 30 years' qualifying service.
- Provided that—
- (i) Gratuity shall not be admissible to an employee who resigns from service (voluntary retirement after 30 years' qualifying service shall not constitute resignation) or whose services are terminated for misconduct, insolvency or inefficiency.
 - (ii) Except in the case of death, gratuity will be admissible only after 5 years' qualifying service.
- (c) Qualifying service shall mean all service rendered in the Institute after completion of 18 years of age, except periods of service rendered as Apprentice and extraordinary leave without leave salary.
- * (d) (i) Gratuity shall be equal to one-fourth of the emoluments for each completed six monthly period of service subject to a maximum of $16\frac{1}{2}$ times the emoluments or Rs. 30,000 whichever be less.
- (ii) In the case of death, the amount of gratuity shall be calculated under (1) or as worked out below, whichever be more :

* Amended vide Ministry of Education letter No. F. 11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

(a)	During the first year of service	2 months' emoluments	Reduced by the amount of Institute's contribution together with interest there on standing to the credit in the Contributory Provident Fund Account of the employees.
(b)	After one year but before 5 years of service	6 months' emoluments	
(c)	After completion of 5 years of service	12 months' emoluments	

***Explanation :** For the purpose of this paragraph, "emoluments" means pay including dearness pay if any, leave salary, or subsistence grant and includes any remuneration of the nature of pay (including dearness pay, if any) received in respect of the foreign service, immediately before his retirement or relinquishment of service, subject to a maximum of Rs. 2500 per month.

37. (1) Every employee shall make a nomination in the form at Appendix VIII conferring on one or more persons of his family the right to receive the gratuity in the event of his death while in service or after quitting service but before payment of gratuity is made, indicating the shares payable to each member. In case of an employee having no family, the nomination may be made in favour of a person, or persons, or a body of persons, corporate or incorporate.
- (2) In the event of there being no nomination, the gratuity on death may be paid in the manner indicated below :
- (a) if there are one or more surviving members of the family as in (i) to (iv) below, it may be paid to all such members other than any such member who is widowed daughter, in equal shares.
- (b) if there are no such surviving members of the family but there are one or more surviving widowed daughters and/or more surviving members of the family as in (v) to (ix) below, the gratuity may be paid to all such members, in equal shares.

Explanation : For the purpose of this paragraph, "Family" shall include the following :

- (i) wife in the case of a male employee;
- (ii) husband in the case of a female employee;
- (iii) sons including step-children and adopted children;
- (iv) unmarried and widowed daughters;

* Amended vide Ministry of Education letter No. F. 11-6/78-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

- (v) Brothers below the age of 18 years and unmarried and widowed sisters; } including step brothers and step sisters
- (vi) father;
- (vii) mother;
- (viii) married daughters; and
- (ix) children of a pre-deceased son.

*38. When the Board is satisfied that the operation of any of these provisions causes or is likely to cause undue hardship to an employee, it may, notwithstanding anything contained in these provisions, deal with the cases of such employees in such manner as may appear to it to be just and equitable.

* Added vide Ministry of Education letter No. F-11-4/80-T. 6, dated 18th June, 1982. Effective from May 29, 1982.

APPENDIX I

Form I—Application for Option

[Statute 16A(2)]

I, _____ an employee of the Indian Institute of Technology _____ hereby elect to be governed by the Contributory Provident Fund-cum-Gratuity Scheme as laid down in Statute 16A and in Schedule E to the Statutes of the Institute and relinquish my claim to be governed by all the terms and conditions including that of retirement benefits which were applicable to me immediately before the *1st January, 1971*. I am aware of this fact that this election is final and that it shall take effect from the *1st January, 1971*.

Witnesses :

(1) _____

(2) _____

Signature _____

(Thumb impression, if illiterate)

Designation _____

Date of election _____

Form II — Declaration

[See paragraph 1(3)]

I _____ (the subscriber), an employee of the Indian Institute of Technology at _____ do hereby declare that I have read the provisions governing the Contributory Provident Fund-cum-Gratuity Scheme of the Indian Institute of Technology _____ and agree to abide by them.

Dated this _____ day of 19 _____

Signature of Subscriber

Two witnesses to the signature :

1. _____

2. _____

APPENDIX II

[See paragraph 4 (3)]

Form of Nomination

I. When the Subscriber has a family and wishes to nominate one member thereof.

I hereby nominate the person mentioned below, who is a member of my family as defined in paragraph 2 of the provisions governing the Contributory Provident Fund-cum-Gratuity of the Indian Institute of Technology _____ to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable or having become payable, has not been paid.

Name and address of the nominee	Relationship with subscriber	Contingencies on the happening of which the nomination shall become invalid	Age	Name, address and relationship of the person, if any, whom the right of the nominee shall pass in the event of his predeceasing the subscriber
---------------------------------	------------------------------	---	-----	--

Dated this _____ day of _____ 19

at _____

Two witnesses to the signature :

Signature of Subscriber

1. _____

2. _____

APPENDIX II (Contd.)

II. When the Subscriber has a family and wishes to nominate more than one member thereof

I hereby nominate the persons mentioned below who are the members of my family as defined in paragraph 2 of the provisions governing the Contributory Provident Fund-cum-Gratuity Scheme of the Indian Institute of Technology _____ to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable has not been paid and direct that the said amount shall be distributed among the said persons in the manner shown below against their names :

Name and addresses of the nominees	Relation-ship with subscriber	Age	*Amount of share of accumulations to be paid to each	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his pre-deceasing the subscriber

Dated this _____ day of _____ 19

at _____

Two witnesses to the signature :

Signature of Subscriber

1. _____

2. _____

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

APPENDIX II (Contd.)

III. When the Subscriber has no family and wishes to nominate one person.

I, having no family as defined in para 2 of the provisions governing the Contributory Provident Fund-cum-Gratuity Scheme of the Indian Institute of Technology _____ hereby nominate the person mentioned below to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable has not been paid.

Name and address of the nominee	Relation-ship with subscriber	Age	*Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this _____ day of _____ 19

at _____

Two witnesses to the signature :

Signature of Subscriber

1. _____

2. _____

* Where a subscriber who has no family makes a nomination, he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

APPENDIX II (Contd.) -

IV. When the Subscriber has no family and wishes to nominate more than one person.

I, having no family as defined in para 2 of the provisions governing the Contributory Provident Fund-cum-Gratuity Scheme of the Indian Institute of Technology hereby nominate the person mentioned below to receive the amount that may stand to my credit in the Fund in the event of my death before that amount has become payable, or having become payable has not been paid, and direct that the said amount shall be distributed among the said persons in the manner shown below against their names :

Name and addresses of the nominees	Relation-ship with subscriber	Age	*Amount of share of accumulations to be paid to each	†Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his pre-deceasing the subscriber
------------------------------------	-------------------------------	-----	--	--	--

Dated this _____ day of _____ 19

at _____

Two witnesses to the signature :

Signature of Subscriber

1. _____

2. _____

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

† Where a subscriber who has no family makes a nomination he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

Contributory Provident

(See

Account No _____

Date of receipt of Nomination _____

Name _____

YEAR: 19

19

SUBSCRIPTIONS

INSTITUTE'S CONT.

Month	Emoluments	Subscriptions	Refunds of withdrawals	Total	Withdrawals	Monthly balance on which interest is calculated	***	Please see below	Withdrawals	Remarks
April										
May										
June										
July										
August										
September										
October										
November										
December										
January										
February										
March										
General entries										

Total

***Subscriber's emoluments drawn on duty

Balance from	19	19	...	I.I.T. contribution	
Deposits & Refunds as above			...	on Rs.	
Interest for	19	19	...	@	
@			...	Balance from 19	19
Bonus for	19	19	...	Interest for 19	19
@			...		
			...	Total	
			...	Deduct—Withdrawals	
Deduct—Withdrawals as above			...	as above	
Balance on 31st March, 19			...	Balance on 31st	
			...	March, 19	

Calculated/Checked by

III

Fund Ledger

paragraph 5)

Designation _____ Joined on _____

YEAR: 19 _____ 19 _____

SUBSCRIPTIONS _____ INSTITUTE'S CONT. _____

Emoluments	Subscriptions	Refunds of withdrawals	Total	Withdrawals	Monthly balance on which interest is calculated	***	Please see below	Withdrawals	Remarks
------------	---------------	------------------------	-------	-------------	---	-----	------------------	-------------	---------

or during leave or on deputation abroad.

Balance from	19	19	...	I.I.T. contribution on Rs.		
Deposits & Refunds as above			...	@		
Interest for	19	19	...	Balance from 19	19	
@				Interest for 19	19	
Bonus for	19	19	...	Total		
@				Deduct—Withdrawals as above		
		Total	...	Balance on 31st March, 19		
Deduct—Withdrawals as above			...			
Balance on 31st March, 19			...			

Calculated/Checked by _____

APPENDIX IV
(See paragraph 11)

**Form of Application for a Temporary Advance from the
Contributory Provident Fund**

1. Name of the Subscriber & his Account Number
2. Designation
3. Pay
4. Balance of subscription at credit of the subscriber on the date of application
5. Amount of advance required
6. Purpose for which the advance is required—
Para 11(a) of the Contributory Provident Fund Rules
7. Number (and amount) of monthly instalments in which the advance is proposed to be repaid
8. Amount of advance or advances last taken, if any. State particulars of the advance, date on which taken, instalments of repayment and balance outstanding.
9. Whether any advance last taken is in course of repayment or 12 months have not elapsed since its complete repayment together with interest.
10. Full particulars of the pecuniary circumstances of the subscriber justifying the application for the temporary withdrawal

Signature of the Applicant

The particulars against items 3, 4, 8 and 9 have been verified to be correct.

Signature

Accounts Officer

APPENDIX IV (Contd.)

(Remarks of the Recommending Authority)

No. _____ Date _____ the _____

Forwarded to the _____

I am satisfied that the pecuniary circumstances of the official justify the grant of advance applied for which is admissible under para 11 of the provisions governing the Contributory Provident Fund and is recommended, as a special case, for the _____'s sanction under para 12 *ibid*.

The advance is recoverable in _____ instalments of Rs. _____ per mensem with one/two additional instalments representing interest at the prescribed rate.

Signature _____

Designation _____

No. _____ Date _____ the _____

Sanction of the _____ is conveyed to the grant of an advance of Rs. _____ to be recovered in monthly instalments of Rs. _____ each with one/two additional instalments representing interest at the prescribed rate.

Signature _____

Designation _____

Notes : (i) The application should in the first instance be submitted to the Registrar, who after obtaining necessary certificate from the Accounts Officer submit the application, with his recommendations, to the Director for sanction or submit it to the higher authority, after obtaining the Director's recommendations, as the case may be.

(ii) The application, when sanctioned, should be sent to the Accounts Section for necessary further action.

APPENDIX V

(See paragraph 18)

Forms of Assignment

(1)

I, _____ hereby assign unto the Indian Institute of Technology _____ the within policy of assurance as security for payment of all sums which under the provisions governing the Contributory Provident Fund of the Indian Institute of Technology _____ I may hereafter become liable to pay to the Contributory Provident Fund of the Indian Institute of Technology _____

I hereby certify that no prior assignment of the within policy exists.

Dated _____ day of _____ 19

Station _____

Signature of Subscriber

One witness to signature :

(2)

We, _____ (the subscriber) of _____ and (the joint assured) of _____ in consideration of the Indian Institute of Technology _____ agreeing at our request to accept payments towards the within policy of assurance in substitution for the subscriptions payable by me the said _____ to the Contributory Provident Fund, Indian Institute of Technology _____ to accept the withdrawal of the sum of Rs. _____ from the sum to the credit of the said _____ in the Contributory Provident Fund, Indian Institute of Technology _____ for payment of the premium of the within policy of assurance hereby jointly and severally assign up to the said Indian Institute of Technology _____ the within policy of assurance as security for payment of all sums which under the rules of the said Fund the said _____ may hereafter become liable to pay to that Fund.

We hereby certify that no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

Station _____

Signature of Subscriber
and the Joint Assured

One witness to signature :

Note : The assignment may be executed on the policy itself either in the subscriber's handwriting or type written, or alternatively a typed or printed slip containing the assignment may be pasted on the blank paper provided for the purpose on the policy. A typed or printed endorsement must be duly signed and if pasted on the policy it must be initialled across all four margins.

(3)

I, _____ wife of _____ and the assignee of the within policy, having at the request of _____ the assured, agree to release my interest in the policy in favour of _____ in order that _____ may assign the policy to the Indian Institute of Technology _____ which body has agreed to payment towards the within policy of Assurance in substitution for the subscriptions payable by _____ to the Contributory Provident Fund hereby at the request and by the direction of _____ assign and I the said _____ assign and confirm unto the Indian Institute of Technology _____ the within policy of assurance as security for payment of all sums which under the rules of the said Fund the said _____ may hereafter become liable to pay to the Fund.

We hereby certify that no prior assignment of the within policy exists.

Dated this _____ day of _____ 19
Station _____

Signature of the Assignee and the Subscriber

One witness to signature :

(4)

[Form of assignment to be used in cases where a subscriber to the General Provident Fund who has effected an insurance policy under the rules of that Fund is admitted to the Contributory Provident Fund, Indian Institute of Technology, _____]

I, _____ of _____ hereby further assign unto the Indian Institute of Technology _____ the within policy of assurance as security for payment of all sums which under the provisions governing the Contributory Provident Fund of the Indian Institute of Technology _____ I may hereafter become liable to pay to the Contributory Provident Fund of the Indian Institute of Technology _____

I hereby certify that except an assignment to the President of India as security for payment of all sums which I have become liable to pay under the General Provident Fund Rules, no prior assignment of the within policy exists.

Dated this _____ day of _____ 19

Station _____

Signature of Subscriber

One witness to signature :

APPENDIX VI
(See paragraph 23)

Form of Reassignment and Assignment by the Indian Institute of Technology

All sums which have become payable by the above named _____ under the provisions governing the Contributory Provident Fund, Indian Institute of Technology _____ having been paid and all liability for payment by him of any such sums in the future having ceased the Institute doeth hereby reassign the within policy of assurance to the said _____

Dated this _____ day of _____ 19 _____

Executed by _____ Registrar of the Institute for and on behalf of the Indian Institute of Technology _____

Signature of the Registrar

(One witness who should add his designation and address)

(2)

The above-named _____ having died on the _____ day of _____ 19, _____ the Indian Institute of Technology _____ doeth hereby assign the within policy of assurance to _____ *

Dated this _____ day of _____ 19

Executed by _____ Registrar of the Institute and on behalf of the Indian Institute of Technology _____

Signature of the Registrar

(One witness who should add his designation and address).

Form of Reassignment by the Indian Institute of Technology _____

The Indian Institute of Technology _____ doeth hereby reassign the within policy to the said _____

Dated this _____ day of _____ 19

Executed by _____ Registrar of the Institute for and on behalf of the Indian Institute of Technology _____

Signature of the Registrar

(One witness who should add his designation and address)

* Fill in particulars of persons legally entitled to receive the policy.

APENDIX VII
(See paragraph 35)

Subscriber's Statement of Account for the year ending 31-3-19

Name of the Subscriber _____

Number of Account _____

Particulars	Opening Balance	Deposits	Interest	Total	Withdrawals	Closing Balance
Subscription and refunds of withdrawals						
Institute contributions						
Total						

- Note :* (i) The subscriber should satisfy himself as to the correctness of the statement and bring errors, if any, to the notice of the Accounts Officer within 3 months from the date of receipt of the statement. If no intimation is received from the subscriber within this period it shall be assumed that he has accepted the statement.
- (ii) The subscriber should state whether he desires to make any alteration in any nomination made under the rules of the Fund.
- (iii) In cases where the subscriber has made no nomination in favour of a member of his family owing to his having no family at the time but acquired a family thereafter the fact should be reported to the Registrar forthwith.

Dated _____

Accounts Officer
Indian Institute of Technology

(Portion to be returned to the Accounts Officer)

I hereby acknowledge receipt of the Annual Statement of my Contributory Provident Fund Account for the year 19__ and/or do not accept the balance shown therein as correct for the reason given overleaf.

Reasons, if any, for the non-acceptance of the balance with particulars necessary in support.

Dated _____

Signature of Subscriber

APPENDIX VIII
FORM OF NOMINATION — FORM I
 (See paragraph 37)

Nomination for Death-cum-Retirement Gratuity

When the employee has a family and wishes to nominate one member thereof

I hereby nominate the person mentioned below, who is a member of my family, and confer on him the right to receive any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death any gratuity which having become admissible to me on retirement may remain unpaid at my death:

Name and address of the nominee	Relation-ship with the employee	Age	Contingen-cies on the happening of which the nomi-nation shall become in- valid	Name, address and rela- tionship of the person or persons; if any, to whom the right conferred on the nominee shall pass in the event of the nominee predeceasing the employee or the no- minee dying after the death of the employee but before receiving pay- ment of the gratuity	Amount or share of gratuity payable to each

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

Dated this _____ day of _____ 19____ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Employee

Nomination by _____

Designation _____

Signature of the Registrar

Department _____

Note : The last column should be filled in so as to cover the whole amount of gratuity.

FORM II

(See paragraph 37)

Nomination for Death-cum-Retirement Gratuity

When the member of staff has a family and wishes to nominate more than one member thereof

I hereby nominate the persons mentioned below, who are members of my family, and confer on them the right to receive to the extent specified below, any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death, to the extent specified below, any gratuity which having become admissible to me on retirement may remain unpaid at my death :

Names and addresses of nominees	Relationship with the employee	Age	Amount of shares of gratuity payable to each	Name, address and relationship of the person or persons, if any, to whom the right conferred on nominee shall pass in the event of the nominee predeceasing the employee or the nominee dying after the death of the employee but before receiving payment of the gratuity	Amount or share of gratuity payable to each
---------------------------------	--------------------------------	-----	--	--	---

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

Note : The member of staff shall draw lines across the blank space below the last entry to prevent the insertion of any name after he has signed.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

- 1.
- 2.

Signature of Employee

Nomination by _____

Designation _____

Department _____

Signature of the Registrar

- Notes :
1. Fourth column should be filled in so as to cover the whole amount of gratuity.
 2. The amount/share of gratuity shown in last column should be the whole amount/share payable to the original nominees.

FORM III

(See paragraph 37)

Nomination for Death-cum-Retirement Gratuity

When the employee has no family and wishes to nominate one person

I, having no family, hereby nominate the person mentioned below and confer on him the right to receive any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death any gratuity which having become admissible to me on retirement remains unpaid at my death :

Name and address of the nominee	Relation-ship with the employee	Age	Contingen-cies on the happening of which nomination shall be-come in-valid	Name, address and relationship of the person or persons, if any, to whom the right conferred on the nominee shall pass in the ovent of the nominee pre-deceasing the emp-loyee or the nominoe dying after the death of the employee but before receiving the payment of the gratuity	Amount of share of gratuity payable to each

This nomination supersedes the nomination made by me earlier on which stands cancelled.

Dated this _____ day of _____ 19__ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Employee

Nomination by _____

Designation _____

Signature of the Registrar

Department _____

Date _____

FORM IV

(See paragraph 37)

Nomination for Death-cum-Retirement Gratuity when the employee has no family and wishes to nominate more than one person

I, having no family, hereby nominate the persons mentioned below, and confer on them the right to receive to the extent specified below, any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death, to the extent specified below any gratuity which having become admissible to me on retirement may remain unpaid at my death :

Names and addresses of the nominees	Relationship with the employee	Age	Amount or share of gratuity payable to each	Contingencies on the happenings of which the nomination shall become invalid	Name, address and relationship of person or persons, if any, to whom the right conferred on the nominee shall pass in the event of the nominee predeceasing the employee or the nominee dying after the death of the employee but before receiving payment of the gratuity.	Amount or share of gratuity payable to each

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

Dated _____ this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

Signature of the Employee

2. _____

Dated _____

Nomination by _____

Designation _____

Signature of Registrar

Department _____

Dated _____

N.B. : The employee should draw lines across blank space below the last entry to prevent the insertion of any name after he has signed.

- Note :**
1. Fourth column should be filled in so as to cover the whole amount of gratuity.
 2. The amount/share of gratuity shown in last column should cover the whole amount of share payable to the original nominee.

General Provident Fund-cum-Pension-cum-Gratuity Scheme

(See Statute 16B)

1. Application

The provisions contained in this Schedule shall apply to the employees specified in clause (1) of Statute 16B.

2. Transfer of Accumulations In Contributory or Non-Contributory Provident Fund

If an employee admitted to the benefit of the Fund was previously a subscriber to any Contributory/Non-Contributory Provident Fund of the Central Government/State Government or of a body corporate, owned or controlled by Government or an autonomous organisation registered under the Societies Registration Act, 1860, the amount of his accumulations in such Contributory or Non-Contributory Provident Fund, shall be transferred to his credit in the Fund.

3. Declaration

Every employee of the Institute entitle to the benefits of the Fund shall be required to sign a written declaration in the form set-forth in Appendix I that he has read this Schedule and agreed to abide by the provisions contained in it.

4. Definitions

In this Schedule, unless the context otherwise requires :

- (i) "accident" means—
 - (a) a sudden and unavoidable mishap; or
 - (b) a mishap due to an act of devotion to duty in an emergency arising otherwise than by violence out of and in the course of service.
- (ii) "Accounts Officer" means the Accounts Officer of the Institute.
- (iii) "Annexure" means an annexure appended to the Schedule.
- (iv) "Audit Officer" means the (Internal) Audit Officer of the Institute.
- *(v) "average emoluments" means the average emoluments calculated upon the last 10 months of service.
- (vi) "Board" means the Board of Governors of the Institute.
- (vii) "Director" means the Director of the Institute.

* Inserted vide Ministry of Education letter No. F. 11-3/75, dated 23rd November, 1976. Effective from November 19, 1976.

- (viii) "disease" means—
- (i) disease solely and directly attributable to an accident; or
 - (ii) an epidemic disease contracted by an employee in consequence of his being ordered on duty to an area in which such disease is prevalent, or in consequence of his attending voluntarily, out of humanitarian motives, upon any patient suffering from any such disease in an area where he happens to be in the performance of his duties; or
 - (iii) venereal disease of septicaemia where such disease or septicaemia is contracted by a medical officer as a result of attendance in the course of his official duty on an infected patient or of conducting a postmortem examination in the course of that duty.
- (ix) "emoluments" means pay including dearness pay, if any, leave salary, or subsistence grant and includes any remuneration of the nature of pay (including dearness pay, if any) received in respect of foreign service.
- (x) "employee" means an employee of the Institute.
- (xi) "Family" means—
- (i) in the case of a male subscriber, the wife or wives and children of a subscriber and the widow or widows and children of a deceased son of the subscriber;

Provided that if a subscriber proves that his wife has been judicially separated from him or has ceased under the customary law of the community to which she belongs to be entitled to maintenance, she shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which these rules relate, unless the subscriber subsequently intimates in writing to the Registrar that she shall continue to be so regarded;
 - (ii) in the case of a female subscriber, the husband and children of the subscriber, and the widow or widows and children of a deceased son of the subscriber;

Provided that if a subscriber by notice in writing to the Registrar expresses her desire to exclude her husband from her family, the husband shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which these rules

relate, unless the subscriber subsequently cancels such notice in writing.

Note : "Child" means a legitimate child and includes an adopted child where adoption is recognised by the personal law governing the subscriber.

- (xii) "Form" means a form appended to these provisions.
- (xiii) "Fund" means the General Provident Fund of the Institute.
- (xiv) "Injury" means bodily injury resulting from violence, accident or disease assessed by the consulting Medical Officer of the Institute as being not less than severe.
Note : Examples of injuries of certain categories are given in Appendix V.
- (xv) "Institute" means the Indian Institute of Technology.
- (xvi) "Leave" means any variety of leave recognised by the Institute framed in Schedule D under Statute 17.
- *(xvii) "Pay" means the amount drawn monthly by an employee as pay including Dearness Pay where, admissible, which has been sanctioned for the post held by him substantively or in any officiating capacity and includes special pay and personal pay, if any.
- (xviii) "Personal pay" means additional pay granted to an employee—
 - (a) to save him a loss of substantive pay in respect of permanent post owing to a revision of pay or to any reduction of such substantive pay otherwise than as a disciplinary measure; or
 - (b) in exceptional circumstances on other personal consideration.
- †(xix) "Qualifying Service" means service rendered as an employee in a substantive capacity including period spent on probation, continuous/temporary or officiating service under the Institute or under the States/Central Government or under an autonomous organisation or under corporate body of States/Central Government followed without interruption by confirmation in the same or in other post shall count in full as qualifying service except in respect of the period of service in "work charged" establishment and period of service paid from "contingencies."

Explanation I

All periods of leave with allowances shall count as qualifying service.

* Substituted vide Ministry of Education letter No. F. 11-6/78-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

† Substituted vide Ministry of Education letter No. F. 11-6/82-T. 6, dated 31st January, 1984. Effective from January 28, 1984.

Note : Nothing in this clause shall affect other periods relating to the accounting of special kinds of leave or pension.

- (a) Any period of special disability leave or study leave availed of by an employee shall count as qualifying service.
- (b) Where maternity leave availed of by an employee either alone or in combination with some other form of leave on full pay (except special disability leave) exceeds 120 days, the first 120 days only of the entire spell of leave shall count as qualifying service.
- (c) The period spent on deputation for training or deputation for any special purpose including periods of travel to and from the country of deputation shall count as qualifying service; provided that if the employee has availed himself of any extra-ordinary leave without allowances during the period of deputation, the period of such extraordinary leave shall be excluded.

Explanation II

The following period in the service of an employee shall not count as qualifying service :

- (i) Time passed under suspension pending enquiry into his conduct, if the suspension is not immediately followed by reinstatement;
- (ii) Extraordinary leave without leave salary and allowances;
- (iii) Unauthorised absence in continuation of authorised leave of absence.

Explanation III

An addition to the service qualifying for superannuation pension of a period not exceeding five years in the case of certain cadres specified by the Board may be made under the following conditions :

- (a) The post should require Postgraduate, Research or specialist qualifications or experience in scientific, technological or professional field;
 - (b) the post is such that candidates of more than 25 years of age are normally recruited; and
 - (c) that the concession is not admissible unless actual qualifying service of an officer at the time he quits Govt. service is not less than 10 years.
- (xx) "Registrar" means the Registrar of the Institute.
- (xxi) "risk of office" means any risk, not being a special risk, of accident or disease to which an employee is exposed in the course of and as a consequence of his duties, but nothing shall be deemed to be a risk of office which is a risk common to human existence in modern conditions in India, unless such risk is definitely enhanced in kind of degree by the nature, conditions, obligations or incidents of service.

Note : The terms "risk of office" includes risk of death or injury to which an employee is exposed when he attends on a working day, or is required to attend on a holiday, the place of his employment for the performance of his duties during any riot or civil commotion in the locality and while proceeding from his residence to the place of his employment or vice versa, becomes a victim of any such riot or civil commotion.

- (xxii) "Special pay" means an addition of the nature of pay to emoluments of a post or of an employee granted in consideration of the specially arduous nature of his duties or of a specific addition to his work or responsibility.
- (xxiii) "special risk" means—
- (i) a risk of suffering injury by violence;
 - (ii) a risk of injury by accident to which an employee is exposed in the course of, and as consequence of, the performance of any particular duty which has the effect of materially increasing his liability to such injury beyond the normal risk of his office.
 - (iii) a risk of contracting disease to which a medical officer is exposed as a result of attending in the course of his official duty to a venereal or septicaemia patient or conducting a postmortem examination in pursuance of that duty.
- (xxiv) "Violence" means the act of a person who inflicts an injury on an employee—
- (i) by assaulting or resisting him in discharge of his duties, or in order to deter or prevent him from performing his duties; or
 - (ii) because of anything done or attempted to be done by any such employee or by any other member of the staff in the lawful discharge of his duty as such; or
 - (iii) because of his official position.
- (xxv) "Year" means a financial year.

GENERAL PROVIDENT FUND

5. Nominations

- (1) A subscriber shall at the time of joining the Fund, send to the Registrar, a nomination in the prescribed form conferring on one or more persons the right to receive the amount that may stand to his credit in the Fund, in the event of his death, before that amount has become payable or having become payable has not been paid.

Provided that if, at the time of making nomination, the subscriber has a family, the nomination shall not be in favour of any person or persons other than the members of his family.

Provided further that the nomination made by the subscriber in respect of any other Provident Fund to which he was subscribing before joining the Fund shall, if the amount to his credit in such other fund has been transferred to his credit in the Fund, be deemed to be a nomination duly made under this paragraph until he makes a nomination in accordance with this rule.

- (2) If a subscriber nominates more than one person under sub-paragraph (1), he shall specify in the nomination the amount of share payable to each of the nominees in such manner as to cover the whole of the amount that may stand to his credit in the Fund at any time.
- (3) Every nomination shall be in such one of the Forms as is appropriate in the circumstances.
- (4)
 - (i) A subscriber may at any time cancel a nomination by sending a notice in writing to the Registrar. The subscriber shall along with such notice or separately, send a fresh nomination made in accordance with the provisions of this paragraph.
 - (ii) A subscriber may provide in a nomination :
 - (a) in respect of any specified nominee, that in the event of his predeceasing the subscriber, the right conferred upon that nominee shall pass to such other person or persons as may be specified in the nomination, provided that such other person or persons shall, if the subscriber has other members of his family, be such other member or members. Where the subscriber confers such a right on more than one person under this clause, he shall specify the amount of share payable to each of such persons in such a manner as to cover the whole of the amount payable to the nominee;
 - (b) that the nomination shall become invalid in the event of the happening of a contingency specified therein.

Provided that if at the time of making the nomination the subscriber has no family, he shall provide in the nomination that it shall become invalid in the event of his subsequently acquiring a family.

Provided further that if at the time of making the nomination the subscriber has only one member of the family, he shall provide in the nomination that the right conferred upon the alternate nominee under sub-clause (a) shall become invalid in the event of his subsequently acquiring other member or members of his family.

- (5) Immediately on the death of a nominee in respect of whom no special provision has been made in the nomination under sub-clause (a) of clause (2) of paragraph 5 or on the occurrence of any event by reason of which the nomination becomes invalid in pursuance of sub-clause (b) of clause (2) of paragraph 5 or the proviso thereto, the subscriber shall send to the Registrar a notice in writing cancelling the nomination, together with a fresh nomination made in accordance with the provisions of this paragraph.

- (6) (i) Every nomination made, and every notice of cancellation given, by a subscriber shall, to the extent that it is valid, take effect on the date on which it is received by the Registrar.
- (ii) The Institute shall not be bound by nor shall recognise any assignment or encumbrance executed or attempted to be created which affects the disposal of the amount standing to the credit of a subscriber who dies before the amount becomes payable.

6. Subscriber's Account

An account shall be opened in the name of each subscriber to which shall be credited the subscriber's subscription and interest as provided by these provisions on subscription.

7. Conditions and Rates of Subscription

- (1) Every subscriber shall subscribe monthly to the Fund when on duty in the service of the Institute or on foreign service :

Provided that a subscriber shall not subscribe during the period when he is under suspension and may at his option not subscribe during any period of leave other than leave on average pay or earned leave of less than thirty days' duration, as the case may be.

Provided further that a subscriber on reinstatement after a period passed under suspension shall be allowed the option of paying in one sum or in instalments any sum not exceeding the maximum amount of arrears of subscription payable for that period.

- (2) The subscriber shall intimate his election not to subscribe during leave by a written communication addressed to the Registrar before he proceeds on leave. Failure to make due and timely intimation shall be deemed to constitute an election to subscribe. The option of a subscriber intimated under this sub-paragraph shall be final.

8. Rates of Subscription

- (1) The rate of subscription shall be fixed by subscriber himself subject to the following conditions :
 - (i) The rate of subscription may not be less than 6% of his emoluments and not more than his total emoluments, the amount so calculated being rounded off to the nearest rupee, provided that in the case of subscriptions at the minimum or maximum rates, the rounding off will be to the next higher or the next lower rupee respectively.
 - (ii) For the purpose of this clause, the emoluments of a subscriber shall be :
 - (a) in the case of a subscriber who was in service on 31st March of

the preceding year, the emoluments to which he was entitled on that date, provide as follows :

- (i) if the subscriber was on leave on the said date and elected not to subscribe during such leave or was under suspension on the said date, his emoluments shall be the emoluments to which he was entitled on the first day after his return to duty;
 - (ii) if the subscriber was on deputation out of India on the said date or was on leave on the said date and continues to be on leave and has elected to subscribe during such leave, his emoluments shall be the emoluments to which he would have been entitled had he been on duty in India;
 - (iii) if the subscriber joined the Fund for the first time on a day subsequent to the said date, his emoluments shall be the emoluments to which he was entitled on such subsequent date.
- (b) In the case of a subscriber who was not in service on the 31st of March of the preceding year, the emoluments to which he was entitled on the first day of his service or, if he joined the Fund for the first time on a date subsequent to the first date of his service, the emoluments to which he was entitled on a such subsequent date.

*(2) The amount of subscription so fixed may be:

- (a) reduced once at any time during the course of the year;
- (b) enhanced twice during the course of the year;
- (c) reduced and enhanced as aforesaid.

9. Interest

- (1) The Institute shall pay to the credit of the account of each subscriber, interest at such rate as may be determined by the Board for each year at the beginning of the year.
- (2) Interest shall be credited with effect from the last day in each year in the following manner :
 - (i) on the amount at the credit of a subscriber on the 31st March of the preceding year less any sums withdrawn during the current year—Interest for twelve months;
 - (ii) on sums withdrawn during the current year—Interest from the 1st of -

* Substituted vide Ministry of Education letter No. F. 11-3/80-T.6, dated 24th March, 1982. Effective from March 15, 1982.

- April of the current year up to the last date of the month preceding the month of withdrawal;
- (iii) on all sums credited to the subscriber's account after the 31st of March of the preceding year—Interest from the date of credit up to the 31st of March of the current year;
 - (iv) the total amount of interest shall be rounded to the nearest rupee (50 paise and above counting as the next higher rupee).

Provided that when the amount standing at the credit of a subscriber has become payable, interest thereon shall be credited under this subparagraph in respect only of the period from the beginning of the current year or from the date of credit as the case may be, up to the date on which the amount standing to the credit of a subscriber becomes payable.

- (3) For the purpose of this paragraph, the date of credit shall be deemed to be the first day of the month in which it is credited.
- (4) In all cases interest shall be paid in respect of balance at the credit of a subscriber up to the close of the month preceding that in which payment is made or up to the end of the sixth month after the month in which such amount becomes payable, whichever of these periods is less, provided that no interest shall be paid in respect of any period after the date on which the Registrar has intimated to the subscriber or his agent as the date on which he is prepared to make payments.

10. Advances from the Fund

- (1) The payment of an advance from the Fund may be sanctioned by the Director and in the case of the Director by the Chairman to a subscriber from the amount of his subscription and interest thereon standing to his credit, subject to the following conditions :
- (2) No advance shall be granted unless the sanctioning authority is satisfied that the applicant's pecuniary circumstances justify it, and that it will be expended on the following object or objects and not otherwise :
 - (i) To pay expenses incurred in connection with the illness of the applicant, applicant's wife, legitimate children, step-children, parents, sisters and minor brothers actually dependent on him;
 - (ii) To pay for the overseas passage for reasons of health or education of the applicant or the applicant's wife, legitimate children, step-children, parents, sisters and minor brothers actually dependent on him;
 - (iii) To meet the cost of higher education of any person actually dependent on the applicant. Such person need not necessarily be a member of the applicant's family;

(iv) To pay obligatory expenses on a scale appropriate to the applicant's status in connection with marriages, funerals or ceremonies which by his religion it is incumbent on him to perform;

(v) To meet the cost of legal proceedings instituted by the applicant for vindicating his position in regard to any allegations made against him in respect of any act done or purporting to be done by him in the discharge of his official duty;

Provided that the advance under this clause shall not be admissible to an applicant who institutes legal proceedings in any court of law either in respect of any matter unconnected with his official duty or against the Institute in respect of any condition of service or penalty imposed on him.

(vi) To meet the cost of his defence where the applicant is prosecuted by the Institute in any court of law in respect of any alleged official misconduct on his part;

*(vii) To meet the cost of a plot or construction of a house or a ready built flat for his residence or to make any payment towards the allotment of a plot or a ready built flat by a State Housing Board or House Building Co-operative Society.

(3) An advance shall not exceed the following ceiling limits :

When sanctioned for any of the objects mentioned in clause (i) to (vi) of sub-paragraph (2)	3 months' pay of the subscriber
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Provided, however, that in no case shall the amount of advance exceed 50 per cent of the amount of the member's subscription and interest thereon standing to the credit of the subscriber in the Fund.

(4) An advance shall not, except for special reasons to be recorded in writing be granted to any subscriber in excess of the limit laid down in sub-paragraph (3) herein until repayment of the last instalment of any previous advance.

(5) The sanctioning authority shall record in writing its reasons for granting the advance.

(6) The amount of advance shall be recovered in not more than twenty four equal monthly instalments, if the advance was sanctioned for any of the objects mentioned in clauses (i) to (vi) of sub-paragraph (2). Each instalment shall be a number of whole rupees, the amount of advance being raised or reduced, if necessary, to admit of the fixation of such instalments. A subscriber may at his option repay in a smaller number of instalments than that agreed upon at the time of grant of advance or in a lump sum.

(7) Recovery of advance shall be made from the emoluments of a subscriber and shall commence on the first occasion, after the advance is made, on which the subscriber draws emoluments for a full month.

* Added vide Ministry of Education letter No. F. 11-3/80-T. 6, dated 24th March, 1982. Effective from March 15, 1982.

- (8) Interest on advances shall be such as may be determined by the Institute from time to time and shall not exceed by more than one per cent of the rate paid by the Institute to the account of a subscriber. It shall ordinarily be recovered in one instalment in the month after complete repayment of the principal has been made. If the period of repayment exceeds twenty months, interest may, if the subscriber so desires, be recovered in two equal monthly instalments, the monthly payment being rounded to the nearest whole rupee, 50 paise and above counting as the next higher rupee. Recoveries made under this paragraph shall be credited, as they are made, to the account of the subscriber in the Fund.
- (9) Notwithstanding anything contained in these provisions, if the Director is satisfied that money withdrawn as an advance from the Fund under sub-paragraph (2) has been utilised for a purpose other than that for which sanction was given to the drawal of the money, the amount in question shall with penal interest calculated at a rate of 3% over and above the rate provided under sub-paragraph (8) be repaid by the subscriber to the Fund, or in default be ordered to be recovered by deduction in one sum from the emoluments of the subscriber. If the total amount to be repaid be more than half the subscriber's emoluments, the recoveries shall be made in monthly instalments of moieties of his emoluments till the entire amount recoverable be repaid.

Note : The term 'emoluments' as used in this paragraph does not include subsistence allowance, if any, granted in cases of suspension of any employee pending an enquiry into his alleged misconduct.

*11. Subject to the conditions specified hereunder, in the case of withdrawal by the Director from the Fund, it shall be sanctioned by the Chairman and by the Director in any other case at any time :

- (A) after the completion of twenty years of service (including broken periods of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier from the amount standing to his credit in the Fund for one or more of the following purposes, namely :
- (i) for meeting the cost of higher education, including where necessary, the travelling expenses of the subscriber or any child of the subscriber in the following cases, namely :
- (a) for education outside India for academic, technical, professional or vocational course beyond the High School stage, and
- (b) for any medical, engineering or other technical or specialised course in India beyond the High School stage;

* Substituted vide Ministry of Education letter No. F.11-3/80-T.6, dated 24th March, 1982. Effective from March 15, 1982.

- (ii) for meeting the expenditure in connection with the betrothal/marriage of the subscriber or his sons or daughters, and any other female relation actually dependent on him;
 - (iii) for meeting the expenses in connection with the illness, including where necessary, the travelling expenses, of the subscriber and members of his family or any person actually dependent on him.
- (B) after the completion of fifteen years of service (including broken periods of service, if any) of a subscriber or within ten years before the date of his retirement on superannuation, whichever is earlier, from the amount standing to his credit in the Fund for one or more of the following purposes, namely :
- (i) for constructing or acquiring a suitable house or ready built flat for his residence including the cost of the land;
 - (ii) for repaying an outstanding amount on account of loan expressly taken for constructing or acquiring a suitable house or a ready built flat for his residence;
 - (iii) for purchasing a plot of land for constructing a house thereon for his residence or repaying any outstanding amount on account of loan expressly taken for this purpose;
 - (iv) for reconstructing or making additions or alterations to a house or a ready built flat already owned or acquired by the subscriber;
 - (v) for renovating, making additions or alterations or upkeep of an ancestral house at a place other than the place of duty or to a house built with the assistance of loan from Government at a place other than the place of duty;
 - (vi) for constructing a house on a plot of land purchased under clause (c).
- (C) within six months before the date of the subscriber's retirement, from the amount standing to his credit in the Fund for the purpose of acquiring a farm land or business premises or both.

12. Final Withdrawal of Accumulations In the Fund

When a subscriber quits the service of the Institute the amount standing to his credit in the Fund shall become payable to him.

Provided that a subscriber who has been dismissed from the service of the Institute and is subsequently reinstated in service, shall if required to do so, repay any amount paid to him from the Fund in pursuance of this sub-paragraph with interest thereon at the rate provided in these provisions in the manner provided. The amount so repaid shall be credited to his account in the Fund.

Explanation : A subscriber who is granted refused leave shall be deemed to have quit the service from the date of compulsory retirement or on the expiry of an extension of service.

13. Retirement of a Subscriber

When a subscriber (a) has proceeded on leave preparatory to retirement or if he is entitled to vacation on leave preparatory combined with vacation, or (b) while on leave, has been permitted to retire or has been declared by the Consulting Medical Officer of the Institute or by a competent medical authority that may be prescribed by the Board in this behalf to be unfit for further service, the amount standing to his credit in the Fund shall upon an application made by him in that behalf to the Registrar, become payable to the subscriber.

Provided that the subscriber if he returns to duty shall, if required to do so, repay to the Fund for credit to his account the whole or part of any amount paid to him from the Fund in pursuance of this paragraph with interest thereon at the rate provided, by instalments or otherwise by recovery from his emoluments or otherwise as the Director may direct.

14. Procedure on the Death of a Subscriber

On the death of a subscriber before the amount standing to his credit has become payable, or where the amount has become payable before payment has been made :

(i) *When a subscriber leaves a family*

- (a) If a nomination made by the subscriber in accordance with the subparagraph (i) of paragraph (5) or of the corresponding provision heretofore in force in favour of a member or members of his family subsists, the amount standing to his credit, in the Fund or one part thereof to which the nomination relates shall become payable to his nominee or nominees in the proportion specified in the nomination;
- (b) If no such nomination in favour of a member or members of the family of the subscriber subsists; or if such nomination relates only to a part of the amount standing to his credit in the Fund, the whole amount or the part thereof to which the nomination does not relate, as the case may be, shall, notwithstanding any nomination purporting to be in favour of any person or persons other than a member or members of his family, become payable to the members of his family in equal shares.

Provided that no share shall be payable to—

- (i) sons who have attained majority;
- (ii) sons of a deceased son who have attained majority;
- (iii) married daughters whose husbands are alive;
- (iv) married daughters of a deceased son whose husbands are alive.

If there is any member of the family other than those specified in clauses (i), (ii), (iii) and (iv).

Provided further that the widow or widows and the child or children of

a deceased son shall receive between them in equal part only the share which that son would have received if he had survived the subscriber and had been exempted from the provision of clause (i) of the first proviso.

(ii) *When the subscriber leaves no family*

If a nomination made by him in accordance with the sub-paragraph (i) of paragraph 5 or of the corresponding provision heretofore in force in favour of any person or persons subsists, the amount standing to his credit in the Fund or the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination.

15. Statement of Accounts

- (1) As soon as possible after the 31st of March of each year, the Accounts Officer shall send to each subscriber a statement of his account in the Fund, showing the opening balance on the 1st of April of the year, the total amount credited and debited during the year, the total amount of interest credited as on the 31st March of the year and the closing balance on that date. The Accounts Officer shall attach to the statement of account an enquiry whether the subscriber—
 - (a) desires to make any alteration in any nomination made by the subscriber;
 - (b) has acquired a family (in cases where the subscriber has made no nomination in favour of a member of his family under the rules).
- (2) Subscribers should satisfy themselves as to the correctness of the annual statement, and errors should be brought to the notice of the Accounts Officer within six months from the date of receipt of the statement.
- (3) The Registrar shall, if required by a subscriber once, but not more than once in a year, inform the subscriber of the total amount standing to his credit in the Fund at the end of the last month for which his account has been written up.

***16. Investment of Fund**

All sums paid into the Fund under the rules shall be credited in the books of the Institute to an account by name 'General Provident Fund Account' of the Indian Institute of Technology. A deposit account shall be opened in the State Bank of India to be operated in such manner as the Board may direct. The Institute may invest such part of the Fund, as may be considered expedient, in the Government securities/certificates, negotiable Government guaranteed bonds, and in such deposit schemes of the Central

* Substituted vide Ministry of Education letter No. J. 11011/7777-T. 6, dated 20th July, 1979. Effective from June 25, 1979.

Government as may be notified in this regard from time to time, interest or profit realised on such investments being credited to the Institute as Miscellaneous Receipts.

All investments and securities shall be held in the name of the Institute.

PENSION

17. Superannuation, Invalid and Compensation Pension

- (1) The amount of superannuation, invalid and compensation pension shall be the appropriate amount as set out in Appendix II.
- (2) An employee may retire from service any time after completing 30 years' qualifying service, but before the completion of the age of 60 years, provided he shall give in this behalf a notice in writing to the appropriate authority at least 3 months before the date on which he wishes to retire.
- (3) Institute may also require any employee to retire at any time after he has completed 30 years' qualifying service even before the completion of the age of 60 years, provided the appropriate authority shall give in this behalf a notice in writing to the employee at least 3 months' before the date on which he was required to retire.
- * (4) An employee who retires or is retired in the manner indicated in subparagraph (3) may be granted retiring pension not exceeding 33/80th of the average emoluments subject to a maximum of Rs. 12,000 per annum.

Explanation : For the purpose of this provision any service put in by any employee before attainment of the age of 18 years shall not count towards pension.

18. Qualifying Service

- (1) Every employee shall put in a minimum of ten years of qualifying service on superannuation to be eligible for pension subject to such provision as may be applicable to the categories of pension set out in clause (2).
- (2) Subject to the minimum qualifying service, an employee shall be eligible for one or other of the following pensions :
 - (a) *Compensation Pension*—If an employee is discharged owing to the abolition of the permanent post, he shall be granted a compensation pension on the scale prescribed in paragraph 19.
 - (b) *Invalid Pension*—An invalid pension shall be granted to an employee on retirement from the service of the Institute for permanent physical or mental disability incapacitating him for further service if certified by the Consulting Medical Officer of the Institute on the scale prescribed in paragraph 19.

* Amended vide Ministry of Education letter No. F. 11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

- (c) *Superannuation or Retiring Pension*—Pension shall be granted to an employee who may retire from service on completion of the age of retirement of 60 years or on completion of 30 years of qualifying service whichever is earlier, provided that in the event of retirement after 30 years of qualifying service but before the completion of the age of 60 years the employee concerned shall give in this behalf a notice in writing to the Director at least 3 months before the date on which he wishes to retire.

***19. Scale of Pension**

- (1) An employee eligible for pension/retiring gratuity under any of the categories mentioned in paragraph 17 shall be granted on retirement $\frac{1}{2}$ 80 of the average emoluments for each completed six monthly period of qualifying service subject to maximum pension as stipulated in Appendix II and subject also to the total pension not exceeding 33/80th of the average emoluments. In addition, every such employee shall also be entitled to such dearness allowance as may be granted to employees of the Central Government, from time to time.
- (2) (a) In respect of the employees who were in service on 31st March, 1979 and retiring from service on or after that date, the amount of pension shall be calculated in accordance with the following slabs, namely :
- | | | | | |
|-------|--|---|---|---------------------------|
| (i) | Up to first Rs. 1,000 of average emoluments reckonable for pension | : | : | 50% of average emoluments |
| (ii) | Next 500 of average emoluments reckonable for pension | : | : | 45% of average emoluments |
| (iii) | Balance of average emoluments reckonable for pension | : | : | 40% of average emoluments |
- (b) The amount of pension arrived at on the basis of the above slabs shall be related to the maximum qualifying service of 33 years. For employees who, at the time of retirement, have rendered the qualifying service of ten years or more but less than 33 years, the amount of their pension shall be such proportion of the maximum admissible pension as the qualifying service rendered by them bears to the maximum qualifying service of 33 years.
- (c) The pension as determined in accordance with the above slabs plus the maximum relief on pension at the rate of Rs.100 per month

* Substituted vide Ministry of Education letter No. F-11-3/80-T. 6, dated 24th March, 1982. Effective from March 15, 1982.

admissible to an employee as on 1.12.1978 shall be subject to an overall ceiling of Rs.1,500 per month, if the pension itself exceeds Rs.1500 per month then the maximum pension for full service of 33 years shall be restricted to Rs.1,500 per month and no relief shall be payable up to index level 328.

- (d) Where the amount of pension, calculated by taking into account dearness pay, or calculated after excluding dearness pay, but inclusive of *ad hoc* increases is less than forty rupees per mensem, the difference shall be made good by the grant of further increase in pension.

20. Commutation of Pension

- (1) An employee shall, subject to the conditions specified below, be allowed to commute for lump payment any portion or portions of his pension not exceeding one-third of the pension granted to him.
- (2) No commutation shall be sanctioned unless the Consulting Medical Officer of the Institute certifies that the pensioner's health and prospects of duration of life are such as to justify commutation.
*Provided that an employee who applies for commutation of pension within one year of the date of his retirement on superannuation shall not be subjected to medical examination;
*Provided further that an application for commutation of pension shall be made after the date of retirement and the commutation shall become absolute, that is, the retired employee shall become entitled to receive the commuted value on the date on which his application is received by the Head of office.
- (3) The lump sum payable on commutation shall be calculated in accordance with the table appended to Appendix III.
- (4) Commutation when sanctioned shall take effect on the date to be specified in the order and any such date shall be the first of a month and ordinarily about one month later than the date of the order and all calculations shall be made and with reference to the date specified.

21. Death-cum-Retirement Gratuity

- (1) An employee who has completed 5 years' qualifying service may be granted an additional gratuity not exceeding the amount specified in sub-paragraph (3), when he retires from service and is eligible for a gratuity or pension under paragraph 19.
- (2) If an employee who has completed 5 years' qualifying service dies while in

* Inserted vide Ministry of Education letter No. F. 11-5/78-T. 6, dated 23rd February, 1979, Effective from February 16, 1979.

service, a gratuity not exceeding the amount specified in sub-paragraph (3) may be paid to the person or persons on whom the right to receive the gratuity is conferred under paragraph 22 or if there is no such person, it may be paid in the manner indicated below :

- (i) If there are one or more surviving members of the family as in terms (i), (ii), (iii) and (iv) of clause (a) of sub-paragraph (1) of paragraph (22), it may be paid to all such members other than any such member who is a widowed daughter, in equal shares.
 - (ii) If there are no such surviving members of the family as, at (i) but there are one or more surviving widowed daughters and/or more surviving members of the family as in items (v), (vi) and (vii) of clause (a) of sub-paragraph (1) of paragraph 22, the gratuity may be paid to all such members in equal shares.
- * (3) The amount of gratuity shall be one-fourth of the emoluments of the employee for each completed six monthly period of qualifying service subject to a maximum of $16\frac{1}{2}$ times the 'emoluments'. In the event of death of an employee while in service, the gratuity shall be subject to a minimum of 12 times the 'emoluments' of the employee at the time of his death.
- Provided that in no case it shall exceed Rs.30,000.
- (4) If an employee who has become eligible for a pension under paragraph 17 or gratuity under paragraph 27, dies after he has retired from service, and the sums actually received by him at the time of his death on account of such gratuity or pension together with the gratuity granted under sub-paragraph (1) and the commuted value of any portion of pension commuted by him are less than the amount equal to 12 times his 'emoluments' a gratuity equal to the deficiency may be granted to the persons specified in sub-paragraph (2).
- * (5) The 'emoluments' for the purpose of this paragraph shall be subject to a maximum of Rs.2,500 per mensem.

22. Nominations

- (1) For the purpose of this paragraph—
 - (a) "Family" includes the following relatives of the employee :
 - (i) Wife in the case of a male employee;
 - (ii) Husband in the case of a female employee;
 - (iii) Sons;
 - (iv) Unmarried and widowed daughters;

* Amended vide Ministry of Education letter No. F. 11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

- (v) Brothers below the age of 18 years and unmarried or widowed sisters;
- (vi) Father and mother.

Note : (iii) and (iv) above shall include step and adopted children.

- (b) "Person" shall include any company or association of body of individuals, whether incorporated or not.
- (2) An employee shall make a nomination after conferring on one or more persons the right to receive any gratuity that may be sanctioned under sub-paragraphs (2) and (4) of paragraph 21 and gratuity which having become admissible to him under sub-paragraph (1) of that paragraph and sub-paragraph 5 has not been paid to him before death.
- Provided that if at the time of making the nomination, the employee has family, the nomination shall not be in favour of any persons other than the members of his family specified under clause (a) sub-paragraph 1.
- (3) If an employee nominates more than one person under sub-paragraph (2), he shall specify any nomination of the amount or share payable to each of the nominees in such manner as to cover the whole amount of the gratuity.
- (4) An employee may provide in a nomination :
- (a) in respect of any specified nominee, that in the event of his predeceasing the employee the right conferred upon that nominee shall pass to such other person as may be specified in the nomination;
Provided that if at the time of making the nomination the employee has a family consisting of more than one member, the person so specified shall not be a person other than a member of his family.
 - (b) that the nomination shall become invalid in the event of the happening of a contingency specified therein.
- (5) The nomination made by an employee who has no family at the time of making it, or a provision made in nomination under clause (a) or sub-paragraph (4) by an employee whose family consists, at the date of making the nomination of only one member, shall become invalid in the event of the employee subsequently acquiring a family, or an additional member in the family, as the case may be.
- (6) (a) Every nomination shall be in such one of the forms as may be appropriate in the circumstances of the case.
- (b) An employee may at any time cancel a nomination by sending a notice in writing to the appropriate authority.
Provided that any such employee shall, along with such notice send a fresh nomination made in accordance with this paragraph.
- (7) Immediately on the death of a nominee in respect of whom no special

provision has been made in the nomination under clause (a) of sub-paragraph (4) or on the occurrence of any event by reason of which the nomination becomes invalid in pursuance of clause (b) of that sub-paragraph or sub-paragraph (5), the employee shall send to the appropriate authority a notice in writing formally cancelling the nomination, together with a fresh nomination made in accordance with this paragraph.

- (8) Every nomination made, and every notice of cancellation given by an employee under this paragraph, shall be sent by the employee to his Accounts Officer and immediately on receipt of a nomination from an employee, the Head of the office shall countersign it indicating the date of receipt and keep it under his custody.
- (9) Every nomination made, and every notice of cancellation given, by an employee shall, to the extent that it is valid, take effect on the date on which it is received by the authority mentioned in sub-paragraph (8).

23. Gratuity for Temporary Employees

- (1) *Terminal Gratuity*—A temporary employee who retires on superannuation or is discharged on account of retrenchment or is declared invalid for further service will be eligible for a gratuity at the rate of one-third of a month's pay for each completed year of service, provided that he has completed not less than five years of continuous service at the time of retirement, discharge or invalidment.
- (2) *Death Gratuity*—The family of a temporary employee who dies while in service shall be eligible for a death gratuity on the scale and subject to the conditions specified below :
 - (a) On death, after completion of one year of service but before completion of three years' service, a gratuity equal to one month's pay.
 - (b) On death, after completion of three years of service but before completion of five years' service, a gratuity equal to two months' pay.
 - (c) On death, after completion of five years of service or more, a gratuity equal to three months' pay or the amount of the terminal gratuity mentioned in sub-paragraph (1) whichever is more.

Note : Pay for the purpose of determining the amount of terminal or death gratuity under sub-paragraph (1) or sub-paragraph (2) shall mean only basic pay and also dearness pay in the case of those who retain the existing scales of pay, at the time of relinquishing service or of death, as the case may be, it will not include special pay, personal pay, and other emoluments as pay. In case the employee concerned was on leave with or without allowance immediately before retirement, discharge, invalidment or death, pay for this purpose shall be such which he would have drawn had he not proceeded on such leave.

24. Family Pension.

- * (1) (a) A family pension shall be admissible in case of death while in service or after retirement, if at the time of death, the retired employee was in receipt of a compensation, invalid, retiring or superannuation pension :

Provided that In case of death, while in service the employee should have completed a minimum period of one year service.

- (b) Family pension shall be admissible at the following rates, namely :

<i>Pay of the employee</i>	<i>Monthly pension of the widow/ widower/ children</i>
Below Rs. 400	30% of pay subject to a minimum of Rs.60 and a maximum of Rs.100 per month.
Rs.400 and above but below Rs.1200	15% of pay subject to a minimum of Rs.100 and a maximum of Rs.160 per month.
Rs.1200 and above	12% of pay subject to a minimum of Rs.160 and a maximum of Rs.250 per month.

(2) But

- * (i) (a) in case of an employee who dies after having rendered a minimum service of seven years, the family pension shall be paid at an enhanced rate equal to 50% of the last pay drawn or twice the ordinary family pension at the above rates, whichever is less, for a minimum period of seven years or the age of 65 years, had he survived, whichever is earlier;
- (b) in case of death after retirement, the amount of family pension at the enhanced rates shall not exceed normal superannuation pension (uncommuted value) to which the Institute employees would be entitled to on superannuation;
- (c) family pension in case of death after retirement shall be given only to those who were members of the family of the said employee so declared at the time of retirement.
- (ii) the pension payable thereafter shall be at the rate laid down in the table above;
- (iii) the pension at the rate mentioned under clause (i) shall not be applicable if the employee had put in less than seven years continuous service prior to his death.

* Substituted vide Ministry of Education letter No. F. 11-6/76-T. 6, dated 16th July, 1978. Effective from July 11, 1978.

25. "Family" for the purpose of this Scheme shall include the following relatives :

- (a) Wife, in the case of male employee;
- (b) Husband in the case of female employee;
- (c) Minor son; and
- (d) Unmarried minor daughters.

Note : 1. (c) and (d) shall include children adopted legally before retirement.
2. Marriage after retirement shall not be recognised for purpose of this Scheme.

26. **The Family Pension shall be admissible**

- (a) in case of widow/widower up to the date of death or re-marriage whichever is earlier;
- (b) in case of minor son until he attains the age of 18 years;
- (c) in case of unmarried daughter until she attains the age of 21 years or marriage whichever is earlier.

Note : 1. Where an employee is survived by more than one widow, the pension shall be paid to them in equal shares. On the death of a widow, her share of the pension shall become to her eligible minor child. If at the time of her death, a widow leaves no eligible minor child, the payment of her share of the pension shall cease.

2. Where an employee is survived by a widow but has left behind an eligible minor child from another wife, the eligible minor child shall be paid the share of pension which the mother would have received if she had been alive at the time of death of the employee.

- (d) in the event of re-marriage or death of the widow/widower, the pension shall be granted to the minor children through their natural guardian.

*27. Omitted

28. **Extraordinary Pension and Gratuity**

- (1) Extraordinary pension and gratuity may be sanctioned by the Board when an employee sustains an injury or dies as a result of an injury or is killed.
- (2) While making the award, the Board may take into consideration the degree of default or contributory negligence on the part of the member of the staff who sustains an injury or dies as a result of an injury or is killed.
- (3) For the purpose of Extraordinary Pension and Gratuity Scheme, injury shall be classified as follows :

* Omitted vide Ministry of Education letter No. F.11-6/76-T.6, dated 20th July, 1979. Effective from June 30, 1979.

Class A : Injuries caused as a result of special risk of office which have resulted in the permanent loss of an eye or limb or are of a more serious nature.

Class B : Injuries caused as a result of special risk of office and equivalent, in respect of the degree of disablement which they cause to the loss of a limb or are very severe; or injuries caused as a result of risk of office which have resulted in the permanent loss of an eye or a limb, or/are of a more serious nature.

Class C : Injuries caused as a result of special risk of office which are severe, but not very severe, and likely to be permanent; or injuries caused as a result of risk of office which are equivalent, in respect of the degree of disablement which they cause, to the loss of a limb or which are very severe or severe and are likely to be permanent.

29. (1) If a member of the staff sustains an injury, which falls within Class A, he shall be awarded :
- (a) a gratuity of the applicable amount specified in Appendix IV.
 - (b) with effect from the date following the expiry of one year from the date of the injury :
 - (i) if the injury has resulted in the permanent loss of more than one limb or one eye, a permanent pension of the applicable amount specified in Appendix IV for a higher scale pensions; and
 - (ii) in other cases, a permanent pension the amount of which shall not exceed the applicable amount specified in Appendix IV for a higher scale pension and shall not be less than half that amount.
- (2) If a member of the staff sustains an injury which falls within Class B, he shall be awarded :
- (a) If the injury has resulted in the permanent loss of an eye or limb or is of more serious nature, a permanent pension, with effect from the date of the injury, of an amount which shall not exceed the applicable amount specified in Appendix IV, for a lower scale pension and shall not be less than half that amount.
 - (b) In other cases :
 - (i) for a period of one year, with effect from the date of the injury a temporary pension the amount of which shall not exceed the applicable amount specified in Appendix IV for a lower scale pension and shall not be less than half that amount, and thereafter;
 - (ii) a pension within the limit specified in sub-clause (i), if the Consulting Medical Officer of the Institute from year to year certifies that the injury continues to be very severe.

- (3) If an employee sustains an injury which falls within Class C, he shall be awarded a gratuity of the applicable amount specified in Appendix IV, if the Consulting Medical Officer of the Institute certifies that the member of the staff is likely to be unfit for service for a year, or a proportionate amount subject to a minimum of one-fourth the amount so specified if he is certified to be likely to be unfit for less than a year.

Provided that in any case where the injury is equivalent in respect of the degree of disablement which it causes to the loss of limb, the Board may award, if it thinks fit, in lieu of the gratuity pension not exceeding the amount admissible under clause (b) of sub-paragraph (2).

30. A temporary pension awarded under the Extraordinary Pension and Gratuity Scheme may be converted into a permanent injury pension :

- (a) when the employee is rendered invalid out of service on account of the injury in respect of which the temporary pension was awarded; or
- (b) when the temporary pension has been drawn for not less than five years; or
- (c) at any time, if the Consulting Medical Officer certifies that he sees no reason to believe that there shall ever be a perceptible decrease in the degree of disablement.

31. The award shall be made to the widow and children of the employee as follows :

- (a) if the employee is killed or dies of injury received as a result of special risk of office—
 - (i) a gratuity of the applicable amount specified in paragraph 21; and
 - (ii) a pension the amount of which shall not exceed the applicable amount specified in paragraph 24.
- (b) If the employee is killed or dies of injuries received as a result of risk of office, a pension the amount of which shall not exceed the applicable amount specified in paragraph 24.

Provided that if the pay of the deceased member of the staff was less than Rs. 200, the monthly pension or the sum of pensions that may be granted under this paragraph shall not, irrespective of the rates (including the minimum limits) specified in paragraph 24 exceed the limit of one-half of his pay and if in any case the sum of such pensions calculated under paragraph 24 exceeds the limit of one-half of his pay such a *pro rata* reduction shall be made in the amount of each individual pension as will reduce the sum to such limit.

32. If the deceased employee has left neither a widow nor a child, an award may be made to his father and his mother individually or jointly and in the absence of the father and mother to minor brothers and sisters, individually or jointly if they were largely dependent on the employee for support and are in pecuniary need.

Provided that the total amount of the award shall not exceed one half of the pension that would have been admissible to the widow under the preceding paragraph.

Provided further that each minor brother's or sister's share shall not exceed the amount of pension specified in paragraph 24 for a "child who is not motherless".

33. Any award made under paragraph 32 shall in the event of an improvement in the pecuniary circumstances of the pensioner, be subject to review in such manner as the Board may by order prescribe.

34. A family pension shall take effect from the day following the death of the employee or from such other date as the Board may determine.

35. A family pension shall ordinarily be tenable---

- (a) in the case of a widow or mother until death or remarriage, whichever occurs earlier;
- (b) in the case of a minor son, or minor brother, until the age of 18;
- (c) in the case of an unmarried daughter or minor sister, until marriage or until she attains the age of 21, whichever occurs earlier;
- (d) in the case of a father, for life.

36. Except as otherwise provided in the Extraordinary Pension and Gratuity Scheme, an award made under the foregoing paragraphs shall not affect any other pension or gratuity for which the employee concerned or his family may be eligible under other schemes.

37. (1) When a claim for any injury pension or gratuity or family pension arises under the Extraordinary Pension and Gratuity Scheme, the officer in charge of the office or the department or section in which the injured or the deceased was employed shall forward the claim to the Board through the Director with the following documents :

- (a) a full statement of circumstances in which the injury was received, the disease was contracted or the death occurred;
- (b) the application for injury pension or gratuity in Form X, or as the case may be, the application for family pension in Form XI;
- (c) in the case of an injured employee or one who has contracted a disease, medical report in Form XII;
- (d) in the case of a deceased employee, a medical report as to the death or reliable evidence as to the actual occurrence of the death, if the employee lost his life in such circumstances that a medical report cannot be secured.

(2) The Director while placing the above documents before the Board shall add

to it a report of the Audit Officer as to whether an award is admissible under the Scheme and if so, of what amount.

***37A. Deposit Linked Insurance Scheme**

On the death of a subscriber, the person entitled to receive the amount standing at the credit of the subscriber shall be paid by the Accounts Officer an additional amount equal to the average balance in the account during the 3 years immediately preceding the death of such subscriber, subject to the condition that—

- (a) The balance at the credit of such subscriber shall not at any time during the 3 years preceding the month of death have fallen below the limits of—
 - (i) Rs. 4000 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 1300 or more;
 - (ii) Rs. 2500 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is Rs. 900 or more but less than Rs. 1300;
 - (iii) Rs. 1500 in the case of subscriber who has held, for the greater part of the aofresaid period of three years, a post of the maximum of the pay scale of which is Rs. 291 or more but less than Rs. 900,
 - (iv) Rs. 1000 in the case of a subscriber who has held, for the greater part of the aforesaid period of three years, a post the maximum of the pay scale of which is less than Rs. 291.
- (b) the additional amount payable under this rule, shall not exceed Rs. 10,000.
- (c) the subscriber has put in at least 5 years' service at the time of his death.

Notes : 1. The average balance shall be worked out on the basis of the balance at the credit of the subscriber at the end of each of the 36 months preceding the month in which the death occurs. For this purpose, as also for checking the minimum balances prescribed above.

- (a) The balance at the end of March shall include the annual interest credited in terms of paragraph 9; and
 - (b) If the last of the aforesaid 36 months is not March, the balance at the end of the said last month shall include interest in respect of the period from the beginning of the financial year in which death occurs to the end of the said last month.
2. Payments under this scheme should be in whole rupees. If an amount due includes a fraction of a rupee, it should be rounded to the nearest rupee (50 paise counting as the next higher rupee).

* Inserted vide Ministry of Education letter No F. 16-24/78-T. 6, dated 1st March, 1979. Effective from the same date from which it is applicable to Government servants.

3. Any sum payable under this scheme is in the nature of insurance money and, therefore, the statutory protection given by section 3 of the Provident Funds Act; 1925 (19 of 1925) does not apply to sums payable under this scheme.
4. This scheme also applies to those subscribers to the Fund who are transferred to an autonomous organisation consequent upon conversion of a Government Department into such a body and who, on such transfer, opt, in terms of option given to them to subscribe to this Fund in accordance with these rules.

GENERAL

38. The sanction and payment of pension and gratuity benefits admissible under this Schedule shall be regulated by such procedural instructions as may be issued by the Board from time to time.

39. When the Board is satisfied that the operation of any of these provisions causes/ is likely to cause undue hardship to an employee, it may, notwithstanding anything contained in these provisions, deal with the cases of such employees in such manner as may appear to it to be just and equitable.

40. (1) The Board shall have the power to condone, on the merits of individual cases, shortages up to three months in the period of qualifying services prescribed for any of the purposes of foregoing provisions.

(2) Resignations of permanent/temporary contract appointment of Central/ State Government service or the service of an autonomous organisation or the service of a Corporate body of Central/State Governments take up with proper permission another appointment under any of the Institute incorporated under any of the Institute of Technology Act, 1961 or any Central University service in which counts in full or part for pension is not a resignation and such resignation shall not constitute interruption in service.

Provided that in any such case the proportionate pensionary liability is borne by the employer from whose services the employee joins the Institute or Central University in case where an interruption in service is inevitable due to the two appointments being in different stations, such interruptions not exceeding the joining time permissible under the rules of transfer shall be covered by grant of leave of any kind due to the employee on the date of release or by formal condonation as referred to above to the extent to which the period is not covered by leave due to the employee.

Provided further that such employee shall be required to surrender in lump sum or instalments not exceeding 12 in number, employer's contributions in

* Substituted vide Ministry of Education letter No. F. 11-6/82-T. 6, dated 31st January, 1984. Effective from January 28, 1984.

full received at the time of resignation along with the interest as was in force, the date on which the amount actually received from the date of payment to the date of final refund and the amount along with interest thereof shall be credited to the pension fund of the Institute or Central University.

41. If any question arises relating to the interpretation of these provisions, it shall be referred to the Board whose decision thereon shall be final.

42. Future good conduct of the recipient of the pension etc. is an implied condition of every grant of a pension under these provisions and the Institute reserves to itself the right of withholding or withdrawing such a pension or any part of it if, the recipient be convicted of serious crime or be guilty of great misconduct and the decision of the sanctioning authority of the pension in such matters shall be final.

APPENDIX I

Form I—Option

[See Statute 16B(2)]

I _____ an employee of the Indian Institute of Technology _____ hereby elect to be governed by General Provident Fund-cum-Pension-cum-Gratuity Scheme as laid down in Statute 16B and Schedule 'F' to the Statutes of the Institute and relinquish my claim to be governed by all the terms and conditions including that of retirement benefits which were applicable to me immediately before the 1st January, 1971. I am aware of this fact that this election is final and that it shall take effect from the 1st January, 1971.

Signature _____
(Thumb Impression, if illiterate)

Designation _____

Date of election _____

Witnesses :

(1) _____

(2) _____

Form II—Option

[See Statute 16B(4)]

I _____ an employee of the Indian Institute of Technology _____ hereby elect to be governed by General Provident Fund-cum-Pension-cum-Gratuity Scheme as laid down in Statute 16B and Schedule 'F' to the Statutes of the Institute and relinquish my claim to be governed by all the terms and conditions including that of retirement benefits which were applicable to me immediately before the 1st April, 1970. I am aware of this fact that this election is final and that it shall take effect from the 1st April, 1970.

Signature _____
(Thumb Impression, if illiterate)

Designation _____

Date of election _____

Witnesses :

(1) _____

(2) _____

Form III — Declaration

[See Paragraph 1(3)]

I _____ (the subscriber), an employee of the Indian Institute of Technology at _____ do hereby declare that I have read the provisions governing the General Provident Fund-cum-Pension-cum-Gratuity Scheme of the Indian Institute of Technology _____ and agree to abide by them.

Dated, this _____ day of 19

Signature of Subscriber

Two witnesses to the signature :

1. _____

2. _____

*APPENDIX II
GPF-cum-Pension-cum-Gratuity Scheme

(See paragraph 19)

Completed six monthly periods of qualifying service	Scale of gratuity or pension	Maximum pension (in rupees per annum)
1	$\frac{1}{2}$	(a) Gratuity months emoluments
2	1	" "
3	$1\frac{1}{2}$	" "
4	2	" "
5	$2\frac{1}{2}$	" "
6	3	" "
7	$3\frac{1}{2}$	" "
8	4	" "
9	$4\frac{3}{8}$	" "
10	$4\frac{3}{4}$	" "
11	$5\frac{1}{8}$	" "
12	$5\frac{1}{2}$	" "
13	$5\frac{7}{8}$	" "
14	$6\frac{1}{4}$	" "
15	$6\frac{5}{8}$	" "
16	7	" "
17	$7\frac{3}{8}$	" "
18	$7\frac{3}{4}$	" "
19	$8\frac{1}{8}$	" "
20	$\frac{10}{80}$ ths	(b) Pension of average emoluments
21	$10\frac{1}{2}$ /80ths	" "
22	11/80ths	" "
23	$11\frac{1}{2}$ /80ths	" "
24	12/80ths	" "
25	$12\frac{1}{2}$ /80ths	" "
26	13/80ths	" "
27	$13\frac{1}{2}$ /60ths	" "
28	14/80ths	" "
29	$14\frac{1}{2}$ /80ths	" "
30	15/80ths	" "
		3,750.70
		3,937.50
		4,125.00
		4,312.50
		4,500.00
		4,687.50
		4,875.00
		5,062.50
		5,250.00
		5,437.50
		5,625.00

* Substituted vide Ministry of Education letter No. F. 11-8/76-T.8, dated 1st January, 1979.

APPENDIX II (Contd.)

Completed six monthly periods of qualifying service		Scale of pension	Maximum pension (in rupees per annum)
1		2	3
31	15 1/2/80ths	(b) Pension of average	5,812.50
32	16/80ths	emoluments	6,000.00
33	16 1/2/80ths	" "	6,187.50
34	17/80ths	" "	6,375.00
35	17 1/2/80ths	" "	6,562.50
36	18/80ths	" "	6,750.00
37	18 1/2/80ths	" "	6,937.50
38	19/80ths	" "	7,125.00
39	19 1/2/80ths	" "	7,312.50
40	20/80ths	" "	7,500.00
41	20 1/2/80ths	" "	7,687.00
42	21/80ths	" "	7,875.00
43	21 1/2/80ths	" "	8,060.50
44	22/80ths	" "	8,250.00
45	22 1/2/80ths	" "	8,437.50
46	23/80ths	" "	8,625.00
47	23 1/2/80ths	" "	8,812.50
48	24/80ths	" "	9,000.00
49	24 1/2/80ths	" "	9,187.50
50	25/80ths	" "	9,375.00
51	25 1/2/80ths	" "	9,562.50
52	26/80ths	" "	9,750.00
53	26 1/2/80ths	" "	9,937.50
54	27/80ths	" "	10,125.00
55	27 1/2/80ths	" "	10,312.50
56	28/80ths	" "	10,500.00
57	28 1/2/80ths	" "	10,687.50
58	29/80ths	" "	10,875.00
59	29 1/2/80ths	" "	11,062.50
60	30/80ths	" "	11,250.00
61	30 1/2/80ths	" "	11,437.50
62	31/80ths	" "	11,625.00
63	31 1/2/80ths	" "	11,812.50
64	32/80ths	" "	12,000.00
65	32 1/2/80ths	" "	12,000.00
66	33/80ths	" "	12,000.00

APPENDIX III

Commutation Table

(Commutation value for a pension of Re. 1/- per annum)

(See paragraph 20)

Age next birthday	Commutation value expressed as number of years purchase	Age next birthday	Commutation value expressed as number of years purchase	Age next birthday	Commutation value expressed as number of years purchase
1	2	3	4	5	6
17	19.24	40	15.75	63	8.99
18	19.15	41	15.52	64	8.66
19	19.06	42	15.27	65	8.34
20	18.96	43	15.02	66	8.01
21	18.86	44	14.76	67	7.69
22	18.76	45	14.50	68	7.37
23	18.64	46	14.23	69	7.06
24	18.53	47	13.96	70	6.75
25	18.40	48	13.68	71	6.45
26	18.28	49	13.39	72	6.15
27	18.14	50	13.10	73	5.86
28	18.00	51	12.80	74	5.58
29	17.85	52	12.50	75	5.30
30	17.70	53	12.20	76	5.03
31	17.54	54	11.89	77	4.78
32	17.37	55	11.58	78	4.52
33	17.20	56	11.26	79	4.28
34	17.01	57	10.94	80	4.05
35	16.82	58	10.62	81	3.83
36	16.62	59	10.29	82	3.62
37	16.42	60	9.97	83	3.42
38	16.20	61	9.64	84	3.23
39	15.98	62	9.31	85	3.04

APPENDIX IV

Scale of Injury Gratuity and Pension

(See paragraph 29)

Pay of member of staff on the date of injury	Gratuity	Monthly Pension :	Monthly Pension :
		Higher Scale	Lower Scale
		Rs.	Rs.
1. Rs. 2,000 and over		300	225
2. Rs. 1,500 and over but under Rs. 2,000		275	200
3. Rs. 1,000 and over but under Rs. 1,500	3 months' pay subject to a minimum of Rs. 800	200	150
4. Rs. 900 and over but under Rs. 1,000	"	150	125
5. 400 and over but under Rs. 900	"	100	84
6. Rs. 350 and over but under Rs. 400	"	85	70
7. Rs. 200 and over but under Rs. 350	"	67	50
8. Under Rs. 200	4 months' pay	1/3rd of pay sub- ject to a mini- mum of Rs. 8 per mensem	1/5th of pay sub- ject to a mini- mum of Rs. 4 per mensem

APPENDIX V

Classification of Injuries

[See paragraph 82(3)]

Equal to loss of limb

- Bemiplegia without aphasia
- Permanent use of tracheotomy tube
- Artificial anus
- Total deafness of both ears

Very severe

- Complete unilateral facial paralysis, likely to be permanent
- Lesion of kidney ureter or bladder
- Compound fractures (except phalanges)
- Such gross destruction of soft parts as to lead to permanent disability or loss of function.

Severe and likely to be permanent

- Ankylosis of, or considerable restriction in the movement of one of the following joints :
 - Knee, elbow, shoulder, hip, ankle, temporo-maxillary or rigidity of the dorsilumbar or cervical section of the spine.
- Partial loss of vision of one eye.
- Destruction or loss of the testicle.
- Retention of foreign bodies not causing permanent or serious symptoms.

APPENDIX VI

Forms of Nomination for General Provident Fund

FORM I

When the subscriber has a family and wishes to nominate one member thereof

I hereby nominate the person mentioned below, who is a member of my family as defined in Paragraph 5(1) of the General Provident Fund-cum-Pension-cum-Gratuity Rules of the Indian Institute of Technology to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable, has not been paid :

Name & Address of the nominee	Relation-ship with subscriber	Age	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person if any, to whom the right of the nominee shall pass in the event of the nominee predeceasing the subscriber
-------------------------------	-------------------------------	-----	---	--

Dated this _____ day of _____ 19 _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Subscriber

Designation _____

Department _____

FORM II

When the subscriber has a family and wishes to nominate more than one member thereof

I hereby nominate the persons mentioned below, who are members of my family as defined in Paragraph 5(1) of the General Provident Fund-cum-Pension-cum-Gratuity Rules of the Indian Institute of Technology, to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable has not been paid and direct that the said amount shall be distributed among the said persons in the manner shown below against their names :

Names & addresses of the nominees	Relation-ship with subscriber	Age	*Amount or share of accumulation to be paid to each	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person or persons, if any, to whom the right of the nominee shall pass in the event of the nominee's pre-deceasing the subscriber
-----------------------------------	-------------------------------	-----	---	---	---

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Subscriber _____

Designation _____

Department _____

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

FORM III

[See paragraph 5(1)]

When the subscriber has no family and wishes to nominate one person

I having no family as defined in Paragraph 5(1) of the General Provident Fund-cum-Pension-cum-Gratuity Rules of the Indian Institute of Technology, hereby nominate the person mentioned below, to receive the amount that may stand to my credit in the Fund in the event of my death before that amount has become payable or having become payable has not been paid :

Name & address of the nominee	Relation-ship with subscriber	Age	*Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person or persons, if any, to whom the right of the nominee shall pass in the event of the nominee's predeceasing the subscriber
-------------------------------	-------------------------------	-----	--	--

Dated this _____ day of _____ 19____ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Subscriber

Designation

Department

* Where a subscriber who has no family makes a nomination, he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

FORM IV

When the subscriber has no family and wishes to nominate more than one person

I, having no family as defined in Paragraph 5(1) of the General Provident Fund-cum-Pension-cum-Gratuity Rules of the Indian Institute of Technology, hereby nominate the persons mentioned below, to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable or having become payable has not been paid, and direct that the said amount shall be distributed among the said persons in the manner shown below against their names :

Names & addresses of the nominees	Relationship with the subscriber	Age	*Amount of share of accumulation to be paid to each	†Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee in the event of the nominee's predeceasing the subscriber

Dated this _____ day of _____ 19____ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of the Subscriber

Designation

Department

* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

† Where a subscriber who has no family makes a nomination he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

FORM V

Nomination for Death-cum-Retirement Gratuity

(See paragraph 22)

When the member of staff has a family and wishes to nominate one member thereof

I hereby nominate the person mentioned below, who is a member of my family and confer on him the right to receive any gratuity that may be sanctioned by the Institute in the event of my death while in service and the rights to receive on my death gratuity which having become admissible to me on retirement may remain unpaid at my death :

Name & address of the nominee	Relationship with member of staff	Age	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person or persons, if any, to whom the right conferred on the nominee shall pass in the event of the nominee predeceasing the member of staff or the nominee dying after the death of the member of staff but before receiving payment of the gratuity.	Amount or share of gratuity payable to each
-------------------------------	-----------------------------------	-----	---	---	---

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

Signature of member of staff

2. _____

Note : The last column should be filled in so as to cover the whole amount of gratuity.

FORM VI

Nomination for Death-cum-Retirement Gratuity

(See paragraph 22)

When the member of staff has a family and wishes to nominate more than one member thereof

I hereby nominate the persons mentioned below, who are members of my family, and confer on them the right to receive, to the extent specified below, any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death, to the extent specified below, any gratuity which having become admissible to me on retirement may remain unpaid at my death :

Names & address- es of no- minees	Relationship with member of staff	Age	Amount or share of gra- tuity pay- able to each	Name, address and relation- ship of the person or persons if any, to whom the right con- ferred on nominee shall pass in the event of the nominee predeceasing the member of staff or the nominee dying after the death of the member of the staff but before recei- ving payment of the gratuity	Amount or share of gratuity payable to each
---	---	-----	--	--	---

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

N.B. The member of staff shall draw line across the blank space below the last entry to prevent the insertion of any name after he has signed.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

Signature of member of staff

2. _____

Nomination by _____

Signature of Registrar

Designation _____

Date _____

- Note :*
1. Fourth column should be filled in so as to cover the whole amount of gratuity.
 2. The amount/share or gratuity shown in last column should cover the whole amount/share payable to the original nominees.

FORM VII

Nomination for Death-cum-Retirement Gratuity

(See paragraph 22)

When the member of staff has no family and wishes to nominate one person

I, having no family, hereby nominate the person mentioned below and confer on him the right to receive any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death any gratuity which having become admissible to me on retirement may remain unpaid at my death :

Name & address of the nominee	Relation-ship with member of staff	Age	Contingencies on the happening of which nomination shall become invalid	Name, address and relationship of the person or persons, if any, to whom the right conferred on the nominee shall pass in the event of the nominee predeceasing the member of staff or the nominee dying after the death of the member of staff but before receiving payment of the gratuity	Amount or share of gratuity payable to each
-------------------------------	------------------------------------	-----	---	--	---

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

Signature of member of staff

2. _____

Signature of Registrar

Nomination by _____

Date _____

Designation _____

Department _____

FORM VIII

Nomination for Death-cum-Retirement Gratuity

(See paragraph 22)

When the member of staff has no family and wishes to nominate more than one person

I, having no family, hereby nominate the persons mentioned below and confer on them the right to receive to the extent specified below, any gratuity that may be sanctioned by the Institute in the event of my death while in service and the right to receive on my death, to the extent specified below any gratuity which having become admissible to me on retirement may remain unpaid at my death :

Names & addresses of nominees	Relation-ship with member of staff	Age	*Amount or share of gratuity payable to each	Contingencies on the happening of which the nomination shall become invalid	Name, address & relationship of person or persons, if any, to whom the right conferred on the nominee shall pass in the event of the nominee predeceasing the member of staff or the nominee dying after the death of the member of staff but before receiving payment of the gratuity	†Amount or share of gratuity payable to each

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

N.B. : The member of staff should draw lines across blank space below the last entry to prevent the insertion of any name after he has signed.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____
2. _____

Signature of member of staff
Dated _____

Nomination by _____
Designation _____
Department _____

Signature of Registrar
Date _____

* This column should be filled in so as to cover the whole amount of gratuity.

† The amount/share of gratuity shown in this column should cover the whole amount of share payable to the original nominees.

FORM IX

Nomination for Family Pension

(See paragraph 22)

I hereby nominate the persons mentioned below who are members of my family, to receive in order shown below the family pension which may be granted by the Institute in the event of my death after completion of 5 years' qualifying service :

Name and address of the nominee	Relationship with member of staff	Age	Whether married or unmarried
---------------------------------	-----------------------------------	-----	------------------------------

This nomination supersedes the nomination made by me earlier on _____ which stands cancelled.

N.B.: The member of staff should draw lines across blank space below the last entry to prevent the insertion of any name after he has signed.

Dated this _____ day of _____ 19 _____ at _____

Two witnesses to signature :

1. _____

2. _____

Signature of member of staff

Nomination by _____

Designation _____

Department _____

Signature of Registrar

Date

FORM X

Form of Application for Injury Pension for Gratuity

(See paragraph 37)

1. Name of applicant
2. Father's name
3. Residence, showing village and pergunah
4. Present or last employment :
Designation _____
Department/Section _____
5. Date of beginning of service at the Institute
6. Length of service, including interruption
7. Classification of injury
8. Pay at the time of injury
9. Proposed pension or gratuity
10. Date of injury
11. Place of payment
12. Date of applicant's birth by Christian era*
13. Date on which the applicant applied for pension

Place _____

Date _____

Signature of applicant

Special remarks, if any, by member of the staff in charge of the department/section/office

Signature

* If not known exactly, must be stated on the best information or estimate.

FORM XI
Form of Application for Family Pension
(See paragraph 37)

Application for an extraordinary pension for the family of late _____ killed, or died or injuries received, as a result of special risk of office

- | | |
|--|--|
| Submitted by the description of claimant | 1. Name and residence, showing village and pergunah
2. Age
3. Height
4. Mark of identification
5. Present occupation and pecuniary circumstances
6. Degree of relationship to deceased |
| Description of deceased | 7. Name
8. Occupation and service
9. Length of service
10. Pay when killed
11. Nature of injury causing death
12. Amount of pension or gratuity proposed
13. Place of payment
14. Date from which pension is to commence
15. Remarks |

Name *Date of birth by
Christian era*

Names and ages of surviving kindred of deceased

Sons
Widows
Daughters
Father
Mother

Signature of claimant

Place _____

Date _____

Signature of member of staff
in charge of the department/
section/office

Place _____

Date _____

Note : If the deceased has left no son, widow, daughter, father or mother surviving him, the word 'none' or 'dead' should be entered opposite to such relative.

FORM XII

Form to be used by Consulting Medical Officer when Reporting on Injuries

(See paragraph 37)

Confidential Report of the Consulting Medical Officer on the present state of the injury sustained by disease contracted by _____ at _____ (Place of injury, etc.) on _____ (date of injury, etc.)

- (a) State briefly the circumstances under which the injury was sustained/ disease was contracted.
- (b) What is the present condition of the member of the staff?
- (c) Is the present condition of the member of the staff wholly due to the injury/ disease?
- (d) If not, state to what other causes it is attributable. In the case of disease, from which date does it appear that the member of the staff has been incapacitated?

The opinion of the Consulting Medical Officer on the question below is as follows :

Part 'A' — First Examination

The severity of the injury should be assessed in accordance with the following classification and details given in the Remarks column below :

Yes No

1. Is the injury :

- (i) (a) the loss of an eye or limb?
(b) the loss of more than one eye or limb?
- (ii) more severe than the loss of an eye or a limb?
- (iii) equivalent to the loss of an eye or a limb?
- (iv) very severe?
- (v) severe, but not likely to be permanent?
- (vi) slight but likely to be permanent?

2. For what period from the date of the injury :

- (a) has the member of the staff likely to remain unfit for duty?
- (b) is the member of the staff likely to remain unfit for duty?

Remarks : Here the classification above may be amplified if necessary, or details of additional injuries to the main injury may be given.

Part 'B' — Second or Subsequent Examinations

If the original degree of the member of the staff has changed : In which of the above categories should it now be placed?

Remarks : In this space additional details may be given if necessary.

Signature of Consulting Medical Officer

Dated

**Instructions to be Observed by the Consulting Medical Officer in
Preparing the Report**

1. Before recording his opinion he should invariably consult the previous reports, if any, as also all medical documents connected with the member of the staff on previous examinations brought before him for examination.
2. If the injuries be more than one they should be numbered and described separately and should it be considered that, for instance, though only "severe" or "slight" in themselves, they represent together the equivalent of a single "very severe" injury, such an opinion may be expressed in the columns provided.
3. In answering the questions in the prescribed form he will confine himself exclusively to the medical aspect of the case and will carefully discriminate between the unsupported statements of the member of the staff and the medical and documentary evidence available.
4. He will not express any opinion, either to the member of staff examined, or in his report, as to whether he is entitled to compensation, or as to the amount of it nor will he inform the member of the staff how the injury has been classified.

Office Address : #302, The Capital-B wing, Adjacent Regent Plaza,
Baner-Pashan Link Road, Baner, Pune - 411045, Maharashtra, India
☎ (+91) 78880 41660 / 70 ✉ Sjinfo@stratjuris.com 🌐 www.stratjuris.com

30210
06/04/18

2 April 2018

To,
The Controller of Patents,
The Patent Office, Delhi



Re: Patent Application Number 201711036085 filed on 11 Oct 2017

Applicant - Surgitech Healthcare Private Limited

Dear Sir/ Madam,

We submit herewith the following document in respect of the above mentioned patent application:

1. Form 26 (Power of Authorization) Duly Stamped in our favour
2. FORM 1 (Proof of right)

The controller is respectfully requested to take the aforesaid documents on record.

Yours faithfully,

Priyank Gupta

StratJuris Partners

Agent for the Applicant

IN/PA-1454

Mob: +91 95452 20444

Email: ip@stratjuris.com

Ans
06/04/18

IPO DELHI 06-04-2018 16:47



FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7,54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No.:..... Filing Date:..... Amount of Fee Paid:..... CBR No.:..... Signature:.....
--	--

1. APPLICANT(S)

Sr.	Name	Nationality	Address
1	Surgitech Healthcare Private Limited	India	9/102, Geeta Colony, Delhi-110031, New Delhi, India

2. INVENTOR(S)

Sr.	Name	Nationality	Address
1	Anuj Kumar	India	9/102 Geeta colony Delhi 110031
2	Surender Kumar Sharma	India	House No 4327, Street No 20 Shanti Mohalla Extn. Delhi 110031
3	Ajay Kaul	India	14/27 East Patel Nagar Delhi

3. TITLE OF THE INVENTION: **MOTORIZED REUSABLE TITANIUM SURGICAL TOOL FOR POSITIONING STABILIZING AND EXPOSING OF HEART**

4. ADDRESS FOR CORRESPONDENCE OF APPLICANT / AUTHORIZED PATENT AGENT IN INDIA

StratJuris Partners, 302, The Capital Building, B wing, BanerPashan Link Road, Pune 411045

Telephone No.:07888041660
 Fax No.:
 Mobile No.:.....
 E-mail:ip@stratjuris.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY:

Sr.	Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
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6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International Application Number	International Filing Date as Allotted by the Receiving Office
PCT//	

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) Application Number	Date of Filing of Original (first) Application
-------------------------------------	--

8. PARTICULARS FOR FILING PATENT OF ADDITION

Main Application / Patent Number	Date of Filing of Main Application
----------------------------------	------------------------------------

9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We, Anuj Kumar, Surender Kumar Sharma, Ajay Kaul, is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:-----

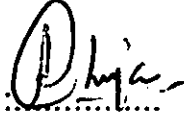
(b) Signature(s) of the inventor(s):

(c) Name(s): Anuj Kumar, Surender Kumar Sharma, Ajay Kaul

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 4/7/2017

(b) Signature(s) 

(c) Name(s) of the singnatory: Surgitech Healthcare Private Limited (ANUJKUMAR)

(iii) Declaration by the applicant(s):

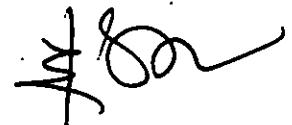
- The Complete specification relating to the invention is filed with this application.
- I am/We are, in the possession of the above mentioned invention.
- There is no lawful ground of objection to the grant of the Patent to me/us.
- I am/We are, the assignee or legal representative to true first inventors.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

Sr.	Document Description	FileName
1	COMPLETE SPECIFICATION	FORM 2.pdf
2	DRAWINGS	DRAWING.pdf
3	FIGURE OF ABSTRACT	FIGURE OF ABSTRACT.pdf
4	EVIDENCE FOR REGISTRATION UNDER SSI(FORM-28)	DIPP1659_Surgitech_Helathcare_Pvt_Ltd_Recognition.pdf
5	FORM FOR SMALL ENTITY(FORM-28)	Form 28_drafted.pdf

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated hering are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this(Final Payment Date):-----



Signature.....

Name:PRIYANK GUPTA

To The Controller of Patents
The Patent office at NEW DELHI

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We hereby assent to the action already taken by the said person (s) in the above matter. I hereby revoke all previous authorizations, if any, made in respect of said matter or proceeding.

Dated this 01st Day of October, 2017

Signature for Surgitech Healthcare Pvt. Ltd.:



Name of Authorized Signatory:

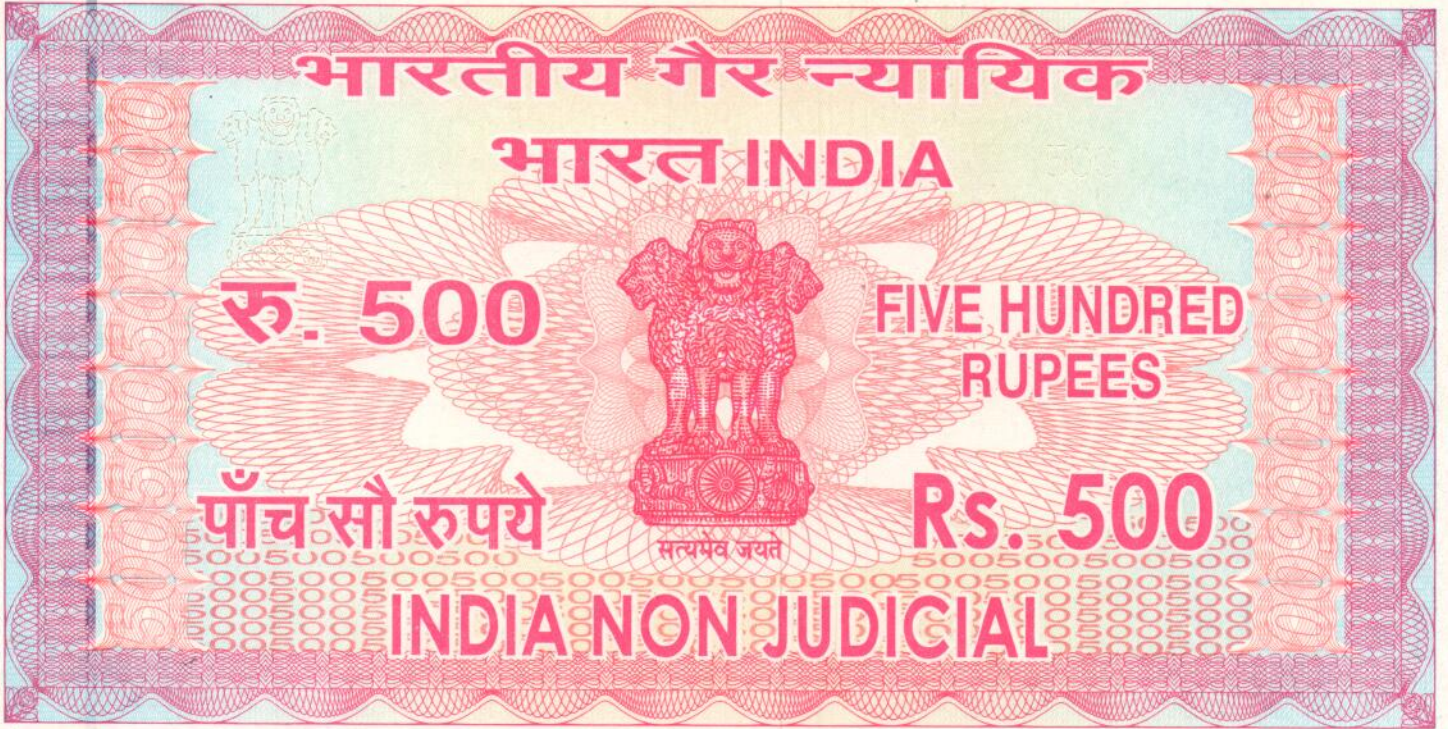
ANUJ KUMAR

Designation:

Director

To
The Controller of Patents,
The Patent Office
at Delhi

IPO DELHI 06-04-2018 16:47



महाराष्ट्र MAHARASHTRA

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AH 298426

दि. 20 MAR 2018

वस्तु का प्रकार

वस्तु नोंदणी के लिए माहौत का? होय/नाही.

मिळकतीचे व.

मुद्रांक विकत *Street Juris Partners*

पत्ता *Baner Pashan Link Road Pune*

दुसऱ्या पक्षकार *The Patent office*

हस्ते ध्यक्तीचे नाव *Pranita Shinde*

[Signature]

सौ. आश्विनी डी. पाटसकर
परवाना क्र. २२०११३३

मुद्रांक विकत घेणाऱ्याची सही

अ. ४४



ज्या कारणासाठी ज्यांनी मुद्रांक खोदी केला त्यांनी त्याच कारणासाठी मुद्रांक खोदी केल्यापासून ६ महिन्यात वापरणे बंधनकारक आहे.

FORM-26

THE PATENT ACT, 1970

(39 of 1970)

AND

THE PATENT RULES 2003

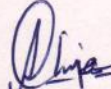
GENERAL FORM OF AUTHORISATION OF PATENT AGENT / ANY PERSON IN A MATTER OR PROCEEDING UNDER THE ACT

(See Sections 127 and 132; Rule 135)

We, **Surgitech Healthcare Private Limited**, an Indian company, having address as 9/102, Geeta Colony, Delhi-110031, New Delhi, India, hereby authorize Mr. Priyank Gupta and Mr. Deepak Pawar (Advocates and Registered Patent Agents), Ms. Pranita Shinde (Patent Agent), Ms. Vithika Sharma, Ms. Sonali Sawant and Mr. Varad Shende (Advocates) and or any other Patent Agents and advocates of the firm having address as **StratJuris Partners**, #302 The Capital "B" Wing, Adjacent Regent Plaza, Baner-Pashan Link Road, Pune - 411045, MH, India to act as my agent for Filing & Prosecution of Patent Applications entrusted to them on our behalf from time to time, including any PCT application, Divisional Application or any application for Patent of addition filed / to be filed, thereto and for obtaining Letters, patent documents from Indian Patent Office in respect of inventions sought to be protected by such applications, and for doing of acts required under the rules, including renewal, restoration and recordal of assignments, on our behalf as provided in the act, for cases entrusted to them and for the purpose of the same and to take all steps necessary and requisite thereto and confirm that all notices, requisitions and communications relating thereto may be sent to said agents at the above address and that they are authorized to pay all necessary fees and incur costs as may be required from time to time on our behalf.

We hereby assent to the action already taken by the said person (s) in the above matter. I hereby revoke all previous authorizations, if any, made in respect of said matter or proceeding.

Dated this 01st Day of October, 2017

Signature for Surgitech Healthcare Pvt. Ltd.: 

Name of Authorized Signatory: ANUJ KUMAR

Designation: Director

To
The Controller of Patents,
The Patent Office
at Delhi

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7,54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No.:..... Filing Date:..... Amount of Fee Paid:..... CBR No.:..... Signature:.....
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1. APPLICANT(S)

Sr.	Name	Nationality	Address
1	Surgitech Healthcare Private Limited	India	9/102, Geeta Colony, Delhi-110031, New Delhi, India

2. INVENTOR(S)

Sr.	Name	Nationality	Address
1	Anuj Kumar	India	9/102 Geeta colony Delhi 110031
2	Surender Kumar Sharma	India	House No 4327, Street No 20 Shanti Mohalla Extn. Delhi 110031
3	Ajay Kaul	India	14/27 East Patel Nagar Delhi

3. TITLE OF THE INVENTION: **MOTORIZED REUSABLE TITANIUM SURGICAL TOOL FOR POSITIONING STABILIZING AND EXPOSING OF HEART**4. ADDRESS FOR CORRESPONDENCE OF APPLICANT /
AUTHORISED PATENT AGENT IN INDIA

StratJuris Partners, 302, The Capital Building, B wing, BanerPashan Link Road,
Pune 411045

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No.:07888041660
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E-mail:ip@stratjuris.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY:

Sr.	Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
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6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International Application Number	International Filing Date as Allotted by the Receiving Office
PCT//	

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) Application Number	Date of Filing of Original (first) Application
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8. PARTICULARS FOR FILING PATENT OF ADDITION

Main Application / Patent Number	Date of Filing of Main Application
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9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We ,Anuj Kumar ,Surender Kumar Sharma ,Ajay Kaul , is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:-----

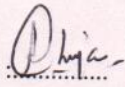
(b) Signature(s) of the inventor(s):.....

(c) Name(s):Anuj Kumar ,Surender Kumar Sharma ,Ajay Kaul

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: 11/7/2017

(b) Signature(s) : 

(c) Name(s) of the singnatory: Surgitech Healthcare Private Limited (ANUJKUMAR)

(iii) Declaration by the applicant(s):

- The Complete specification relating to the invention is filed with this application.
- I am/We are, in the possession of the above mentioned invention.
- There is no lawful ground of objection to the grant of the Patent to me/us.
- I am/We are, the assignee or legal representative to true first inventors.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

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5	FORM FOR SMALL ENTITY(FORM-28)	Form 28_drafted.pdf

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated hering are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this(Final Payment Date):-----



Signature:.....

Name:PRIYANK GUPTA

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The Patent office at NEW DELHI

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FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENT RULES, 2003

COMPLETE SPECIFICATION

(See Section 10 and Rule 13)

Title of invention:

**MOTORIZED REUSABLE TITANIUM SURGICAL TOOL FOR
POSITIONING STABILIZING AND EXPOSING OF HEART**

APPLICANT:

Surgitech Healthcare Private Limited

an Indian company,

having address as,

9/102, Geeta Colony, Delhi-110031,

New Delhi, India

The following specification particularly describes the invention and the manner in which it is to be performed.

CROSS-REFERENCE TO RELATED APPLICATIONS AND PRIORITY

The present application does not claim priority from any patent application.

TECHNICAL FIELD

The present invention relates generally to a device, method and system for exposing, positioning and stabilizing an organ or tissue, and more particularly
5 relates to a device and system capable of exposing, positioning, stabilizing and/or holding a heart during cardiac surgery.

BACKGROUND

10 Ever growing stress and rapid lifestyle changes experienced in the last few decades have contributed to escalating coronary artery disease which is one of the major clinical conditions affecting the world at large and leads to morbidity and mortality. It can lead to insufficient blood flow to various areas of the heart causing discomfort of angina and the risk of ischemia as well as acute blockage of coronary blood flow
15 resulting in irreversible damage to the myocardial tissue including myocardial infarction and the risk of death. Many available treatments include endovascular or percutaneous treatments using techniques such as balloon angioplasty, atherectomy, laser ablation, stents, and the like.

An alternative technique is to perform a coronary artery bypass graft (CABG)
20 procedure. CABG surgery, also known as “heart bypass” surgery, which generally entails the use of a graft or conduit to bypass the coronary obstruction and, thereby provide blood flow to the downstream ischemic heart tissues. The procedure is generally lengthy, traumatic and subject to patient risk. Among the risk factors involved is the use of a cardiopulmonary bypass (CPB) circuit, also known as a
25 “heart-lung machine”, to both pump blood and oxygenate the blood so that the patient's heart may be stopped during the surgery, with its function performed by the CPB circuit.

Due to the risks incurred during cardiopulmonary bypass, beating heart bypass surgery techniques have been developed to allow coronary artery bypass without cardiopulmonary bypass. Several systems are presently available which attempt to immobilize epicardial tissue in the immediate vicinity of an anastomosis site
5 through a pressure stabilizer employing a simple mechanical fork. Such a device stabilizes the heart by pressing a fork downwards onto the heart surface. The fork is typically mounted to an elongated shaft, which in turn is typically mounted to a retractor, which holds the patient's ribs apart to create an operative window. Angular movement of the shaft relative to the retractor in some cases is
10 accomplished by means of a turret, which may be clamped in its desired rotational position. Longitudinal movement of the shaft relative to the retractor is typically allowed as well, and clamping mechanisms are typically provided to allow clamping of the shaft to the turret and locking of the fork relative to the shaft.

Such stabilization systems instead employ a comparatively long, flexible arm
15 carrying a pair of suction paddles or foot pads at its distal end. During use, the arm is typically secured to a surgical spreader or retractor, holding the patient's ribs apart to create an operative window. The foot pads are placed on either side of the anastomosis site and suction is applied to grip and immobilize the surface of the heart. Thereafter, tension is applied along the length of the arm to lock the arm in
20 its position and to lock the position of the foot pads relative to the arm.

In the prior art, the use of flexible articulating arm which provides a heart positioning device for positioning, manipulating, holding, grasping, immobilizing and/or stabilizing a heart is known. However, such devices suffer from several drawbacks.

25 Firstly, such devices are made from materials which possess little specific strength and are also not immune to corrosion. For example, some state of art technologies use aluminium, iron, zinc, tin, steel, copper, bronze etc., some of which are prone to rust and corrosion and which are additionally heavy to carry and possess little specific strength. This renders the device useless after a few uses, necessitating the

need for replacement which is both unsustainable and cost intensive. Further such devices are not autoclavable further reducing their potential for sustainable reuse.

Secondly, most devices are extremely bulky, difficult to operate and need labour assistance since they are to be operated manually. This is not just tedious but also
5 dangerous from the safety perspective because this increases the possibility of human error.

Thirdly, the tension necessary to be applied to the device for facilitating the accurate holding, spreading, exposing, strengthening and tightening functions is not
10 uniformly applied because the tension creating stranded ropes are usually made up of materials like plastics which cannot withstand the required tension.

Resultantly, the lack of uniform tension application results in a loosened grip and reduced efficiency of clamping which causes tremors, shaking, vibration etc. of the tissue / heart held, spread, exposed, strengthened or tightened by the said device. This is extremely dangerous since it can affect various parameters of the left atrium
15 or overall cardiac parameters due to sudden fall or vibration during the holding, spreading, exposing, strengthening and tightening functions.

Thus, what is needed is a device for positioning, stabilizing, and exposing of a tissue during, wherein the device may be made from a material which is autoclavable, strong and corrosion free with high specific strength and wherein the device is
20 operatable via a motor to avoid human error and can withstand sustained tension to reduce tremors of tissue / heart during positioning stabilizing and exposing functions. Accordingly, the present invention which provides for titanium reusable motorized surgical tool for positioning stabilizing and exposing of heart, is of significance and may solve long-standing pressing need.

25

SUMMARY

This summary is provided to introduce aspects related to a device, method and system for positioning an organ or tissue, and more particularly relates to a device

and system capable of exposing, positioning, stabilizing and/or holding a heart during cardiac surgery. This summary is however not intended to disclose essential features of the innovation, nor is it intended to determine, limit or restrict the scope of the innovation.

- 5 In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during, wherein the device may comprise a flexible, articulating arm, a base assembly, a turret assembly mounted on said base assembly, a tension creating means, a controlling assembly and a jaw-type coupling mechanism, are disclosed.
- 10 In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during, wherein the device may include a flexible, articulating arm with hollow core, attached to a base assembly at its proximal end and may include a fixing means for plurality of tightening, holding, attaching or spreading systems at its distal end, are disclosed. The device may further include a turret
- 15 assembly mounted on said base assembly through an associated pivot, which may facilitate rotation of proximal end of said flexible arm relative to said base assembly. The device may further include a controlling assembly comprising of a round nut and threaded rod mechanism operated either manually or through a high torque DC motor with attached gearbox assembly. The device may further include
- 20 a tension creating means, controlled by said controlling mechanism, which may comprise a tension member attached to said fixing means at distal end and to said controlling assembly at proximal end and passing through entire body of said flexible arm to apply tension at said fixing means for plurality of functions, wherein said tension member may comprise of a stainless-steel stranded rope of a
- 25 predetermined thickness. The device may also include a jaw-type coupling mechanism to connect body of said flexible arm to said high-torque motor with gear assembly for rotation of the round nut threaded rod mechanism, wherein said coupling mechanism may enable removable attachment of said high torque DC motor with attached gearbox for movement of the nut-threaded rod mechanism.

In another aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during, wherein the device may include a flexible, articulating arm with hollow core, attached to a base assembly at its proximal end and may include a fixing means for plurality of tightening, holding, attaching or spreading systems at its distal end, are disclosed in accordance with an aspect of the invention described above. The device may comprise a manual means for rotational movement of the round nut threaded rod mechanism, wherein the manual means may comprise of a handle connected with the round nut threaded rod mechanism instead of the jaw-type coupling mechanism for the device comprising motorized means, in accordance with an aspect of the invention.

In another aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the flexible arm, the turret assembly, the fixing means for plurality of tightening, holding, attaching or spreading systems and the controlling assembly of said device may be made from a transition metal with high specific strength and anti-corrosive properties which makes said device lightweight, autoclavable and reusable.

In still another aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the device may contain a vacuum tube connected to a centralised suction line that may enable holding of said tissue or organ at a pre-determined pressure through suction means by a plurality of holding systems, are disclosed.

In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the flexible arm of the device may comprise of up to 22 ring-link structures which may be made from a transition metal with high specific strength and anti-corrosive properties enabling autoclaving and reuse and may be arranged through interlocking joints so as to provide predetermined strength, durability, lightness and flexibility, are disclosed.

In another aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the device may further comprise

three distinct locking means for positioning the device in a particular configuration, are disclosed. The device may comprise a first locking means on said turret assembly to lock the turret assembly on the base assembly in a particular configuration. The device may comprise a second locking means operatable
5 through a button-like structure at the proximal end which may provide locking of said flexible arm of the device. The device may further comprise a third locking means operatable through the said tension means which when pulled by the nut and threaded rod mechanism may provide locking of distal end and fixing means for plurality of tightening, holding, attaching or spreading systems in particular desired
10 configuration.

In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the turret assembly of the device may enable additional range of motion of said flexible arm which may be rotated at a plurality of angles between 0 degree and 360 degree and wherein said three-locking-
15 means may enable accurate positioning of said flexible arm, are disclosed.

In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the tension member may comprise a stainless steel stranded rope of at least 2.5 mm thickness which may facilitate controlled movement of tissue or organ and may provide the necessary strength to
20 said flexible arm for stabilizing cardiac parameters and avoiding undue shaking or vibration of said tissue or organ.

In one aspect of the invention, the features of a device for exposing, positioning and stabilizing of a tissue during surgery, wherein the device may provide for a controlling assembly comprising of a nut and threaded rod mechanism to control
25 the movement of the tension member and wherein said controlling assembly may be operated either manually or through a high torque DC motor with attached gearbox assembly, are disclosed.

The foregoing, and other, features and advantages of the invention will become further apparent from the following detailed description of preferred embodiments,

read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims in equivalence thereof.

5

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description is given with reference to the accompanying figure. In the figure, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the drawings to refer like features and components.

10 Figure 1 (100) illustrates a schematic view of a device for exposing, positioning and stabilizing of a tissue during surgery in accordance with the present invention.

Figure 2 (200) illustrates the detailed interlocking structure of the titanium rings of the flexible articulating arm of said device for exposing, positioning and stabilizing of a tissue during surgery in accordance with the present invention

15 Figure 3 (300) illustrates the arrangement of the three distinct locking means in accordance with the present invention.

Figure 4 (400) illustrates the motorized handling mechanism of the device in accordance with the present invention.

20 The figures depict embodiments of the present disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the steps illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION

25 The foregoing detailed description of embodiments is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the disclosure, there are shown in the present document example constructions of the

disclosure; however, the disclosure is not limited to the specific design disclosed in the document and the drawings.

The detailed description is provided with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the drawings to refer like features and components.

Referring to Figure 1, in one embodiment the device may comprise a flexible, articulating arm (101), attached to a base assembly (102) at its proximal end and may include a fixing means (106) for plurality of tightening, holding, attaching or spreading systems (107) at its distal end. The device may further include a turret assembly (103) mounted on said base assembly (102) through an associated pivot, which may facilitate rotation of proximal end of said flexible arm (101) relative to said base assembly (102) and a locking means on said pivot which may provide for locking said turret (103) to base assembly (102). The device may further include a controlling assembly (104) comprising of a nut and threaded rod mechanism (401) operated either manually (105) or through a high torque DC motor with attached gearbox assembly (402). The device may further include a tension creating means (108), controlled by said controlling mechanism, which may comprise a tension member attached to said fixing means (106) at distal end and to said controlling assembly (104) at proximal end and passing through entire hollow body of said flexible arm (101) to apply tension at said fixing means (106) for plurality of functions, wherein said tension member may comprise of a stainless-steel stranded rope of a predetermined thickness. The device may also include a jaw-type coupling mechanism (not shown in the figure) to connect body of said flexible arm (101) to said high-torque motor with gear assembly for rotation of the nut-threaded rod mechanism (401), wherein said coupling mechanism may enable removable attachment of said high torque DC motor with attached gearbox (402) for movement of the nut-threaded rod mechanism (401). In another embodiment, the device may comprise manual means (105) of rotational movement of the nut-threaded rod mechanism (401) wherein the manual means is facilitated by a handle

connected to said nut-threaded rod mechanism (401) instead of said jaw-type coupling mechanism.

Figure 2 is a combination figure referring to various constituents of the flexible arm (101). Referring to Figure 2, in one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a flexible articulating arm (101) wherein the body of the flexible arm (101) may comprise of a transition metal with high specific strength and anti-corrosive properties which makes said device lightweight, autoclavable and reusable. The body of the flexible arm (101) may comprise multiple ring-like structures (or rings). Each ring like structure may comprise a hollow core and be designed in a way to facilitate accurate inter-linking, fixation and complex and intricate interlocking arrangements with adjacent ring like structure to provide the necessary flexibility as well as sturdiness to the device. The hollow core of the flexible arm (101) is designed so as to enable the continuous presence of the tension member which may pass from the controlling mechanism on the proximal end to the fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) at its distal end. The flexible arm (101) length can be modified according to needs by adjustments to number, size, length, and other dimensions of the rings. For e.g. segments of shorter length provide greater flexibility but come with less and the flexible arm (101) may become unstable when a force is applied to the proximal end and thus accordingly, the user can adjust the length of the device without compromising on accurate holding, tightening spreading mechanisms as well as without compromising on the strength and sturdiness of the device. Further, the flexibility of the flexible arm (101) in the invention may be increased or decreased by the provision of a nut (referred to as the second locking means) at the proximal end at the base assembly (102).

Referring further to Figure 2, in one embodiment of the present invention, the flexible articulating arm (101) of said device may comprise of multiple rings of variable size to provide flexibility and strength and uniform distribution of stress along the flexible arm (101), thus preventing excessive wear on any particular ring

like structure Each ring of the flexible arm (101) may have variable size having outer diameter between 14.99 mm (201) to 20.00 mm (202) made with a transition metal with high specific strength and anti-corrosive properties.

Referring further to Figure 2, in one embodiment of the present invention, the rings
5 of the flexible arm (101) may be manufactured of any substance having sufficient hardness and strength for the intended purpose and may be preferably made of hardened metal.

Referring further to Figure 2, in one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may
10 comprise a flexible articulating arm (101) comprising multiple rings wherein the final ring like structure (203) towards the distal end may comprise a collet (204)-ribbit (205)- jaw (206) structure with a concave socket ball joint to facilitate the attachment of the fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) at its distal end. The concave ball joint / tip connect may
15 also be made from a transition metal with high specific strength and anti-corrosive properties.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a flexible articulating arm
20 (101) wherein the distal end of the flexible arm (101) comprising fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) may be attached through a ball and socket joint or arm collect or universal rotating connected ball to the ball joint / tip connect of the last ring of the multiple ring body of the flexible articulating arm (101). The convex ball joint or arm collect or universal rotating connected ball may fit in perfectly with the concave ball joint /
25 tip connect of the last ring of the multiple ring body of the flexible articulating arm (101) to provide the necessary strength and compactness to the said device.

In an exemplary embodiment of the present invention, the flexible, articulating arm (101) of said device may comprise of up to 22 units of said ring-like structures which may be connected to a base assembly (102) at its proximal end and to a fixing

means (106) for plurality of tightening, holding, attaching or spreading systems (107) at its distal end and wherein each of the said rings may comprise of a transition metal which can render it autoclavable and reusable, said transition metal being more preferably titanium.

5 Referring to Figure 3, in one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a three distinct locking means and tension creating means (108) comprising a tension member which may go through the entire body of the flexible arm (101) i.e. the hollow portion of all of the rings and may be connected to fixing means (106) at
10 distal end and to a controlling assembly (104) at proximal end and which may help apply tension at said fixing means (106) for plurality of functions. The first locking means may comprise a small plug-like structure (301) which may comprise of any material, more preferably of steel or titanium and may be designed according to the turret – base structure design such that once placed in position, the plug-like
15 structure (301) firmly locks the turret (103) on the base assembly (102) in a desired configuration. The second locking means may comprise a small nut like structure (302) on the base assembly (102). The nut-like structure (302) may be worked through a screwing-unscrewing mechanism. The screwing-unscrewing of the nut-like structure (302) may facilitate locking the flexible arm (101) of the device with
20 the turret assembly (103) and base assembly (102) thus locking the entire device in a desired configuration to suit the needs of the operating surgeon. The turret (103) is freely rotatable around the base assembly (102) within an angle ranging from 0 degree to 360 degree. The device arm (101) which comprises of up to 22 ring-link structures also possesses necessary flexibility so as to enable addition freedom of
25 movement for the surgeon during operation. The third locking means (not shown in figure) may comprise pulling the tension creating means (108) to create tension and lock the tension creating means (108) in a particular configuration which in turns locks the fixing means (106) at the distal end in a particular configuration by hydropressing with the controlling mechanism. This locking of the fixing means
30 (106) with a plurality of holding, spreading, exposing, strengthening and tightening systems (107) enables accurate positioning of the device and also helps ensure that

the tissue / organ is held with the necessary strength and does not experience a fall or tremor or vibration of any kind. Application of tension by means of handle may serve to perform multiple functions, including locking both the proximal and distal arms in their desired configurations, rotationally locking the turret assembly (103) relative to the base assembly (102), and controlling activating the spreading/tightening mechanism to spread pods at the fixing means (106) slightly apart from one another. Such three distinct locking means ensure the device is locked at both the distal and proximal ends in a desired configuration to aid in accurate holding, spreading, exposing, strengthening and tightening functions.

Referring to Figure 4, in an embodiment of the present invention, the controlling mechanism may comprise a nut and threaded rod mechanism (401) for controlling the tension creating means (108) and which may be operated through a high torque DC motor with attached gearbox assembly (402). A jaw-type coupling mechanism may be used to connect the controlling mechanism and the high torque DC motor with attached gearbox assembly (402). The end purpose of the controlling assembly (104) is to spin either the threaded rod or nut in a “nut-threaded rod” assembly so that the actuating mechanism can be realized to control the stabilizer arm (101). The gear box may be attached to shaft of the motor to further enhance the torque produced which is the driving force for movement of the nut and threaded mechanism (401) which in turn helps control the applied tension through tension creating means (108). The motor shaft of the gear box that delivers the enhanced torque may be connected to either nut or threaded rod in the “nut-threaded rod” assembly. The system may be electromechanical in nature and may provide precise control mechanism (403) over stabilizer arm (101) by controlling the tension of the stranded rope. Application of torque through the motor with attached gear box assembly may tighten the tension means i.e. stainless steel stranded rope and may cause the rings to hold against each other in place. The rings may vary in size along the length of the arm (101) and immobilization of the rings relative to each other during tightening of the tension stranded rope may be facilitated by the shape of the hollow core which is flared, having a larger opening with the surface of the spherical protrusion and a smaller opening through the surface of the spherical

indentation. The motor with gear assembly may permit the tightening of the device wherein rotational movement of said nut may allow to and fro movement of said threaded rod and wherein the to-and-fro movement of said threaded rod enables control of said flexible arm (101) and application of tension on the plurality of tightening, holding, attaching or spreading systems (107) at its distal end for a plurality of functions.

In one embodiment of the present invention, the motor with gear assembly may comprise a high torque DC motor. Gear Box components may be used in appropriate gear ratio to achieve the required range of torque.

10 In another embodiment of the present invention, a motor with gear assembly may comprise a high torque DC/stepper motor or a DC servo motor or any other type of high torque DC motor with an AC to DC adapter device (404) attached therewith. Gear Box components may be used in appropriate gear ratio to achieve the required range of torque.

15 In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a controlling mechanism which may be operated through a motor with an attached gear box assembly wherein the gear box assembly attached to shaft of the DC motor may comprise component gears including but not limited to spur, helical, spiral, bevel, worm, 20 planetary, zero bevel or combinations thereof.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a controlling assembly (104) which may be operated by a high torque DC motor with gear box assembly and wherein said high torque DC motor may be operated using mini push buttons 25 at the turret assembly (103) of the device, or through attached push buttons operatable by foot or through any other operatable means to facilitate controlled application of torque. The controlled application of torque enables controlled movement of the nut-threaded rod assembly (401) which in turn provides a controlled uniform tension application on the tension means i.e. stainless steel

stranded rope to allow precise and accurate movements of the fixing means (106) at the distal end as well as the plurality of tightening, holding, attaching or spreading systems. In particular, during cardiac surgery this controlled mechanism of uniform application of tension devoid of human error and fatalities, may be of great assistance to maintain the cardiac parameters of the patient's heart and other associated tissues. This is possible because the exact tension applied to the fixing means (106) with a plurality of tightening, holding, attaching or spreading systems (107) removes the major tremors of hands due to manual spinning and helps prevent sudden falling of the heart held by the plurality of tightening, holding, attaching or spreading systems. This may help in stabilizing the left atrium or heart parameters and may also help in preventing any damages.

In another embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a controlling mechanism comprising a nut and threaded rod mechanism (401) which may be operated by manual means. The manual means may comprise tightening of a handle placed at the proximal end of the device which couples the handle to the controlling assembly (104) containing a nut-threaded mechanism. The handle may be rotated preferentially to permit the tightening of the device wherein rotational movement of said nut may allow to-and-fro movement of said threaded rod and wherein the to-and-fro movement of said threaded rod enables application of tension by pulling the tension means and in turns enables control of said flexible arm (101) and application of tension on the plurality of tightening, holding, attaching or spreading systems (107) at its distal end for a plurality of functions.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise mechanical coupling for the attachment of motor and gear assembly to stabilizer arm (101) which may be optionally removable. The mechanical coupling between the nut-threaded rod of the stabilizer arm (101) and the shaft of the motor-gear box assembly may be provided by utilizing easy to remove mechanical couplings i.e. jaw-type couplings or joints inside a socket or any combinations thereof. The jaw-type coupling

mechanism may help for easy removal of electrical parts which cannot be autoclaved from the other autoclavable components.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a tension means comprising
5 a tension member prepared from a hardened metal material or any other material with similar characteristics which represents the internal flexible axis wherein the tension stranded rope runs through the hollow core of the flexible arm (101) from the controlling means at the proximal end to the fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) at the distal end and
10 wherein the tension stranded rope can sustain the applied tension and which can apply the preferred tension to fixing means (106) for plurality of tightening, holding, attaching or spreading systems (107) at the distal end without breakage or damage.

In a highly preferred embodiment, the device for exposing, positioning and
15 stabilizing of a tissue during surgery may comprise a tension creating means (108) comprising a tension means which can withstand an enhanced torque and which preferably comprises stainless steel stranded rope, having a thickness of not less than 2.5 mm.

In one embodiment of the present invention, the device for exposing, positioning
20 and stabilizing of a tissue during surgery may comprise a sleeve attached to the fixing means (106) for a particular type of holding systems (107) wherein the sleeve may be connected to a vacuum line connection for application of vacuum to the said holding systems. The holding means may comprise a structure containing negative pressure foot pads, negative pressure foot chest, holding system pillars and suction
25 pores. The application of the vacuum may be enabled across the pressure foot sleeve through a high-pressure line with a negative pressure channel which is connected to any of the plurality of centralised suction lines. The application of vacuum may enable the suction pores to hold the tissue / heart in a fixed position during surgical procedures and may enable the system to maintain the essential cardiac parameters
30 by preventing any vibration or falling or any other disturbance to the heart.

In an exemplary embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a vacuum line connection for application of vacuum through a high-pressure line with a negative pressure channel to a particular type of holding systems (107) at the fixing means (106) comprising foot pads with central suction pores and apical upliftment of tissue.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may comprise a flexible arm (101) with fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) at its distal end wherein the plurality of tightening, holding, attaching or spreading systems (107) may be removable, autoclavable and reusable, and wherein said systems (107) may include but are not limited to foot pads, positioners, LA retractor, cooley atrial retractor, Atrial Septal Defect (ASD) and Ventricular Septal Defect (VSD) rose retractors or combinations thereof.

In one embodiment of the present invention, the device for exposing, positioning and stabilizing of a tissue during surgery may be utilized for a plurality of surgeries, including but not limited to open & minimally invasive cardiovascular surgery, valve replacement surgery through sternotomy & thoracotomy incision, off-pump coronary artery bypass grafting or combinations thereof. And wherein said device, may be utilized for a plurality of functions including retraction and stabilizing to control the movement of the beating heart, tissue stabilizer, heart positioning, dispositioning or combinations thereof.

The foregoing description shall be interpreted as illustrative and not in any limiting sense. A person of ordinary skill in the art would understand that certain modifications could come within the scope of this disclosure.

WE CLAIM:

1. A device (100) for positioning, stabilizing and exposing of tissue during surgery, said device comprising:

- a) a flexible, articulating arm (101)
- 5 b) a base assembly (102)
- c) a turret assembly (103)
- d) a tension creating means (108), and
- e) a controlling assembly (104),

wherein, said flexible arm (101) is attached to a base assembly (102) at its proximal end and a fixing means (106) for a plurality of tightening, holding, attaching or spreading systems (107) at its distal end, and comprises of a predetermined number of ring-like structures having a hollow core,

and wherein, said turret assembly (103) is mounted on said base assembly (102) through an associated pivot and a first-locking means (301) which facilitates locking of rotation of the turret and locking of said flexible arm (101) in desired configuration relative to said base assembly (102),

and wherein, said controlling assembly (104) comprises of a nut and threaded rod mechanism (401) operated either manually (105) or through a high torque DC motor with attached gearbox assembly (402) to lock the proximal end of the device and to control the tension applied at the distal end of said device,

and wherein, said tension creating means (108) comprises a tension member (108) attached to said fixing means (106) at distal end and to said controlling assembly (104) at proximal end and passing through entire body of said flexible arm (101) to apply tension at said fixing means (106) for plurality of functions, wherein said tension member is a stainless-steel stranded rope of a predetermined thickness,

and wherein, a jaw-type coupling mechanism connects body of said flexible arm (101) to said high-torque motor with gear assembly for rotation of the nut-threaded rod mechanism (401) and enables removable attachment of said high

torque DC motor with attached gearbox (402) for movement of the nut-threaded rod mechanism (401),

and characterizing in that, said predetermined number of ring-like structures of the flexible arm (101), said turret assembly (103) and said fixing means (106) for plurality of tightening, holding, attaching or spreading systems (107) are made from a transition metal with high specific strength and anti-corrosive properties which makes said device autoclavable and reusable.

2. The device of claim 1, wherein said fixing means (106) for a plurality of holding systems (107) at distal end is connected with a vacuum line connection coupled with a vacuum tube, characterizing in that the vacuum generation enables holding of said tissue or organ at a predetermined pressure through suction means by said plurality of holding systems.
3. The device of claim 1 and claim 2, wherein vacuum is applied to the plurality of holding systems (107) through a pressure control line with a negative pressure channel connected to any of the plurality of centralised suction lines, and characterizing in that the plurality of holding systems (107) comprise negative pressure foot pads, negative pressure foot chest, holding system pillars and suction pores which facilitate application of vacuum for functioning of the holding systems.
4. The device of claim 2, wherein plurality of holding systems (107) attached to fixing means (106) at distal end include but are not limited to foot pads and apical upliftment of tissue.
5. The device of claim 1, where in the said transition metal from which entire body of said device is made, is most preferably titanium.

6. The device of claim 1, wherein said flexible arm (101) comprises up to 22 rings of titanium, each with a hollow core having a diameter between 14.99 mm (201) and 20 mm (202), and wherein each ring is jointly connected to the next ring so as to provide durability, strength and flexibility to said flexible arm (101).

5

7. The device of claim 1, wherein the proximal-most ring of said flexible arm (101) has an elongated cylindrical shape and is fixed to the turret assembly (103), and wherein the distal most ring of said flexible arm (101) comprises a proximal-end elongated ribbit (205) and a distal-end collet (204) comprising a concave ball joint, wherein the collet (204) is attached to the ribbit (205) on its proximal end and to a jaw-like structure (206) on its distal end, and wherein the concave ball joint is designed in a way to fit into a convex ball joint attached to said fixing means.

8. The device of claim 1, wherein the turret assembly (103) enables additional range of motion of said flexible arm (101) which can be rotated at a plurality of angles between 0 degree and 360 degree and comprises a button-like structure as second-locking means (302) for fixing proximal end in a desired predetermined configuration.

20

9. The device of claim 1, wherein the tension member is a stranded rope made of stainless steel of at least 2.5 mm thickness which facilitates controlled movement of tissue or organ characterizing in that said tension member with said predetermined thickness provides the necessary strength to said flexible arm (101) for stabilizing cardiac parameters and avoiding undue shaking or vibration of said tissue or organ.

25

10. The device of claim 1, wherein the pulling of the tension member by said manual means or by said motorized means of said device enables a third-locking

means for locking the fixing means (106) at the distal end of the device in desired predetermined configuration.

11. The device of claim 1 and claim 9, wherein the rotational movement of said nut
5 allows to and fro movement of said threaded rod and wherein the to and fro
movement of said threaded rod enables control of said flexible arm (101) and
application of tension on the plurality of tightening, holding, attaching or
spreading systems (107) at its distal end for a plurality of functions.
- 10 12. The device of claim 1, wherein the controlling mechanism is comprised of either
high torque DC motor with attached gear assembly or a DC motor or a stepper
motor or a servo motor with an AC to DC adapter device or any combinations
thereof.
- 15 13. The device of claim 1, wherein the controlling mechanism is operated by the
use of a push button system on the turret assembly (103) to control the clockwise
& anticlockwise rotation of the motor shaft for applying the desirable tension
on tension stranded rope.
- 20 14. The device of claim 1, wherein gear box assembly attached to shaft of the DC
motor comprises component gears including but not limited to spur, helical,
spiral, bevel, worm, planetary, zero bevel or combinations thereof.
- 25 15. The device of claim 1, wherein the tension is created for a plurality of functions,
including but not limited to locking the device arm (101) in its current
configuration, rotationally locking the turret assembly (103) relative to the base
assembly (102), controlling the spreading or tightening mechanism to spread
said systems attached to fixing means (106) slightly apart from one another.


16. The device of claim 1, wherein the fixing means (106) at distal end can be attached to a plurality of removable, autoclavable, reusable systems (107) for tightening, holding, attaching or spreading purposes, said systems (107) including but not limited to foot pads, positioners, LA retractor, cooley atrial retractor, Atrial Septal Defect (ASD) and Ventricular Septal Defect (VSD) rose retractors or combinations thereof.

17. The device of claim 1, wherein the plurality of tightening, holding, attaching or spreading enable the application of the device for a plurality of surgeries, including but not limited to open & minimally invasive cardiovascular surgery, valve replacement surgery through sternotomy & thoracotomy incision, off-pump coronary artery bypass grafting or combinations thereof.

18. The device of claim 1, wherein the device arm (101) can be utilized for a plurality of functions including retraction and stabilizing to control the movement of the beating heart, tissue stabilizer, heart positioning, dispositioning or combinations thereof.

19. The device of claim 1, wherein the device is operated through a manual means, characterizing in that the manual means is connected to the nut-threaded rod mechanism (401) and facilitates rotational movement of the nut-threaded rod mechanism.

Dated this 11th Day of October 2017



Priyank Gupta
Agent for the Applicant
IN/PA-1454

ABSTRACT

The invention discloses a device for exposing, positioning and stabilizing of a tissue during surgery. The said device is a transition metal material which is autoclavable, strong and corrosion free with high specific strength. The said device is also
5 operatable by a motor to avoid human subjectivity of manual use and to improve the ergonomics during its use and can withstand sustained tension application through its tension creating means to minimize vibration of the tissue / heart during exposing, positioning and stabilizing functions so that essential cardiac parameters are not at risk during such coronary artery surgery.

10 *[To be published with Figure 1]*

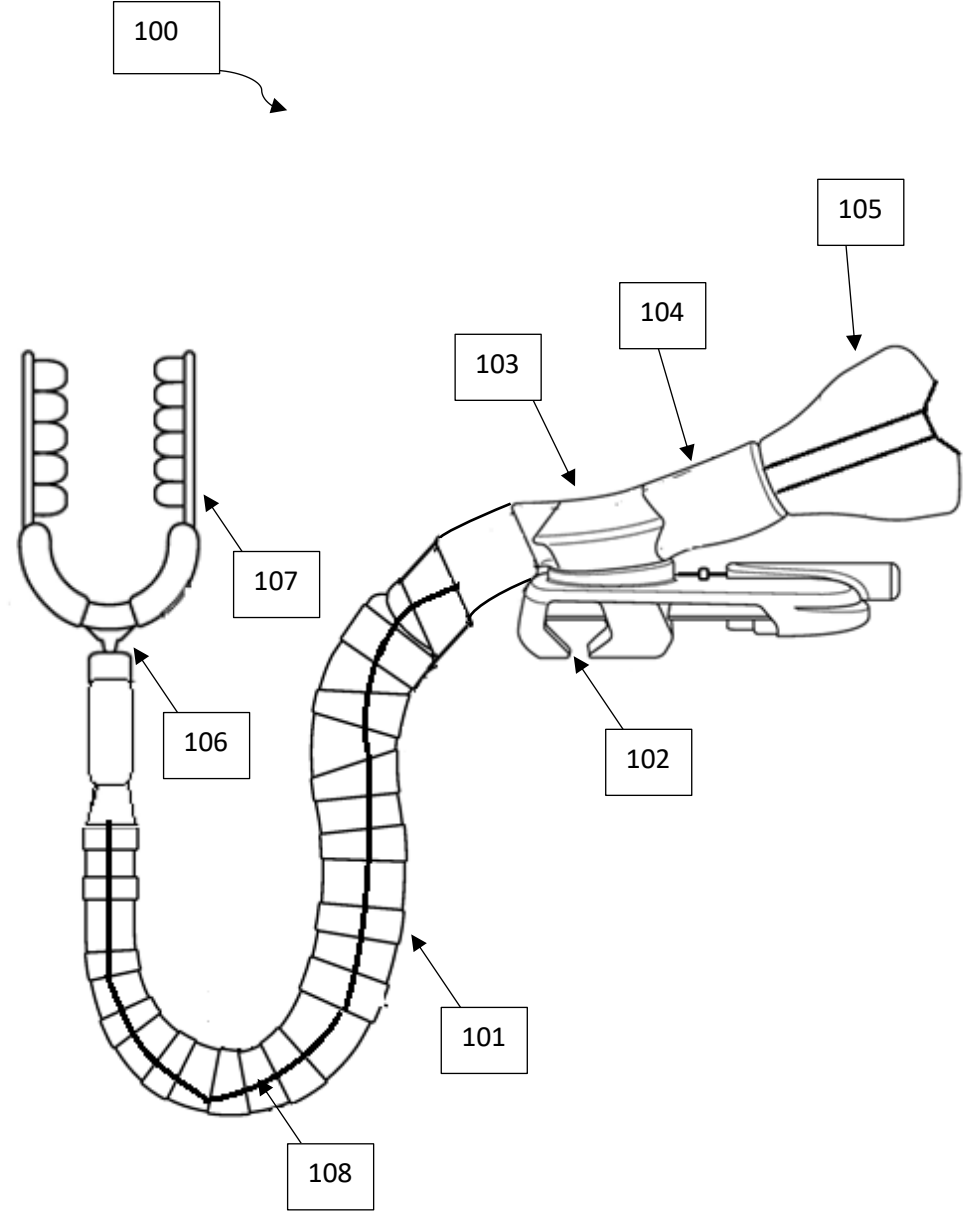


Figure 1

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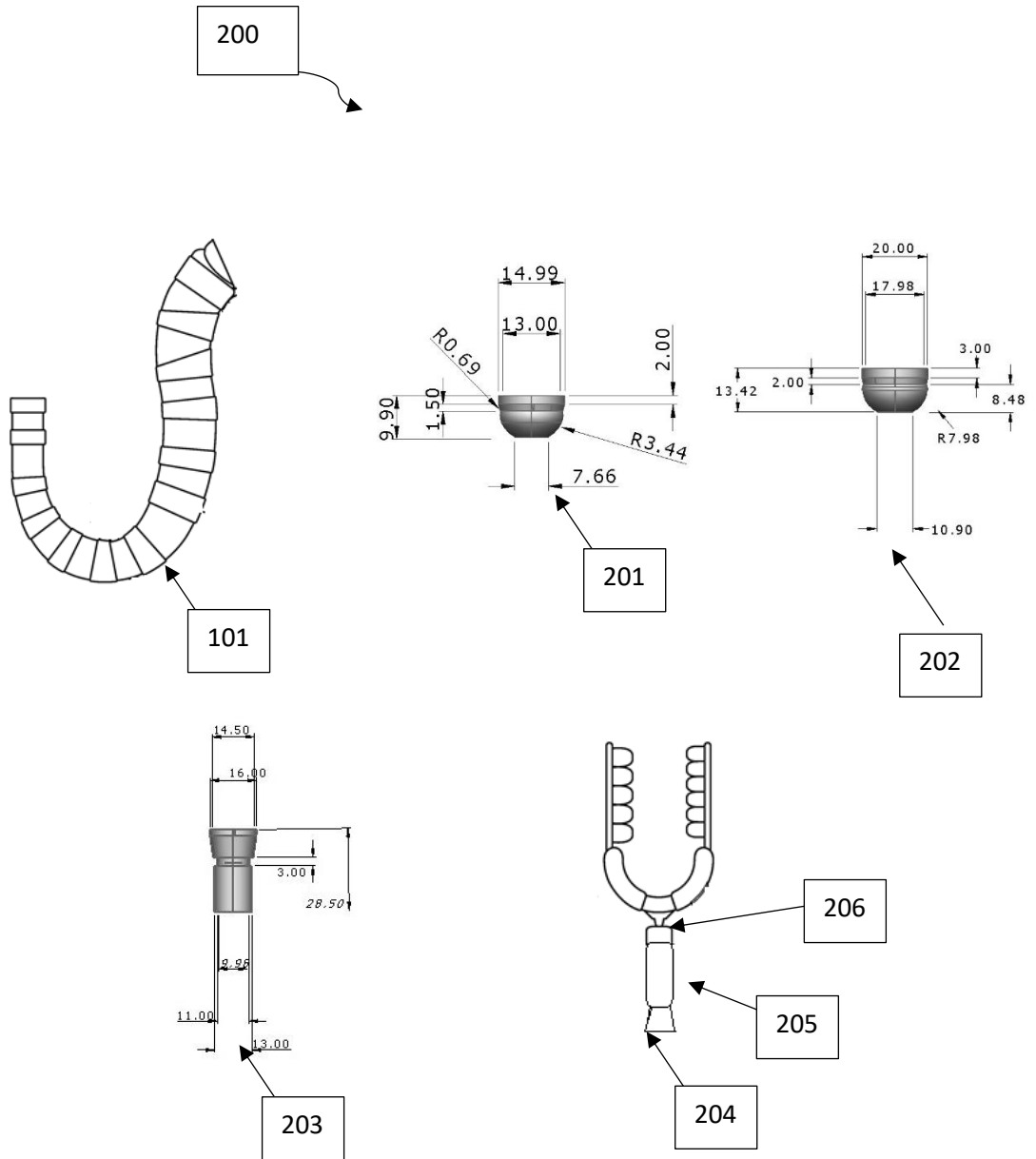


Figure 2

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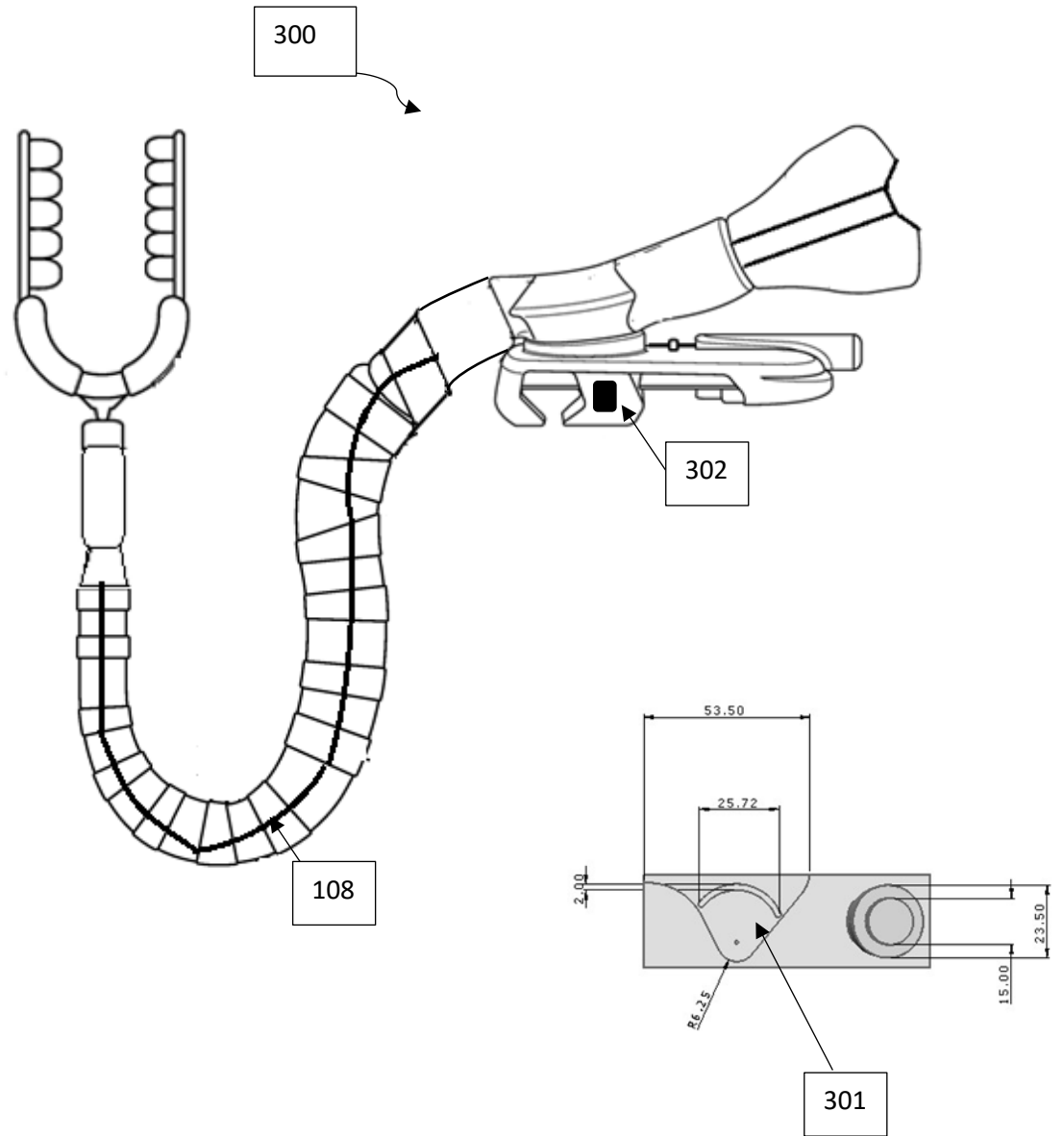


Figure 3

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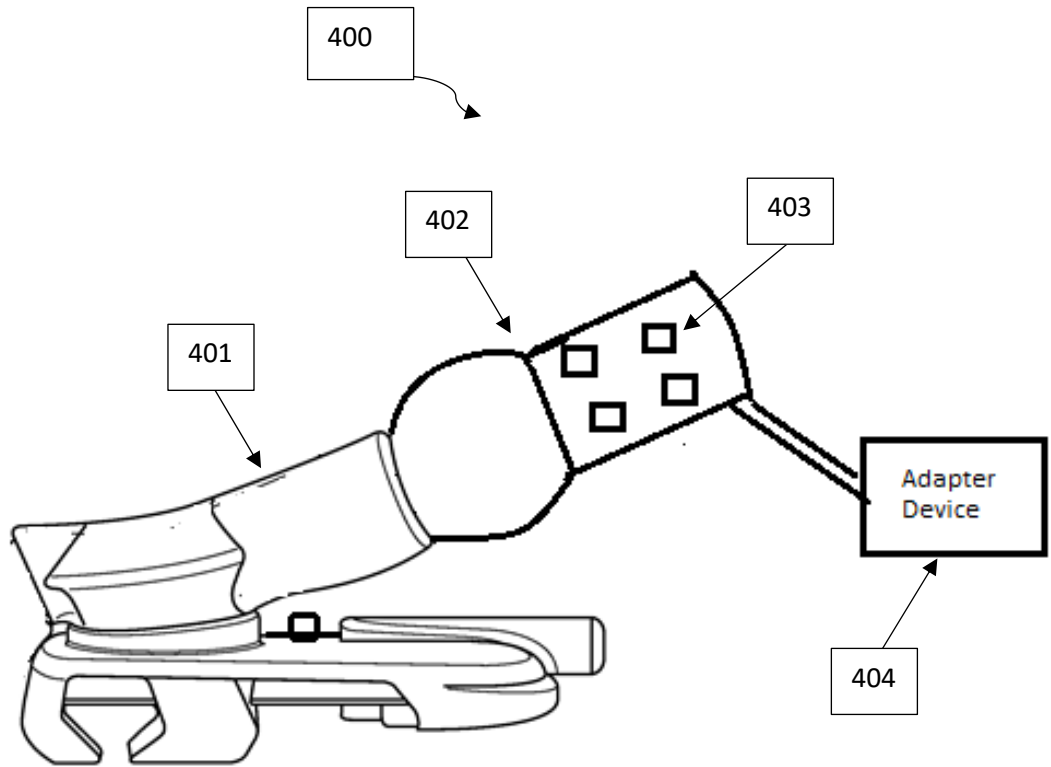


Figure 4

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Certificate No.:DIPP1659



Department of Industrial Policy & Promotion
Ministry of Commerce & Industry
Government of India

CERTIFICATE OF RECOGNITION

Department of Industrial Promotion and Policy

This is to certify that ***Surgitech Helathcare Pvt Ltd*** incorporated/ registered as a ***Private Limited Company*** on ***18-05-2015***, is recognized as a startup by the Department of Industrial Policy and Promotion.

Date of Issue: 13-12-2016

Place of Issue:New Delhi

The certificate shall only be valid for the entity:

- Up to five years from the date of its incorporation/ registration; and
- If its turnover for any of the financial years has not exceeds Rupees 25 crore.

Note:

- **Authorities accepting this Certificate may check its validity on the Startup India portal(www.startupindia.gov.in)**
- This certificate is not the Certificate issued by the Inter Ministerial Board and is not valid for availing Tax benefits
- This is a system generated certificate and hence does not require physical signature

Certificate No.:DIPP1659



Department of Industrial Policy & Promotion
Ministry of Commerce & Industry
Government of India

CERTIFICATE OF RECOGNITION

Department of Industrial Promotion and Policy

This is to certify that ***Surgitech Helathcare Pvt Ltd*** incorporated/ registered as a ***Private Limited Company*** on 18-05-2015, is recognized as a startup by the Department of Industrial Policy and Promotion.

Date of Issue: 13-12-2016

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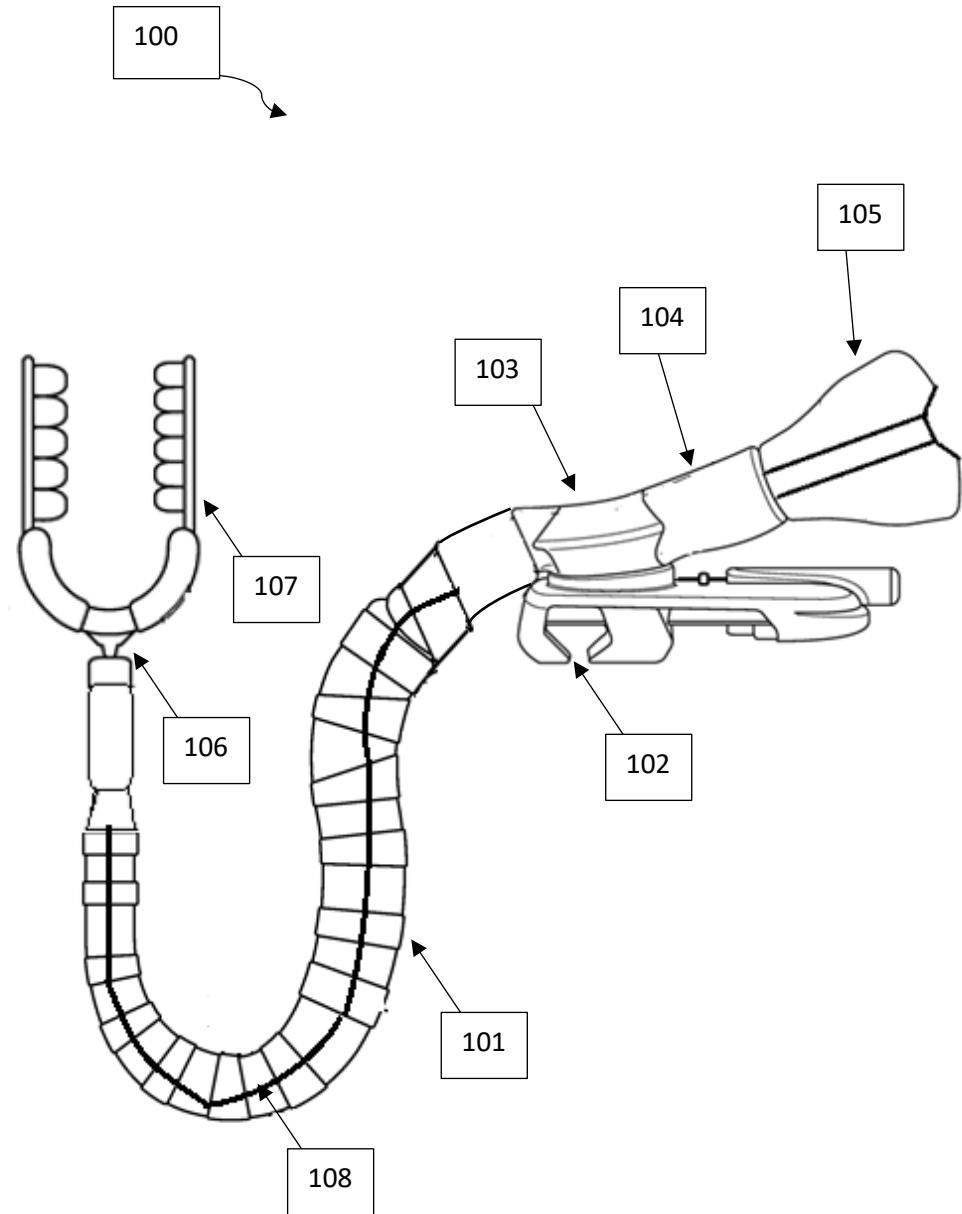


Figure 1

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FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT [See sections 7,54 & 135 and rule 20(1)]	(FOR OFFICE USE ONLY) Application No.:..... Filing Date:..... Amount of Fee Paid:..... CBR No.:..... Signature:.....
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5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY:

Sr.	Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
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6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION

International Application Number	International Filing Date as Allotted by the Receiving Office
PCT//	

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) Application Number	Date of Filing of Original (first) Application
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8. PARTICULARS FOR FILING PATENT OF ADDITION

Main Application / Patent Number	Date of Filing of Main Application
----------------------------------	------------------------------------

9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We ,Anuj Kumar ,Surender Kumar Sharma ,Ajay Kaul , is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:-----

(b) Signature(s) of the inventor(s):.....

(c) Name(s):Anuj Kumar ,Surender Kumar Sharma ,Ajay Kaul

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:-----

(b) Signature(s) :.....

(c) Name(s) of the signatory:Surgitech Healthcare Private Limited

(iii) Declaration by the applicant(s):

- The Complete specification relating to the invention is filed with this application.
- I am/We are, in the possession of the above mentioned invention.
- There is no lawful ground of objection to the grant of the Patent to me/us.
- I am/We are, the assignee or legal representative to true first inventors.

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

Sr.	Document Description	FileName
1	COMPLETE SPECIFICATION	FORM 2.pdf
2	DRAWINGS	DRAWING.pdf
3	FIGURE OF ABSTRACT	FIGURE OF ABSTRACT.pdf
4	EVIDENCE FOR REGISTRATION UNDER SSI(FORM-28)	DIPP1659_Surgitech_Healthcare_Pvt_Ltd_Recognition.pdf
5	FORM FOR SMALL ENTITY(FORM-28)	Form 28_drafted.pdf

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated hereing are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this(Final Payment Date):-.....

Signature:.....

Name:PRIYANK GUPTA

To The Controller of Patents
The Patent office at NEW DELHI

This form is electronically generated.

FORM 28
THE PATENT ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
TO BE SUBMITTED BY A ~~SMALL ENTITY~~ /
STARTUP
[See rules 2 (fa), 2(fb) and 7]

1. We Surgitech Healthcare Private Limited

Address: 9/102, Geeta Colony, Delhi-110031, New Delhi, India

Nationality: Indian

applicant in respect of the patent application no. TEMP/E-1/36818/2017-DEL, hereby declare that, we are a startup in accordance with rule 2(fb) and submit the following document(s) as proof:

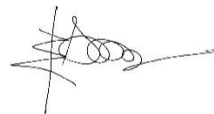
2. Documents to be submitted

ii. For claiming the status of a startup

A. For an Indian applicant:

Start-up certificate, as evidence of eligibility, as defined in rule 2(fb)

Dated this 11th Day of October, 2017



Priyank Gupta
Agent for Applicant
(IN-PA-1454)

To,
The Controller of Patents,
The Patent Office at Delhi

FORM 28
THE PATENT ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
TO BE SUBMITTED BY A ~~SMALL ENTITY~~ /
STARTUP
[See rules 2 (fa), 2(fb) and 7]

1. We Surgitech Healthcare Private Limited

Address: 9/102, Geeta Colony, Delhi-110031, New Delhi, India

Nationality: Indian

applicant in respect of the patent application no. TEMP/E-1/36818/2017-DEL, hereby declare that, we are a startup in accordance with rule 2(fb) and submit the following document(s) as proof:

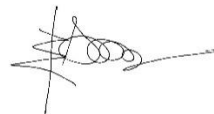
2. Documents to be submitted

ii. For claiming the status of a startup

A. For an Indian applicant:

Start-up certificate, as evidence of eligibility, as defined in rule 2(fb)

Dated this 11th Day of October, 2017



Priyank Gupta
Agent for Applicant
(IN-PA-1454)

To,
The Controller of Patents,
The Patent Office at Delhi

FORM 3
THE PATENT ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8 and rules 12)

(i) We **Surgitech Healthcare Private Limited**, having address as **9/102, Geeta Colony, Delhi-110031, New Delhi, India**, hereby declare:

(ii) that We who have made this application No. **201711036085** dated **11/10/2017** alone/jointly made for the same/substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:

Country	Application Number	Date of application	Status of application	Publication Number	Date of publication	Date of Grant	Patent number
NA	NA	NA	NA	NA	NA	NA	NA

(iii) that the rights in the application(s) has/have been assigned to **NONE** that we undertake that up to the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents file outside India within Six months from the date of filing of such application.

Dated this 15 April 2020



Priyank Gupta
Agent for the applicant
IN/PA-1454



Office of the Controller General of Patents, Designs & Trade Marks
 Department of Industrial Policy & Promotion,
 Ministry of Commerce & Industry,
 Government of India

(<http://ipindia.nic.in/index.htm>)



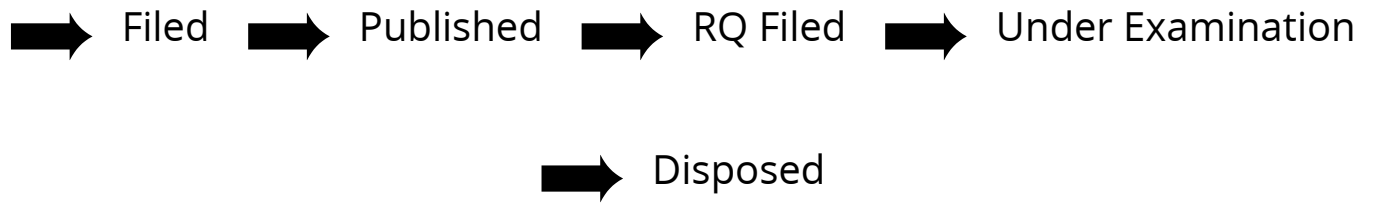
(<http://ipindia.nic.in/index.htm>)

Application Details

APPLICATION NUMBER	201711036085
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	11/10/2017
APPLICANT NAME	Surgitech Healthcare Private Limited
TITLE OF INVENTION	MOTORIZED REUSABLE TITANIUM SURGICAL TOOL FOR POSITIONING STABILIZING AND EXPOSING OF HEART
FIELD OF INVENTION	BIO-MEDICAL ENGINEERING
E-MAIL (As Per Record)	ip@stratjuris.com
ADDITIONAL-EMAIL (As Per Record)	priyank.gupta@stratjuris.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	12/04/2019

Application Status

			View Documents
--	--	--	--------------------------------



In case of any discrepancy in status, kindly contact ipo-helpdesk@nic.in

FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
The Patents Rules, 2003
DECLARATION AS TO INVENTORSHIP
[See section 10(6) and rule 13(6)]

1. NAME OF APPLICANT (S)

ELA KUMAR

hereby declare that the true and first inventor of the invention disclosed in the complete specification filed in pursuance of my application numbered **201811043506** Dated **19-Nov-2018**, is

2. INVENTOR

- (a) NAME – Ela Kumar
(b) NATIONALITY – Indian
(c) ADDRESS – House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN)

Dated This 13th Day of May, 2019

**B. Naveen
Kumar
Varma**

Digitally signed
by B. Naveen
Kumar Varma
Date: 2019.05.13
16:31:37 +05'30'

(Digitally Signed)
B. Naveen Kumar Varma
IN/PA-873
Agent for the Applicant

To,

The Controller of Patents
The Patent Office,
At: New Delhi

3. DECLARATION IS TO BE GIVEN WHEN THE APPLICATION IN INDIA IS FILED BY THE APPLICANT(S) IN THE CONVENTION COUNTRY: N.A.

Dated This 13th Day of May, 2019

**B. Naveen
Kumar
Varma**

Digitally signed
by B. Naveen
Kumar Varma
Date: 2019.05.13
16:31:56 +05'30'

(Digitally Signed)
B. Naveen Kumar Varma
IN/PA-873
Agent for the Applicant

To,

The Controller of Patents
The Patent Office
At: New Delhi



ZeusIP
Advocates LLP

C-4, Jangpura Extension
New Delhi - 110014
Mobile No. - +91-7042934488
Ph: +91-11-41370000; 41824330; 41824331
Fax: +91-11-41824334; 24323338
E-Mail: info@zeusip.com;
Website: www.zeusip.com



585544

ZIP-P-1481

10-Jan-2019

To,
The Controller of Patents and Designs
Boudhik Sampada Bhawan
Plot No. 32, Sector-14
Dwarka,
New Delhi- 110078

Docket No: 2835
10/01/2019

By Hand

SUB: SUBMISSION OF ORIGINAL DOCUMENT UNDER RULE 6(1A)

Re: Indian Patent Application No. : **201811043506**
Date of Filing : **19-Nov-2018**

Dear Sirs,

We bring the attention of the learned Controller to the above mentioned application which was duly filed by us on **19-Nov-2018**. The Applicant has already submitted the below mentioned documents electronically on **04-Jan-2019**. The Applicant herein is submitting the accompanying documents in original as per the requirement of law (under rule 6(1A)).

- **General Power of Attorney (Form 26) with requisite stamp fee. (in original)**

We request the learned Controller to take the above on record and proceed with the matter under intimation to us.

The learned Controller is further requested not to pass any adverse order, against the Applicant without giving the Applicant, an opportunity to be heard.

All communications in the matter may kindly be forwarded to us at the following address:

ZeusIP
Advocates LLP
J-29, 03rd Floor, Jangpura Extension
New Delhi - 110014

Yours faithfully,

Naqeeb Nawab
IN/PA- 1070

Agent for the Applicant

Encl(s): as above

IPO DELHI 10-01-2019 16:57



सत्यमेव जयते

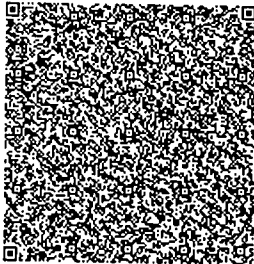
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Government of National Capital Territory of Delhi

e-Stamp

Certificate No.	: IN-DL21600817811251Q
Certificate Issued Date	: 27-Dec-2018 01:46 PM
Account Reference	: IMPACC (FR)/ dl916614/ DELHI/ DL-DLH
Unique Doc. Reference	: SUBIN-DL91661447786979365713Q
Purchased by	: ZEUSIP ADVOCATES LLP
Description of Document	: Article Others
Property Description	: Not Applicable
Consideration Price (Rs.)	: 0 (Zero)
First Party	: ZEUSIP ADVOCATES LLP
Second Party	: Not Applicable
Stamp Duty Paid By	: ZEUSIP ADVOCATES LLP
Stamp Duty Amount(Rs.)	: 100 (One Hundred only)



.....Please write or type below this line.....

FORM 26
GENERAL POWER OF ATTORNEY (Patents)
 THE PATENTS ACT, 1970
 (39 of 1970)

&

THE PATENT RULES, 2003

**FORM FOR AUTHORISATION OF A PATENT AGENT/OR ANY PERSON IN A
 MATTER OR PROCEEDING UNDER THE ACT**
 (See sections 127 and 132; rule 135)

I, Ela Kumar, of the address: House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN), hereby authorize Ms. Gunjan Paharia, Mr. B. Naveen Kumar Varma, Mr. Naqeeb Nawab, Ms. Preksha Sharma, Ms. Komal Kaul, Ms. Divya Dubey, Ms. Natasha Bali, Mr. Sumit Prasad, Mr. Himanshu Deora, Mr. Mudit Kaushik and Mr. Aarohan Bansal, Advocates/Patent Agents of ZeusIP Advocates LLP, J-29, 03rd Floor, Jangpura Extension,

IPO DELHI-110014 2019 16:57

Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

FORM 26
GENERAL POWER OF ATTORNEY (Patents)
THE PATENTS ACT, 1970
(39 of 1970)

&
THE PATENT RULES, 2003

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I hereby revoke all previous authorizations, if any, in respect of the proceeding and confirm and ratify all previous acts, if any, done by the said Agents in respect of the matters aforesaid.

I hereby assent to the action already taken by the said person in the above-matter.

Dated this 26. Day of Dec., 2018

Signature : 
Name : Ela Kumar 26.12.18

To,
The Controller of Patents
The Patent Office, At: New Delhi/Chennai/ Kolkata/Mumbai

ZIP-P-1481

04-Jan-2019

To
The Controller of Patents and Designs
Baudhik Sampada Bhawan
Plot No. 32, Sector-14
Dwarka,
New Delhi- 110078

By Online

SUB: SUBMISSION OF DOCUMENT

Re: Patent Application No. : **201811043506**
Date of Filing : **19-Nov-2018**

Dear Sirs,

We bring the attention of the learned Controller to the above mentioned application which was duly filed by us on **19-Nov-2018**. We are now pleased to submit herewith the accompanying document as per the requirement of law (under rule 135).

- **Copy of Executed General Power of Attorney (Form 26) with requisite stamp fee.**

We request the learned Controller to take the above on record and proceed with the matter under intimation to us.

The learned Controller is further requested not to pass any adverse order, against the Applicant without giving the Applicant, an opportunity to be heard.

All communications in the matter may kindly be forwarded to us at the following address:

ZeusIP
Advocates LLP
C-4, Jangpura Extension
New Delhi – 110014

Yours faithfully,

**B. Naveen
Kumar
Varma**

Digitally signed by B.
Naveen Kumar Varma
Date: 2019.01.04
17:47:36 +05'30'

(Digitally Signed)
B. Naveen Kumar Varma
IN/PA- 873
ZeusIP Advocates LLP

Encl(s): as above



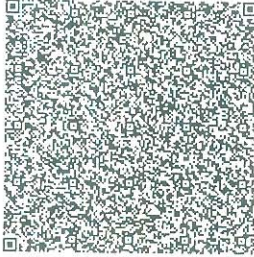
सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

e-Stamp

Certificate No. : IN-DL21600817811251Q
Certificate Issued Date : 27-Dec-2018 01:46 PM
Account Reference : IMPACC (FR)/ dl916614/ DELHI/ DL-DLH
Unique Doc. Reference : SUBIN-DL91661447786979365713Q
Purchased by : ZEUSIP ADVOCATES LLP
Description of Document : Article Others
Property Description : Not Applicable
Consideration Price (Rs.) : 0
(Zero)
First Party : ZEUSIP ADVOCATES LLP
Second Party : Not Applicable
Stamp Duty Paid By : ZEUSIP ADVOCATES LLP
Stamp Duty Amount(Rs.) : 100
(One Hundred only)



.....Please write or type below this line.....

FORM 26
GENERAL POWER OF ATTORNEY (Patents)
THE PATENTS ACT, 1970
(39 of 1970)

&

THE PATENT RULES, 2003

**FORM FOR AUTHORISATION OF A PATENT AGENT/OR ANY PERSON IN A
MATTER OR PROCEEDING UNDER THE ACT**

(See sections 127 and 132; rule 135)

I, **Ela Kumar**, of the address: **House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN)**, hereby authorize **Ms. Gunjan Paharia, Mr. B. Naveen Kumar Varma, Mr. Naqeeb Nawab, Ms. Preksha Sharma, Ms. Komal Kaul, Ms. Divya Dubey, Ms. Natasha Bali, Mr. Sumit Prasad, Mr. Himanshu Deora, Mr. Mudit Kaushik and Mr. Aarohan Bansal, Advocates/Patent Agents of ZeusIP Advocates LLP, J-29, 03rd Floor, Jangpura Extension, New Delhi-110014**

Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

FORM 26
GENERAL POWER OF ATTORNEY (Patents)
THE PATENTS ACT, 1970
(39 of 1970)

&

THE PATENT RULES, 2003

**FORM FOR AUTHORISATION OF A PATENT AGENT/OR ANY PERSON IN A
MATTER OR PROCEEDING UNDER THE ACT**

(See sections 127 and 132; rule 135)


I, **Ela Kumar**, of the address: **House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN)**, hereby authorize **Ms. Gunjan Paharia, Mr. B. Naveen Kumar Varma, Mr. Naqeeb Nawab, Ms. Preksha Sharma, Ms. Komal Kaul, Ms. Divya Dubey, Ms. Natasha Bali, Mr. Sumit Prasad, Mr. Himanshu Deora, Mr. Mudit Kaushik and Mr. Aarohan Bansal, Advocates/Patent Agents of ZeusIP Advocates LLP, J-29, 03rd Floor, Jangpura Extension, New Delhi-110014**, jointly and severally, to act on our behalf, as our Agents, in connection with filing and prosecuting patent applications in India, securing from the Government of India, Letters Patent under the above mentioned Act in all matters and proceedings before the Controller of Patents or the Government of India in connection therewith and/or incidental thereto and in all matters and proceedings subsequent to the grant of such Letters Patent including renewal thereof, filing of statement of working thereof, amendment thereof, specification or any other document filed thereof, restoration thereof, registration of any license, mortgage or assignment thereof, including the appointment of a substitute or substitutes and request that all notices requisitions and communications relating thereto may be sent to such Agent at **J-29, 03rd Floor, Jangpura Extension, New Delhi-110014**.

I hereby revoke all previous authorizations, if any, in respect of the proceeding and confirm and ratify all previous acts, if any, done by the said Agents in respect of the matters aforesaid.

I hereby assent to the action already taken by the said person in the above-matter.

Dated this 26 Day of Dec, 2018

Signature

: 
26.12.18

Name

: **Ela Kumar**

To,
The Controller of Patents
The Patent Office, At: New Delhi/Chennai/ Kolkata/Mumbai

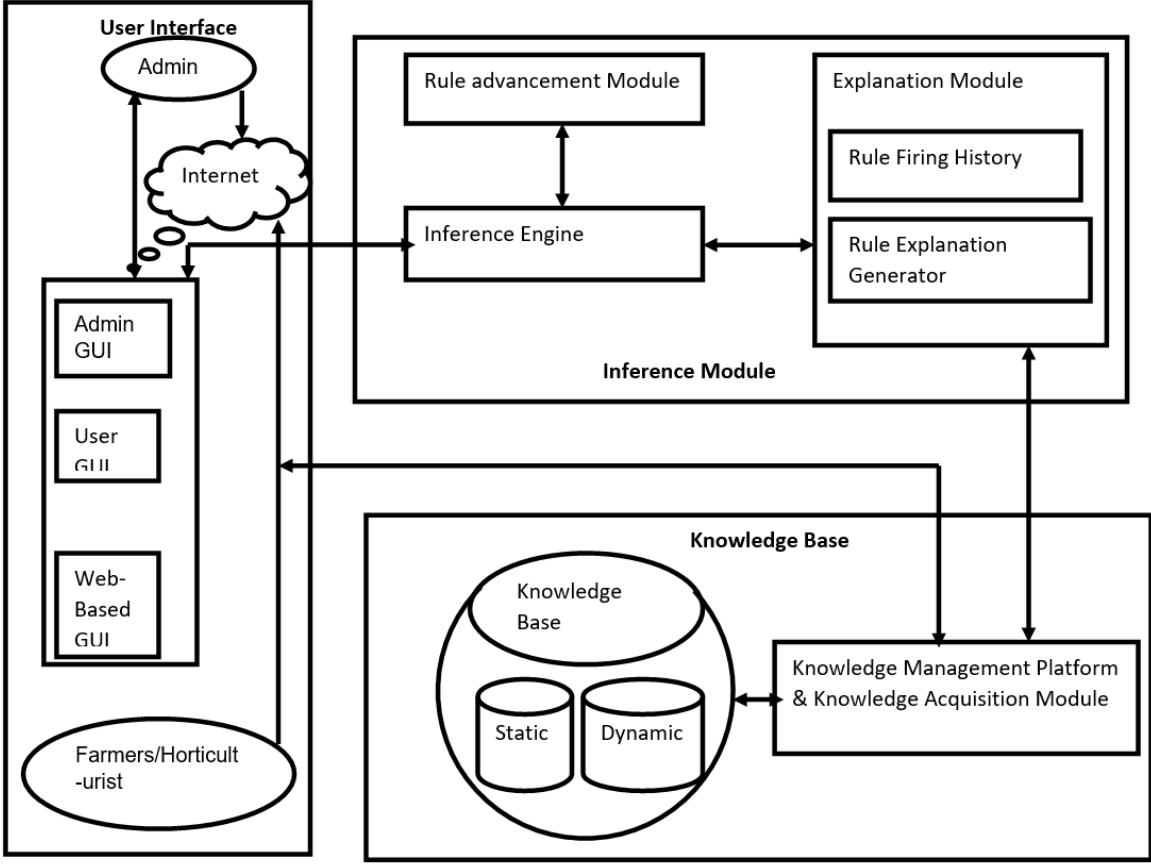


Figure 1

B. Naveen Kumar Varma
 Digitally signed by B. Naveen Kumar Varma
 Date: 2018.11.19 16:11:18 +05'30'
(Digitally Signed)
B. Naveen Kumar Varma
IN/PA-873
Agent for the Applicant

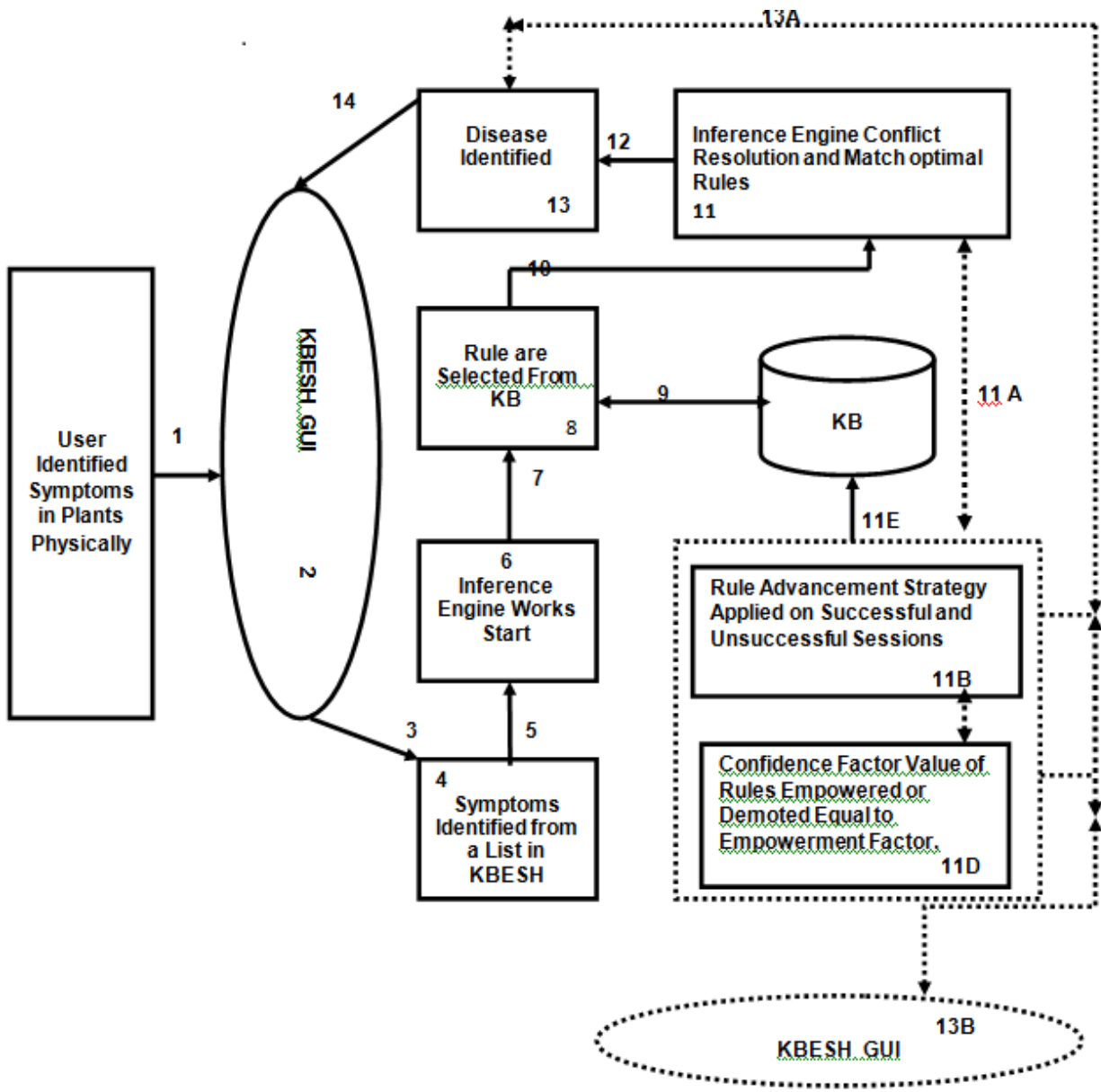


Figure 2

B. Naveen Kumar Varma
 Digitally signed by B. Naveen Kumar Varma
 Date: 2018.11.19 16:11:40 +05'30'
 (Digitally Signed)
 B. Naveen Kumar Varma
 IN/PA-873
 Agent for the Applicant

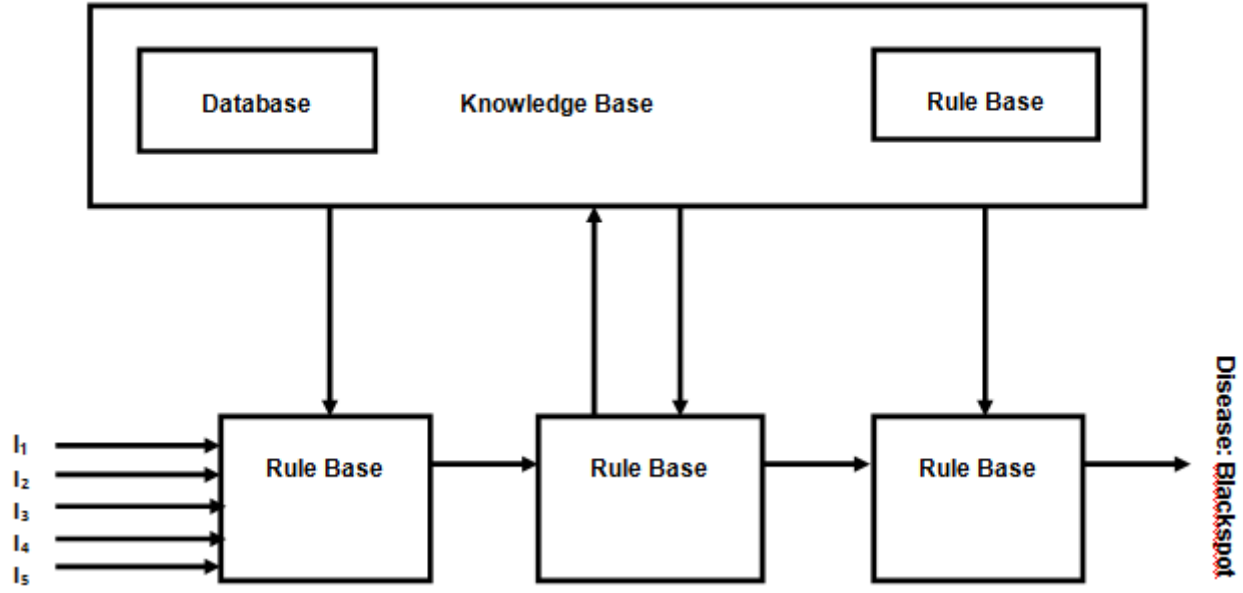


Figure 3

B. Naveen Kumar Varma Digitally signed by B. Naveen Kumar Varma
Date: 2018.11.19 16:11:54 +05'30'
(Digitally Signed)
B. Naveen Kumar Varma
IN/PA-873
Agent for the Applicant

FORM 1
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
APPLICATION FOR GRANT OF PATENT
[See sections 7,54 & 135 and rule 20(1)]

(FOR OFFICE USE ONLY)

Application No.:

Filing Date:

Amount of Fee Paid:

CBR No.:

Signature:

1. APPLICANT(S):

Sr.No.	Name	Nationality	Address
1	Ela Kumar	India	House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN)

2. INVENTOR(S):

Sr.No.	Name	Nationality	Address
1	Ela Kumar	India	House no. 117, Sector 11, Block E1, Faridabad, Haryana, India (IN)

3. TITLE OF THE INVENTION: SYSTEM AND METHOD TO DETERMINE HORTICULTURAL DISEASES

4. ADDRESS FOR CORRESPONDENCE OF APPLICANT / AUTHORISED PATENT AGENT IN INDIA:

ZeusIP Advocates LLP J-29, 3rd Floor, Jangpura Extension, New Delhi - 110014 Telephone No. +91-11-41370000, 41824330, 41824331 Mobile No. +91-7042934488 Fax No. +91-11-41824334, 24323338 E-mail: info@zeusip.com

Telephone No.: +91-11-41370000
Fax No.: +91-11-41824334
Mobile No:
E-mail: info@zeusip.com

5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY:

Sr.No.	Country	Application Number	Filing Date	Name of the Applicant	Title of the Invention
--------	---------	--------------------	-------------	-----------------------	------------------------

6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION:

International Application Number	International Filing Date as Allotted by the Receiving Office
PCT//	

7. PARTICULARS FOR FILING DIVISIONAL APPLICATION

Original (first) Application Number	Date of Filing of Original (first) Application

8. PARTICULARS FOR FILING PATENT OF ADDITION:

Main Application / Patent Number:	Date of Filing of Main Application

9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We ,Ela Kumar, is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: -----

(b) Signature(s) of the inventor(s):

(c) Name(s): Ela Kumar

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date: -----

(b) Signature(s) :

(c) Name(s) of the singnatory: Ela Kumar

(iii) Declaration by the applicant(s)

- **The Provisional specification relating to the invention is filed with this application.**
- **I am/We are, in the possession of the above mentioned invention.**
- **There is no lawful ground of objection to the grant of the Patent to me/us.**

10. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION:

Sr.	Document Description	FileName
1	PROVISIONAL SPECIFICATION	PROVISIONAL SPECIFICATION-.pdf
2	DRAWINGS	Drawings.pdf

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters stated hering are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this(Final Payment Date): -----

Signature:

Name: B. NAVEEN KUMAR VARMA

To The Controller of Patents

The Patent office at NEW DELHI

This form is electronically generated.

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
The Patents Rules, 2003
PROVISIONAL SPECIFICATION
[See section 10 and rule 13]

**TITLE OF THE INVENTION : SYSTEM AND METHOD TO DETERMINE
HORTICULTURAL DISEASES**

1. APPLICANT

(a) NAME - **Ela Kumar**

(b) NATIONALITY - **Indian**

(c) ADDRESS - **House no. 117, Sector 11, Block E1, Faridabad, Haryana, India
(IN)**

PREAMBLE TO THE DESCRIPTION

PROVISIONAL

The following specification describes the invention.

TITLE: SYSTEM AND METHOD TO DETERMINE

HORTICULTURAL DISEASES

I. Field of the Disclosure:

[0001] The present invention generally relates to the field of horticulture. More specifically, relating to a system and method for convenient disease detection in plants which allows for farmers to not lose out on plant and crop production by being able to timely identify the same and take preventive or curative measures in their regard.

II. Background/Motivation for the Disclosure:

[0002] Horticulture is the science propagating to the industry of plant cultivation. Horticulture specialists utilize their knowledge in working for and researching the disciplines of plant cultivation and propagation, namely, crop production, plant breeding, genetic engineering, plant biochemistry, and plant physiology. Their work specifically deals with fruits, berries, nuts, vegetables, flowers, trees, shrubs, turf, and the like. Horticulturists strive to improve crop yield, quality, nutritional value; resistance to insects, diseases, environmental issues and the like.

[0003] All living matter is susceptible to diseases, in some form or another, since it is degradable. Bread could mould, wood could decay, humans could get a cold and even plants have diseases. This has troubled people who grow them, especially the farmers. Most of these producers on the ground level are not able to timely identify or treat these afflictions leading to major losses. The need for developing a system or manner to help them has risen, but fell back down since the field requires extensive study and companies cannot chart off major capital from the farmers.

[0004] The market strategies focusing in this area are lacking in their accuracy as well as their usability. They fail to provide correct results, partly because of a limited knowledge bank and partly because of incapability. In addition to the same, these systems also lack in the

department of usability and accessibility. It is extremely difficult for a regular farmer to operate the complex devices and systems henceforth making their being quite futile.

[0005] The present invention, being a system and method to identify horticultural diseases, focuses on addressing this in an effective manner. It caters to the challenge being faced by the farmers as it offers the technical necessities of advance research in a relatable format. Not only is the interface interactive and easy to use for the farmers; who for most part are illiterate, if not uneducated; but offer it in a manner which is effortless for them to use, utilizing predetermined factors which are validated by a specialized botanist or horticulturist.

[0006] The system and method provides specific solutions in order of relevance by quantifying the relevance of each given diagnosis with the problem at hand utilizing the formerly stated factors. In this manner, it can help save farmers from loss everyday by helping them determine the cause of concern and offering suggestions in a format that is crafted for their convenient understanding.

III. Description of the Disclosure:

[0007] The exemplary mode for carrying out the disclosure is presented in terms of its exemplary embodiments. However, the exemplary embodiments described herein detail for illustrative purposes and are subject to many variations. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but are intended to cover the application or implementation without departing from the spirit or scope of the present disclosure.

[0008] The terms “a” and “an” herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

[0009] A system and method for identifying horticultural diseases can be used to identify diseases in all kinds of botany domain, including but not limited to- crops, pulses, vegetation, decorative plants, and fruit shrubs/orchards. There is an exceeding need for a system like this because of the amount of diseases there exists in lieu of which, plants die all the time.

[0010] The system and method operates on a quantifiable measure, which calculates a confidence factor of each possible disease with a particular plant in order to give a more accurate result. This confidence factor quantifies a relation of a disease to the present scenario.

[0011] The system is a knowledge-based system, which gives it a competitive edge as it keeps updating its database in order to provide a user with more accurate result with every search it carries out. Every piece of data in a knowledge base is tested and certified by an experienced Horticulturist which ensures better and clinically proven results.

[0012] The system detects a location of the user to give location-specific results since diseases vary in different locations even with same or similar symptoms. It also has an easy user interface which can be used by everyday farmers and other persons, and can be modified for use of illiterate and blind persons as well, so that they can become self-sufficient and are not rendered helpless in a time of need.

[0013] Figure 1 illustrates the system for identification of the horticultural diseases.

[0014] Figure 2 illustrates the process flow in the system overlooking the user interface.

[0015] Figure 3 illustrates the magnified design of the knowledge base module in the system.

[0016] In one of the exemplary embodiments of the present invention, as shown in figure 1, the system is web enabled for better result and easy access from anywhere and at anytime; comprised of three major module blocks- namely the user interface, an inference module and the knowledge base. The user interface is the part of the system visible to the user, be it the farmers, other individual personnel, the horticulturists or an admin. The user interface itself has a web-based graphic user interface which is connected to the internet. Internet connectivity enables the system to be easily and readily updated at all places, including all

present versions so that every single user is acquainted with the present technology of the same. Since the system is based on knowledge, it is constantly edited and changed in regard to its underlying information to make a databank existing within the knowledge base vaster, and thence give more accurate results.

[0017] In one of the exemplary embodiments of the present disclosure, as shown in figure 2, the user interface is explained in further detail. This figure entails the process flow when a query is given to the system. A symptom identified by the user is fed into the system's interface, as by being chosen in the drop down menu provided within the user interface module in the system. This/these symptom(s) are identified from a list in the user interface post which an inference engine, a component of the inference module, starts its work. A rule for the same is selected from the database after which the inference engine resolves conflict and matches the rules to identify a disease which is provided to the user; during this period, in parallel, a rule advancement strategy is applied on successful and unsuccessful sessions and the confidence factor is evaluated to be presented to the user along with the identified disease(s).

[0018] In one of the exemplary embodiments of the present disclosure, the user interface, as shown in figure 1, and further explained in figure 2, is created in a manner that has an ease of usability and accessibility to the common man. Since the present invention is catered for the everyday farmer and the likes- ranging from commercial farmers and viticulturists whose major area of work is in horticulture and agriculture, to hobbyist gardeners who enjoy planting and beautifying their backyards. This user interface is so planned that it can even be used by an illiterate person. The user interface can be further modified to suit the need of and be used by a blind person. The user can create a user account so that the user interface can save related information, to be used on further queries instead of information retrieval from the user at every time, though the user can input fresh data in relation to the changed conditions as well. Any person dissatisfied with their plant growth or produce, can use the system and input their plant disease symptoms so that the same can be checked against the horticulturist-verified data base to provide him/her with the supposed result. These results are based on the rules fired within the interference module and are accompanied with the confidence factor, a description, a control measure of the disease(s) and any additional related information pertaining to the query that the databank might have.

[0019] In one of the exemplary embodiments of the present disclosure, the inference module, as shown in figure 1 and referred in figure 2, is the control unit for the system, with the inference engine being a controller. It connects the other two major blocks- the user interface and the knowledge base and forms research based qualitative reasoning which it then converts into a quantitative factor for assessment. The inference module contains the main method for determining the accurate disease. The controller overlooks the data and processes the result according to the details fed in by the user and collected automatically in regard to the basic surrounding factors like the location, time of year, environmental conditions, and more. This controller processes the quantifiable method to develop a certainty factor pertaining to the accuracy of result of each disease shortlisted to the query that was given by the user.

[0020] In one of the exemplary embodiments of the present disclosure, the inference module, as shown in figure 1; further is comprised of the major domains of a rule advancement module, the inference engine which is the controller of the system, and an explanation module. The explanation module has a rule firing history and a rule firing generator. The rule firing history helps us maintain a cache memory so that the same queries are answered using lesser processing power, in much lesser time, whereas the rule firing generator generates new rules to be fired into the engine and found answers for. The rule firing history is cleared or updated when the databank is updated pertinent to the same or similar domain or area of query to give an updated result to the users instead of a quick result.

[0021] In one of the exemplary embodiments of the present disclosure, as shown in figure 1, the knowledge base contains the main knowledge base, having static and dynamic knowledge and a knowledge management platform and knowledge acquisition module. The static knowledge database has facts about the plants and their diseases and the dynamic base corresponds diseases with the query in accordance with the confidence factor.

[0022] In one of the exemplary embodiments of the present disclosure, the knowledge base, as further explained in figure 3, interacts with the rule base during the entire process flow within the knowledge base. The knowledge base, having the database and the rule base, engages actively with the rules fired by the inference module referred in figure 1, to give the most accurate results. This rule query is actively updated in order to find the most appropriate

result in regard to the query from the user. The rule base contains the entirety of all the rules that can be fired within the system in regard to the query asked by the user.

[0023] The foregoing descriptions of exemplary embodiments of the present disclosure have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the disclosure to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The exemplary embodiments were chosen and described in order to best explain the principles of the disclosure and its practical application, to thereby enable others skilled in the art to best utilize the disclosure and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omissions, substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but is intended to cover the application or implementation without departing from the spirit or scope of the claims of the present disclosure.

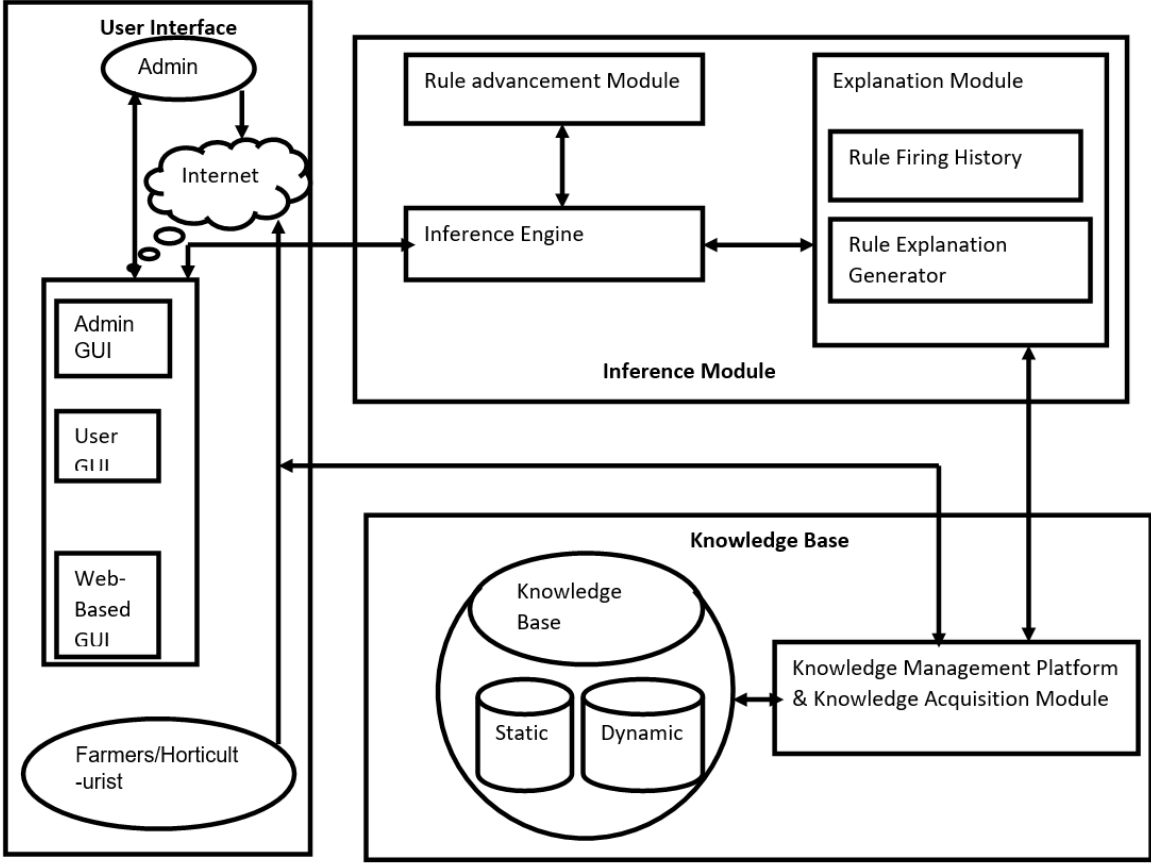


Figure 1

B. Naveen Kumar Varma
Digitally signed by B. Naveen Kumar Varma
Date: 2018.11.19 16:11:18 +05'30'
(Digitally Signed)
B. Naveen Kumar Varma
IN/PA-873
Agent for the Applicant

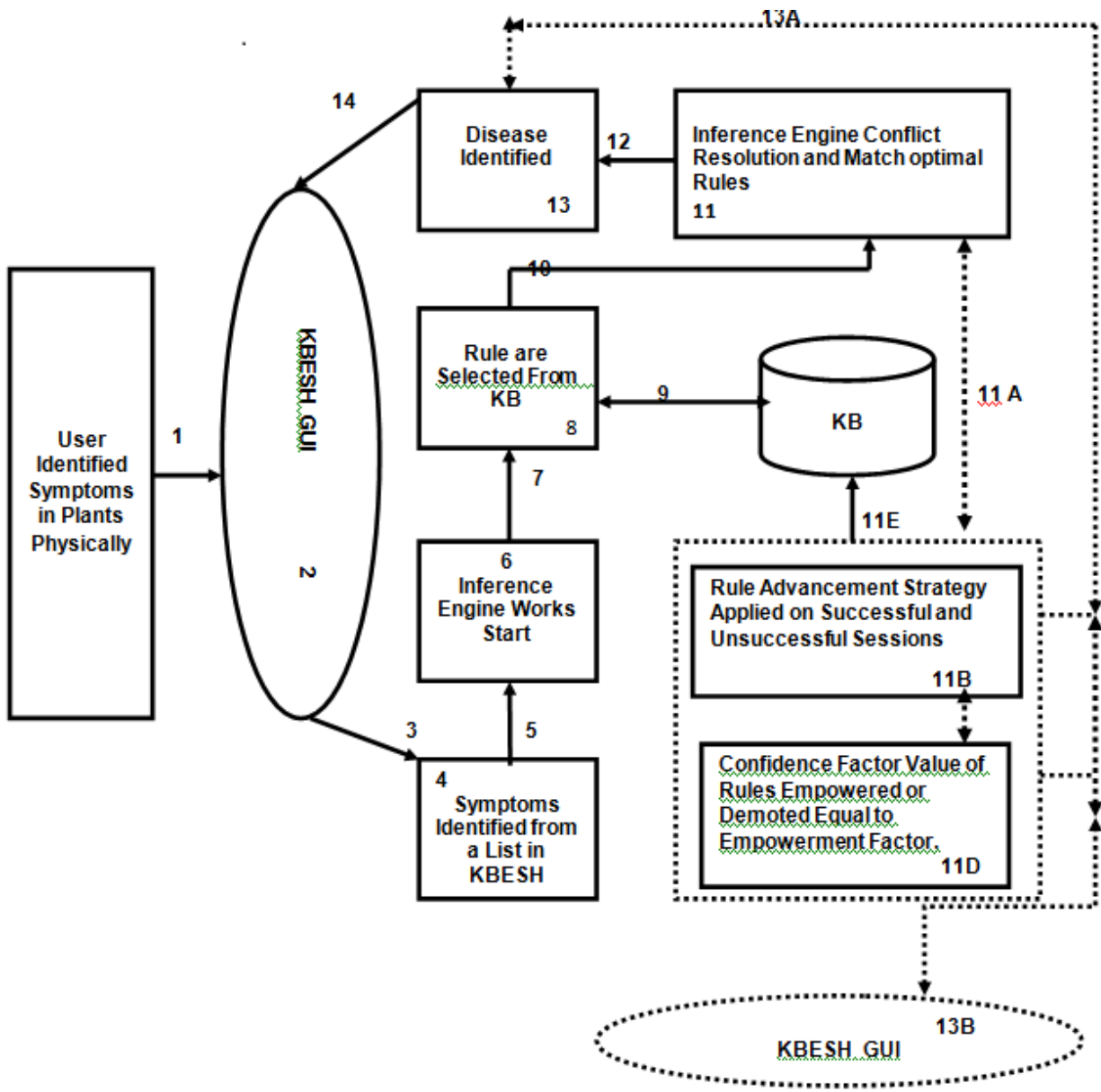


Figure 2

B. Naveen Kumar Varma
 Digitally signed by B. Naveen Kumar Varma
 Date: 2018.11.19 16:11:40 +05'30'
 (Digitally Signed)
 B. Naveen Kumar Varma
 IN/PA-873
 Agent for the Applicant

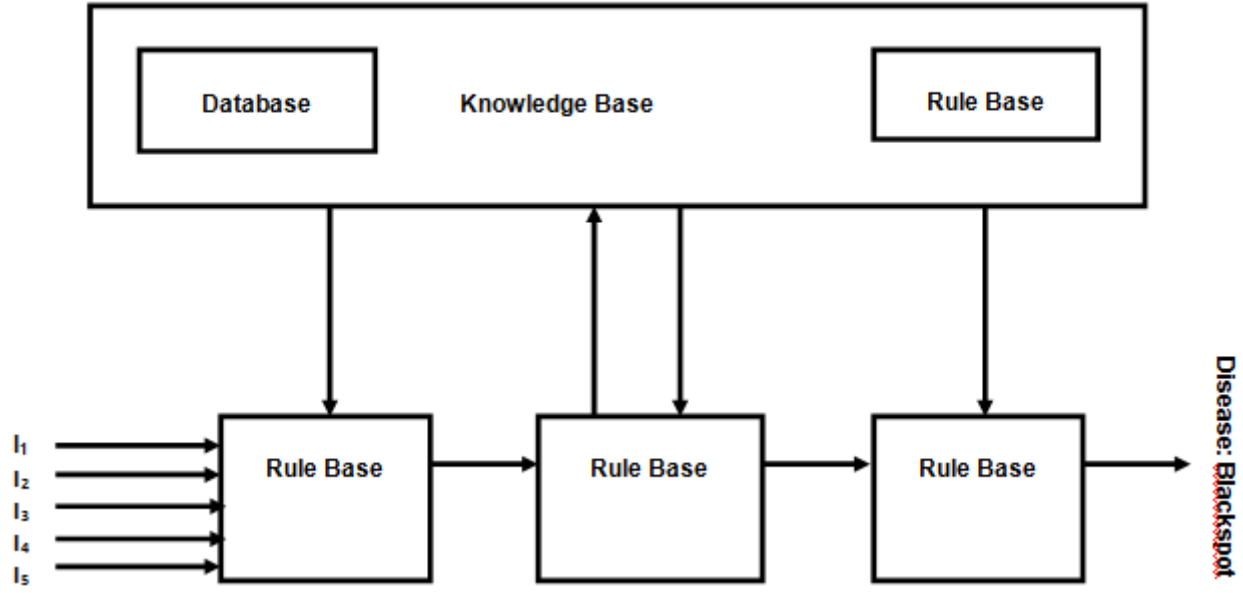


Figure 3

B. Naveen Kumar Varma
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Date: 2018.11.19 16:11:54 +05'30'
(Digitally Signed)
B. Naveen Kumar Varma
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Agent for the Applicant

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
The Patents Rules, 2003
COMPLETE SPECIFICATION
[See section 10 and rule 13]

**TITLE OF THE INVENTION : A SYSTEM AND A METHOD FOR IDENTIFYING
PLANT DISEASES**

1. APPLICANT

- (a) NAME - **Ela Kumar**
- (b) NATIONALITY - **Indian**
- (c) ADDRESS - **House no. 117, Sector 11, Block E1, Faridabad, Haryana,
India (IN)**

PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification particularly describes the invention and the manner in which it is to be performed.

A SYSTEM AND A METHOD FOR IDENTIFYING PLANT DISEASES

FIELD OF THE INVENTION:

5

[0001] The present invention generally relates to the field of horticulture. More particularly, the present invention relates to a system and a method for identifying plant diseases conveniently which allows for farmers to not lose out on plant and crop production by being able to timely identify the same and take preventive or curative
10 measures.

BACKGROUND OF THE INVENTION:

[0002] Horticulture is the science propagating to the industry of plant
15 cultivation. Horticulture specialists utilize their knowledge in working for and researching the disciplines of plant cultivation and propagation, namely, crop production, plant breeding, genetic engineering, plant biochemistry, and plant physiology. Their work specifically deals with fruits, berries, nuts, vegetables, flowers, trees, shrubs, turf, and the like. Horticulturists strive to improve crop yield, quality, nutritional value; resistance to
20 insects, diseases, environmental issues and the like.

[0003] All living matter is susceptible to diseases, in some form or another, since it is degradable. Bread could mould, wood could decay, and even plants have diseases. This has troubled people who grow them, especially farmers. Most of
25 these producers on the ground level are not able to timely identify or treat these afflictions leading to major losses. Diseases occurring in the plants are substantially influenced by environmental factors, such as weather conditions in specific regions. Such an occurrence of diseases in plants may result in lower crop revenue, since payments are often based on mass. The need for developing a system or manner to help them has risen,

but fell back down since this field requires extensive study and companies cannot chart off major capital from the farmers.

5 **[0004]** Some of the conventional methods include taking images of a plant and using an image analysis technology on the images to identify whether the plant has suffered from plant diseases or whether the plant leaves reveal symptoms for diseases. In this method, it is required to use the features of color and texture with a neural network analysis method to correctly find and analyse the plant leaf images from the plant image, so as to identify whether the plant has suffered from plant diseases or whether the leaves
10 have revealed symptoms. However, this method is too complex, as it requires collecting a large number of image data and performing data training before separating the plant leaves image from the plant image. Therefore, the method is unable to meet the practical application requirements because of its low efficiency and incapability of displaying results immediately.

15 **[0005]** There are a number of problems associated with the conventional methods or systems. In some of the conventional methods or systems the images do not quantify the intensity of symptom and does not consider the effect of disease as per the various weather conditions. Further, the market strategies focusing in this area are lacking
20 in their accuracy. They fail to provide correct results, partly because of a limited knowledge bank and partly because of incapability. In addition to the same, these methods or systems also lack in the department of usability and accessibility. Furthermore, it is extremely difficult for a regular farmer to operate such complex methods and systems henceforth making their being quite futile.

25 **[0006]** Therefore, in view of the above limitations of the conventional approaches, systems/devices and methods, there exists a need to develop an improved approach, system and method which would in turn address a variety of issues including, but not limited to, complexity of the methods or systems, low efficiency and incapability

of displaying results promptly. Further, there is a need of a system and a method which caters to the challenge being faced by the farmers by offering technical necessities of advance research in a relatable format, which is not only interface interactive and easy to use for the farmers; who for most part are illiterate, if not uneducated; but also offers the systems and method in a manner which is effortless for them to use, utilizing predetermined factors which are validated by a specialized botanist or horticulturist. Moreover, it is desired to develop a system and a method which provides specific solutions in order of relevance by quantifying the relevance of each given diagnosis with problem at hand utilizing the formerly stated factors. In this manner, the system and method can help save farmers from loss everyday by helping them determine the cause of concern and offering suggestions in a format that is crafted for their convenient understanding.

[0007] Thus, the above-described deficiencies of conventional approaches, systems/devices and methods thereof, are merely intended to provide an overview of some of the problems of conventional approaches and are not intended to be exhaustive. Other problems with conventional approaches, systems/devices and methods and their corresponding benefits of the various non-limiting embodiments described herein may become further apparent upon review of the following description.

20

SUMMARY OF THE INVENTION:

[0008] The following presents a simplified summary of the invention to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the present invention. It is not intended to identify the key/critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concept of the invention in a simplified form as a prelude to a more detailed description of the invention presented later.

[0009] It is, therefore, an object of the present invention to provide a system and a method for identifying plant diseases which allows farmers or users to conveniently and timely identify plant diseases. The system and a method for identifying plant diseases in view of the foregoing disadvantages inherent in the prior-art, the general purpose of the present invention is to provide a system and a method for identifying plant diseases that is capable of including all advantages of the prior art and also overcomes the drawbacks inherent in the prior art offering some added advantages.

[0010] It is another object of the present invention to provide a system for identifying plant diseases with improved efficiency which continuously results in more acceptable diagnosis and reduces non acceptable results.

[0011] It is another object of the present invention to provide a system for identifying plant diseases which has interactive interface and user-friendly. The users such as farmers can also operate the system for identifying plant diseases without any special training or skills.

[0012] It is another object of the present invention to provide a system for identifying plant diseases which allows the users or farmers to timely take preventive or curative measures for curing the identified disease of the plants.

[0013] It is another object of the present invention to provide a system for identifying plant diseases which provides specific solutions or preventive measures in order of relevance by quantifying the relevance of each given diagnosis with symptoms utilizing the predetermined factors which are validated by a specialized botanist or horticulturist.

[0014] It is another object of the present invention to provide a system for identifying plant diseases which operates on a quantifiable measure, which calculates a

confidence factor of each possible disease with a particular plant in order to give a more accurate result.

[0015] It is still another object of the present invention to provide a system
5 for identifying plant diseases which detects a location of the user to give location-specific results since the diseases vary in different locations even with same or similar symptoms.

[0016] Accordingly, in an aspect, the present invention provides a system
10 for identifying plant diseases comprising a user interface, a heuristic knowledge base and an inference module. The user interface is configured to display a plurality of symptoms associated with a plurality of diseased plants and the user interface enables selection of at least one symptom of a selected diseased plant by a user from the plurality of symptoms associated with the plurality of diseased plants to be rated on a scale for accuracy. The heuristic knowledge base is configured to store data related to the plurality of symptoms
15 and the associated diseases of the plurality of diseased plants. The heuristic knowledge base is further configured to store data related to a plurality of rules capable of being implemented for the selected plurality of symptoms of the selected diseased plant. Further, the inference module is configured to communicate between the user interface and the knowledge base such that the inference module based on at least one rule
20 implemented from the plurality of rules capable of being implemented for the selected plurality of symptoms of the selected diseased plant utilizing fuzzy theory results in real-time, a confidence factor thereby identifying at least one disease of the diseased plant.

[0017] Accordingly, in another aspect, the present invention provides a
25 method for identifying plant diseases.

[0018] Other aspects, advantages, and salient features of the invention will become apparent to those skilled in the art from the following detailed description, which, details the invention in different embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS:

5 [0019] While the specification concludes with claims that particularly point out and distinctly claim the invention, it is believed that the advantages and features of the present invention will become better understood with reference to the following more detailed description of expressly disclosed exemplary embodiments taken in conjunction with the accompanying drawings. The drawings and detailed description which follow are intended to be merely illustrative of the expressly disclosed exemplary embodiments and are not intended to limit the scope of the present invention as set forth in the appended claims. In the drawings:

 [0020] FIG. 1 illustrates a system for identifying plant diseases in accordance with an embodiment of the present invention;

15 [0021] FIG. 2 illustrates working of heuristic knowledge base of the system for identifying plant diseases in accordance with an embodiment of the present invention; and

 [0022] FIG. 3 is a flow chart illustrating a method for identifying plant diseases in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION:

CALL OUT LIST

- 25
- 1000 System for identifying plant diseases
 - 110 user interface
 - 112 internet
 - 114 admin user interface

	116	restricted user interface
	116a	farmer user interface
	116b	horticulturist user interface
	130	heuristic knowledge base
5	132	data base
	132a	static module
	132b	dynamic module
	134	rule base
	136	knowledge management platform
10	138	knowledge acquisition module
	150	inference module
	152	rule advancement module
	154	inference engine
	156	explanation module
15	156a	rule firing history
	156b	rule explanation generator
	2000	Method for identifying plant diseases

[0023] The exemplary embodiments described herein detail for illustrative purposes are subject to many variations in the structure and design. It should be emphasized, however, that the present invention is not limited to a particular system for identifying plant diseases as shown and described herein. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but these are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present invention. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[0024] The use of terms “including,” “comprising,” or “having” and variations thereof herein are meant to encompass the items listed thereafter and equivalents thereof as well as additional items.

5 **[0025]** Further, the terms, “an” and “a” herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

[0026] Referring to the drawings, the invention will now be described in more detail. A system (1000) for identifying plant diseases, as shown in FIG. 1,
10 comprises a user interface (110), a heuristic knowledge base (130) and an inference module (150). The system (1000) for identifying plant diseases may be used to identify diseases in all kinds of botany domain, including, but not limited to, crops, pulses, vegetation, decorative plants, or fruit shrubs/orchards.

15 **[0027]** In accordance with an embodiment of the present invention, the system (1000) for identifying plant diseases is web enabled for better results and has easy access from anywhere and at anytime through Local Area Network (LAN) and the system may be upgraded through internet (112). Further, the system (1000) is implemented using, but not limited to, windows apache, SQL, PHP server or WAMP to
20 make the system (1000) web-enabled.

[0028] In accordance with an embodiment of the present invention, the user interface (110) is the part of the system (1000) which is visible to a user such as, but not limited to, farmers, other individual personnel, horticulturists or an admin. The user
25 interface (110) is configured to display a plurality of symptoms associated with a plurality of diseased plants. Further, the user interface (110) enables selection of at least one symptom of a selected diseased plant by the user from the plurality of symptoms associated with the plurality of diseased plants to be rated on a scale for accuracy. The user interface (110) itself has a web-based graphic user interface which is connected to

the internet (112). Internet connectivity enables the system (1000) to be easily and readily updated at all places, including all present versions so that every single user is acquainted with the present technology of the same.

5 **[0029]** In accordance with an embodiment of the present invention, the user interface (110) is configured differently depending upon variety of users. Further, the user interface (110) has an admin user interface (114) and a restricted user interface (116). The admin user interface (114) is configured to access all the data that exists in the system (1000) along with the components therein having rights to edit and update said
10 data as well. The restricted user interface (116) is restricted with respect to not only the information that can be accessed but also with respect to editing rights being given. The restricted user interface (116) comprises of a farmer user interface (116a) and a horticulturist user interface (116b).

15 **[0030]** In accordance with an embodiment of the present invention, the heuristic knowledge base (130) is configured to store data related to the plurality of symptoms and the associated diseases of the plurality of diseased plants. The heuristic knowledge base (130) is further configured to store data related to a plurality of rules capable of being implemented for the selected plurality of symptoms of the selected
20 diseased plant. In other words, the heuristic knowledge base (130) contains domain specific knowledge as well as domain expert knowledge. The heuristic knowledge base (130) is further configured to store data related to the selected plurality of symptoms and associated diseases of the selected diseased plant based on location and weather conditions in a region. Furthermore, the data comprises, but not limited to, plant species,
25 diseases related to plant species, description of diseases related to plant species, control measures of diseases related to plant species and level of diseases related to diseased plant species.

5 **[0031]** In accordance with an embodiment of the present invention, the heuristic knowledge base (130) as shown in FIG. 1 contains a data base (132), having a static (132a) and a dynamic (132b) modules and a rule base (134), a knowledge management platform (136) and a knowledge acquisition module (138). The static module (132a) contains facts about the plants and their diseases and the dynamic module (132b) corresponds to diseases with query or the plurality of rules being implemented or fired for the selected plurality of symptoms of the selected diseased plant in accordance with the confidence factor. For example, static data representation of the static module (132a) has plurality of attributes such as, but not limited to, attributes pertaining to a disease id, a disease name, disease description, and disease control methods or measures. The attribute pertaining to the disease id contains identification codes for all the diseases related to the selected plant. The attribute pertaining to the disease name contains names of all the diseases corresponding to the identification codes of the attribute pertaining to the disease id. The attribute pertaining to disease description contains description of all the diseases corresponding to the identification codes of the attribute pertaining to the disease id. The attribute pertaining to disease control measures contains control measures of all the diseases corresponding to the identification codes of the attribute pertaining to the disease id.

20 **[0032]** In accordance with an embodiment of the present invention, the rule base (134) refers to a storage module configured to store the rules to be fired within the heuristic knowledge base (130). The rule base (134) stores all the rules which may be fired corresponding to all the diseased plants, their associated symptoms, diseases and control measures.

25 **[0033]** In accordance with an embodiment of the present invention, the knowledge management platform (136) refers to a provision of monitoring and providing information based on plants and queries which have been fed and thus, suggestions or control measures. The knowledge management platform (136) has processes of capturing,

defining, storing, categorizing, and linking of knowledge, searching for subscribing relevant and appropriate content. The knowledge management platform (136) has different modules such as replication module, session module, profile analyzer, and a cache memory. The profile analyzer analyzes and keeps an eye on activity of the user which type of queries and suggestions are being entered into the system (1000). According to this, the analyzer gives necessary feedback to an administrator for further improvement of the system (1000). The cache memory is used for faster retrieval from the heuristic knowledge base (130). For example, if any user has asked the same information then instead of providing solution from the heuristic knowledge base (130) the cache memory offers the information and hence gets sufficient time.

[0034] In accordance with an embodiment of the present invention, the inference module (150), as shown in FIG. 1 is configured to communicate between the user interface (110) and the knowledge base (130) such that the inference module (150) based on at least one rule implemented from the plurality of rules capable of being implemented for the selected plurality of symptoms of the selected diseased plant utilizing fuzzy theory results in real-time, a confidence factor identifying at least one disease of the diseased plant. In particular, fuzzy theory along with Euclidean Distance Method (EDM) is used for evaluating the confidence factor identifying at least one disease of the diseased plant.

[0035] In accordance with an embodiment of the present invention, the inference module (150), as shown in FIG. 1 further comprises major domains of a rule advancement module (152), an inference engine (154) which is the controller of the system (1000), and an explanation module (156). The explanation module (156) has a rule firing history (156a) and a rule explanation generator (156b). The rule firing history (156a) helps to maintain the cache memory so that same queries are answered using lesser processing power, in much lesser time, whereas the rule explanation generator (156b) generates new rules to be fired into the inference engine (154) and found answers

for. In other words, the rule firing history (156a) saves all the fired rules for a particular session in rule firing log table, whereas the rule explanation generator (156b) displace the rule selected for drawing inferences. The rule firing history (156a) is cleared or updated when the heuristic knowledge base (130) is updated pertinent to same or similar domain or area of query to give an updated result to the users instead of a quick result. For example, a relation for the plant has a plurality of attributes like an attribute pertaining to rule id, an attribute pertaining to rules for each disease name, an attribute pertaining to disease name and a plurality of attributes pertaining to the confidence factor values given by horticulturists to various diseases and level of diseases.

10

[0036] In accordance with an embodiment of the present invention, the inference module (150), as shown in FIG. 1 is the control unit for the system (1000), wherein the inference engine (154) functions as a controller. The inference module (150) contains the main method for determining the accurate disease based on the plurality of symptoms fed in the user interface (110). The controller overlooks the data, and processes the result according to the details or the plurality of symptoms fed in by the user and collected automatically in regard to the basic surrounding factors like the location, time of year, environmental conditions, and more. This controller processes the quantifiable method to develop a certainty factor pertaining to the accuracy of result of each disease shortlisted to the query that was given by the user.

20

[0037] In accordance with an embodiment of the present invention, the user interface (110) is explained in further detail. A symptom identified by the user of a selected diseased plant is fed into the user interface (110), as by being chosen in a drop down menu provided within the user interface (110) of the system (1000). The symptom or the plurality of symptoms for one or more selected diseased plants are identified from a list in the drop down menu of the user interface (110) after which the inference engine (154) of the inference module (150) starts working. A rule or plurality of rules for the selected plurality of symptoms of the selected diseased plant are selected from the

25

heuristic knowledge base (130) after which the inference engine (154) resolves conflict and matches the rule or the plurality of rules to identify at least one disease of the diseased plant which is provided to the user by displaying the identified disease along with control measures on the user interface (110). During this period, in parallel, the rule advancement module (152) is applied on successful and unsuccessful sessions and the confidence factor is evaluated to be presented to the user along with the one or more identified diseases. When an expert is satisfied with the diagnosed result or identified disease, then it is declared as the successful session and when the expert is not certified it is known as unsuccessful session.

10

[0038] In accordance with an embodiment of the present invention, the user interface (110) is created in a manner that has an ease of usability and accessibility to the users or common man. The user can create a user account on the user interface (110) so that the user interface (110) saves related information, to be used on further queries instead of information retrieval from the user at every time, though the user can input fresh data in relation to the changed conditions as well. Further, the users who are dissatisfied with their plant growth or produce can input their plant disease symptoms in the user interface (110) so that the same can be checked against horticulturist-verified database to provide supposed results to the users. These results are based on the rules fired within the inference module (150) and are accompanied with the confidence factor, a description, a control measure of the one or more identified diseases and any additional related information pertaining to the query that the heuristic knowledge base (130) contains.

25

[0039] In accordance with an embodiment of the present invention, the heuristic knowledge base (130) as shown in FIG. 2, interacts with a rule base (138) during the entire process flow within the heuristic knowledge base (130). The heuristic knowledge base (130) which has the static knowledge database (132a), dynamic knowledge database (132b) and the rule base (138), engages actively with the rules fired

or implemented by the inference module (150) as shown in FIG. 1, to give the most accurate results. This rule query, in which the rules are fired or implemented by the inference module (150), is actively updated in order to find the most appropriate result in regard to the query fed into the user interface (110) from the user. The rule base (138) contains the entirety of all the rules that can be fired within the system (1000) in regard to the query asked or fed by the user. Since the system is based on knowledge, the heuristic knowledge base (130) is constantly edited and changed in regard to its underlying information to make a database existing within the heuristic knowledge base (130) vaster, and thence give more accurate results.

10

[0040] In accordance with an embodiment of the present invention, a method (2000) for identifying plant diseases, as shown in FIG. 3 is provided. At first step (210), the user interface (110) is provided which is configured for displaying a plurality of symptoms associated with a plurality of diseased plants. Further, the user interface (110) displays the plurality of diseases associated with the plurality of diseased plants.

[0041] In accordance with an embodiment of the present invention, at second step (220) of the method, at least one symptom of a selected diseased plant is selected by the user from the plurality of symptoms associated with the plurality of diseased plants. Further, the at least one symptom of the selected diseased plant is rated on a scale for accuracy.

[0042] In accordance with an embodiment of the present invention, at third step (230) of the method, the heuristic knowledge base (130) is provided which is configured to store data related to the plurality of symptoms and associated diseases of the plurality of diseased plants. The heuristic knowledge base (130) is further configured to store data related to a plurality of rules capable of being implemented or fired for the selected plurality of symptoms of the selected diseased plant. Further, the inference module (150) receives a query of the at least one symptom along with the rating of the at

least one symptom for implementing a specific rule to provide data related to the at least one symptom of the selected diseased plant.

[0043] In accordance with an embodiment of the present invention, the
5 heuristic knowledge base (130) is further configured to store data related to the selected plurality of symptoms and associated diseases of the selected diseased plant based on location and weather conditions in a region. Furthermore, the data comprises plant species, diseases related to plant species, description of diseases related to plant species, control measures of diseases related to plant species and level of diseases related to
10 diseased plant species.

[0044] In accordance with an embodiment of the present invention, at
fourth step (240) of the method, the at least one rule from a plurality of rules capable of being implemented is implemented for the selected plurality of symptoms of the selected
15 diseased plant for providing data related to the selected plurality of symptoms and associated diseases of the selected diseased plant. Further, the inference module (150) extracts the specific rule from the rule base (134) of the heuristic knowledge base (130).

[0045] In accordance with an embodiment of the present invention, at fifth
20 step (250) of the method, the inference module (110) is provided which is configured for communicating between the user interface (110) and the heuristic knowledge base (130) such that the inference module (110) based on at least one rule implemented from the plurality of rules capable of being implemented for the selected plurality of symptoms of the selected diseased plant utilizing fuzzy theory results in real-time, the confidence
25 factor. Further, the inference module (150) fires the specific rule for providing data related to the at least one symptom of selected diseased plant by utilizing fuzzy theory and generating a confidence factor.

[0046] In accordance with an embodiment of the present invention, at sixth step (260) of the method, at least one disease of the diseased plant is identified based on the confidence factor.

5 **[0047]** In accordance with an embodiment of the present invention, the method further comprises a seventh step (270) wherein the inference module (150) extracts data related to the at least one symptom and corresponding disease of the selected diseased plant from the data base (132) of the heuristic knowledge base (130).

10 **[0048]** In accordance with an embodiment of the present invention, the method further comprises an eighth step (280) wherein the inference module (150) provides data related to the at least one symptom and corresponding disease of the selected diseased plant to the user interface (110). Further, the user interface (110) displays the at least one identified disease of the diseased plant along with control
15 measures of the identified disease.

[0049] Hereinafter, effect of the present invention is illustrated in the following examples. These examples are provided for illustrative purpose and are not considered limitation on the scope of the present invention.

20

EXAMPLES

[0050] A study was conducted in a modest region along the northern farming stretch in India wherein farmers specifying in horticulture have not been satisfied
25 with the production and quality of their plants. Farmers here have been striving to obtain an accurate production. However, in a preliminary investigation, this study prepares a virtual architecture for the system by sourcing domain expertise and inherent knowledge from the District Horticulture Officers. Further, this study entails relevant information to assist the farmers utilizing the system for identifying plant diseases.

[0051] **Data Collection:** The data for this study has been collected from a variety of published material as well as by horticulturists or domain experts who have been researching in the region. In order to convert the data and knowledge into rules,
5 many interview sessions and discussions were conducted to get actual heuristic knowledge from the domain experts. This study establishes alternative ways to elicit more knowledge from the domain experts in order to maximize the system's performance through test cases and explanations.

10 [0052] **Test Cases:** The knowledge acquired from the domain experts of horticulture are implemented in the system for identifying plant diseases. A multitude of tests have been conducted using various rules and facts. The results of these tests have been discussed with the domain experts. This provided the experts an opportunity to understand the behavior of the system. The experts compared the system prompts with
15 their knowledge to provide additional information for refining existing rules.

[0053] **Explanations:** During knowledge acquisition for rule formation, the system has been demonstrated to experts for their understanding. Further, this study develops a separate module of this system which explains the working of modules
20 separately to collect more information from the experts. Rule formation through representation and development of the expert system has been parallelly worked upon. The knowledge acquired through test cases and explanation is cohesively converted into rules and facts for the heuristic knowledge base of the expert system. The set of rules and facts can also be extended as more knowledge acquired through subsequent interviews.
25 The knowledge acquired by each interview is updated to the existing heuristic knowledge base by way of proper rules and facts.

[0054] **Data Sample and Pre-processing:** This study collected most of the data of diseased plants in horticulture from the mentioned region. However, this

section presents a sample data set of ornamental plants to demonstrate the data collection and pre-processing process. Through data collection and pre-processing, this study has developed the rules for the heuristic knowledge base by preparing the following sample data of ornamental plants including, but not limited to, rose and dahlia, as shown in tables 1 to 2 for their respective diseases. The various symptoms of diseases and corresponding confidence factor values which have been given by the experts to diagnose a particular disease in the plants are provided below in the tables 1 to 2.

Table 1: Sample data collected from domain expert of Rose

Category: Ornamentals		Plants Name: Rose	
Symptoms	Confidence Value (%)	Factor	Probable Disease
Black circular spots on both the surface of the leaves	100		Blackspot
Yellow margin or halo around each spot on the leaves	60		Blackspot
Brown blotches appear on the surface of the leaves	40		Blackspot
Yellowing of leaves followed by defoliation	20		Blackspot
Severe symptoms in young and expanding leaves	20		Blackspot
White powdery fungus on the upper surface of the flower	20		Powdery Mildew
Twisting /distortion and wilting of leaves	40		Powdery Mildew
Leaves turning reddish purple with dry corky scab	80		Powdery Mildew
Yellowing of leaves followed by defoliation	20		Powdery Mildew
Severe symptoms in young and expanding leaves	20		Powdery Mildew
White Downy fungus growth on the lower surface of the flower	100		Powdery Mildew
White to bluish–white fluffy growth forms on the leaves of the flower	80		Powdery Mildew
Gray spore masses on the lower leaf	60		Powdery Mildew
Unhealthy appearance and loss of lower leaves	40		Rose Rust
Yellow to red circular spots on the lower leaves of plants	60		Rose Rust
Smaller circular spots containing red orange or black spores	80		Rose Rust
Orange spots on leaves and disfigured stem tissues and sepals	100		Rose Rust
Yellow or reddish discoloration around wounds with a dark brown border	60		Die Back
Dieback of the tip young dsoots/pruning stubs/twigs	100		Die Back
Tiny Black fruiting bodies visible on the affected part of the plant	100		Die Back
Symptoms appearing on the wounds when plant is cut pruned	40		Botrytis Blight

Grayish brown fungal growth on flowers	40	Botrytis Blight
Small flecks on infected petals	60	Botrytis Blight
Tiny black resting (Sclerotia) on dead plant tissue	80	Botrytis Blight
Sunken grayish –black spots (lesions) on the stem/cane	100	Botrytis Blight

Table 2: Sample data collected from domain expert of Dahlia

Category: Ornamentals		Plants Name: Dahlia	
Symptoms	Confidence Value (%)	Factor	Probable Disease
Wilting of plants	100		Sclerotinia Rot
Dense white fungal growth with large black sclerotia	90		Sclerotinia Rot
Tuber rot	50		Sclerotinia Rot
Firm rot of the main stem	80		Charcoal Rot
White to grey powder appears on upper surface of leaves	100		Powdery Mildew
Rooting of the seeds heads	50		Powdery Mildew
Fungus on buds and flower	80		Grey Mould
Fading and browning of petals	70		Grey Mould
Circular brown spot on the lower surface of the leaves	100		Dahlia Smut
Plants dry up and turn brown	50		Dahlia Smut
Dead tissue falls out leaving a ‘shot hole’	80		Dahlia Smut
Withering of leaf	40		Dahlia Smut

5 [0055] From the above experimental results, it is observed that the system is used for calculating the reliability of a particular disease in a diseased plant within the horticulture domain. Further, the system for identifying plant diseases shows 80-93% success rate for identifying a disease which depends on the symptoms selected by the users. Thus, this study has been found to be efficient in identifying diseases and providing control measures, in comparison to the presently existing approaches.

10

[0056] In accordance with another embodiment of the present invention, the symptoms appeared on the plants may be classified on the level of plant parts like leaves, stem etc. Further, the system for identifying plant diseases may include security techniques for increasing the security of the system.

15

[0057] In accordance with another embodiment of the present invention, the system for identifying plant diseases may include voice recognition system along with local language so that the system can be operated by blind users and illiterate farmers or users. Also, as the heuristic knowledge base is updated manually so a module can be added to the system which mines data from web and add to the heuristic knowledge base. Furthermore, the system for identifying plant diseases may also be operated on many platforms and may be accesses easily through devices such as, but not limited to, smart phones and gadgets with internet.

[0058] In accordance with another embodiment of the present invention, the system for identifying plant diseases may be used worldwide to help the horticulturists of different regions.

[0059] Apart from what is disclosed above, the present invention also includes some additional benefits and advantages. Few of the additional benefits are mentioned below:

- The present invention provides the system for identifying plant diseases which is created in a manner that has an ease of usability and accessibility to common man.
- The system for identifying plant diseases not only identifies the plant diseases but also provide features like disorders in plants, data management, visual identification of probable disease, soil, weather and appropriate control measures.
- The system for identifying plant diseases is simple, cost-effective, time saving and has compact size, easy to use interface and easy to understand language. For example, a farmer is able to identify the expected disease which can affect the plants by using the system, the farmer can give timely treatment to the plant and thus, can increase production.

- The system for identifying plant diseases also expands its usability for visually impaired and illiterate people.
- 5
- The system and method for identifying plant diseases detects a location of the user to give location-specific results since the diseases vary in different locations.

[0060] The foregoing descriptions of exemplary embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The exemplary embodiment was chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omissions, substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but is intended to cover the application or implementation without departing from the spirit or scope of the claims of the present invention.

10

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We Claim:

1. A system (1000) for identifying plant diseases, comprising:
a user interface (110) configured to display a plurality of symptoms
5 associated with a plurality of diseased plants, said user interface (110) enables selection
of at least one symptom of a selected diseased plant by a user from said plurality of
symptoms associated with said plurality of diseased plants to be rated on a scale for
accuracy;
a heuristic knowledge base (130) configured to store data related to said
10 plurality of symptoms and said associated diseases of said plurality of diseased plants,
said heuristic knowledge base (130) is further configured to store data related to a
plurality of rules capable of being implemented for said selected plurality of symptoms of
said selected diseased plant; and
an inference module (150) configured to communicate between said user
15 interface (110) and said knowledge base (130) such that said inference module (150)
based on at least one rule implemented from said plurality of rules capable of being
implemented for said selected plurality of symptoms of said selected diseased plant
utilizing fuzzy theory results in real-time, a confidence factor identifying at least one
disease of said diseased plant.

20

2. The system (1000) for identifying plant diseases as claimed in claim 1,
wherein said data comprises plant species, diseases related to plant species, description of
diseases related to plant species, control measures of diseases related to plant species and
level of diseases related to diseased plant species.

25

3. The system (1000) for identifying plant diseases as claimed in claim 1,
wherein said heuristic knowledge base (130) is further configured to store data related to
said selected plurality of symptoms and associated diseases of said selected diseased
plant based on location and weather conditions in a region.

4. The system (1000) for identifying plant diseases as claimed in claim 1, wherein said user interface (110) displays said at least one identified disease of said diseased plant along with control measures.

5 5. A method (2000) for identifying plant diseases, comprising the steps of:
providing (201) a user interface (110) configured for displaying a plurality
of symptoms associated with a plurality of diseased plants;
selecting (220) at least one symptom of a selected diseased plant by a user
from said plurality of symptoms associated with said plurality of diseased plants and
10 rating said at least one symptom on a scale for accuracy;
providing (230) a heuristic knowledge base (130) configured to store data
related to said plurality of symptoms and associated diseases of said plurality of diseased
plants, said heuristic knowledge base (130) is further configured to store data related to a
plurality of rules capable of being implemented for said selected plurality of symptoms of
15 said selected diseased plant;
implementing (240) at least one rule from a plurality of rules capable of
being implemented for said selected plurality of symptoms of said selected diseased plant
for providing data related to said selected plurality of symptoms and associated diseases
of said selected diseased plant;
20 providing (250) an inference module (110) configured for communicating
between said user interface (110) and said heuristic knowledge base (130) such that said
inference module (110) based on at least one rule implemented from said plurality of
rules capable of being implemented for said selected plurality of symptoms of said
selected diseased plant utilising fuzzy theory results in real-time, a confidence factor; and
25 identifying (260) at least one disease of said diseased plant based on said
confidence factor.

6. The method (2000) for identifying plant diseases as claimed in claim 5, wherein said data comprises plant species, diseases related to plant species, description of

diseases related to plant species, control measures of diseases related to plant species and level of diseases related to diseased plant species.

5 7. The method (2000) for identifying plant diseases as claimed in claim 5,
wherein said heuristic knowledge base (130) is further configured to store data related to
said selected plurality of symptoms and associated diseases of said selected diseased
plant based on location and weather conditions in a region.

10 8. The method (2000) for identifying plant diseases as claimed in claim 5,
wherein said user interface (110) displays said at least one identified disease of said
diseased plant along with control measures.

Dated This 19th Day of November, 2018

15

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Varma Kumar Varma
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25

30

ABSTRACT

A SYSTEM AND A METHOD FOR IDENTIFYING PLANT DISEASES

5

The present invention provides a system for identifying plant diseases comprising a user interface, a heuristic knowledge base and an inference module. The user interface displays a plurality of symptoms associated with a plurality of diseased plants and enables selection of at least one symptom of a selected diseased plant to be rated on a scale for accuracy. The heuristic knowledge base stores data related to the plurality of symptoms and the associated diseases; and also stores data related to a plurality of rules capable of being implemented for the selected plurality of symptoms. The inference module communicates between the user interface and the knowledge base such that the inference module based on at least one rule implemented for the selected plurality of symptoms utilizing fuzzy theory results in real-time, a confidence factor and identifies at least one disease. A method for identifying plant diseases is also provided.

10

15

FIG. 1

20

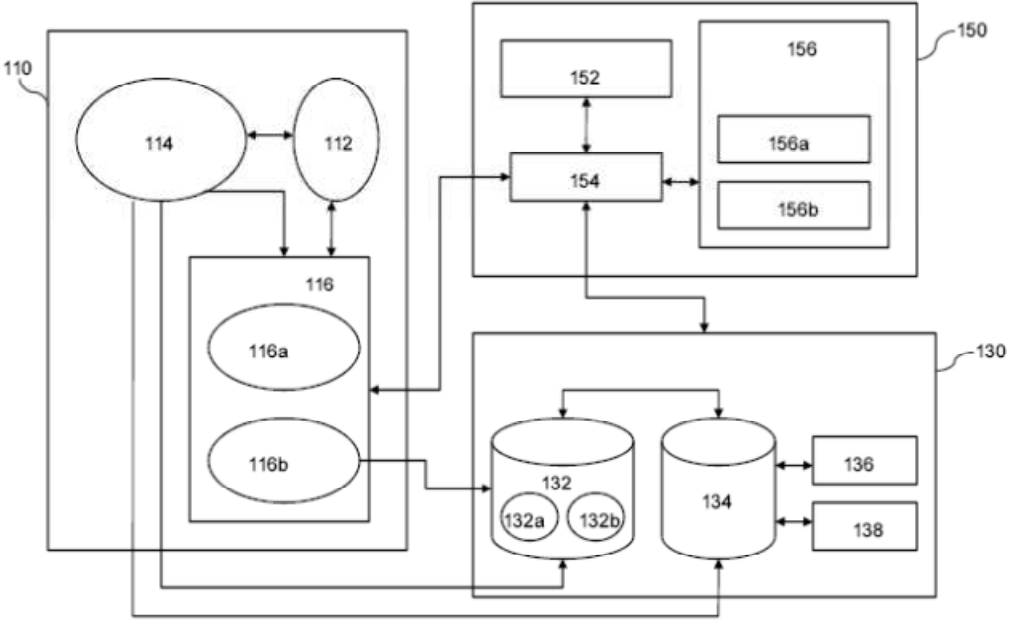


Fig.1

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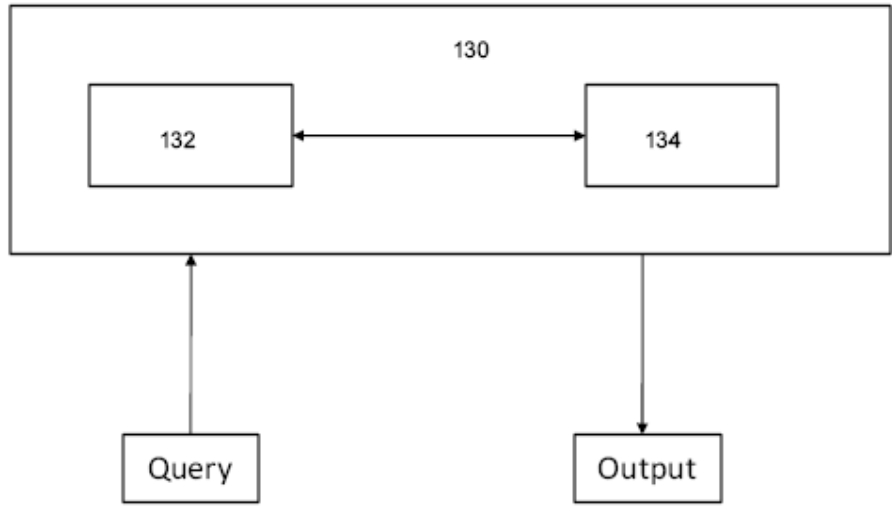


Fig. 2

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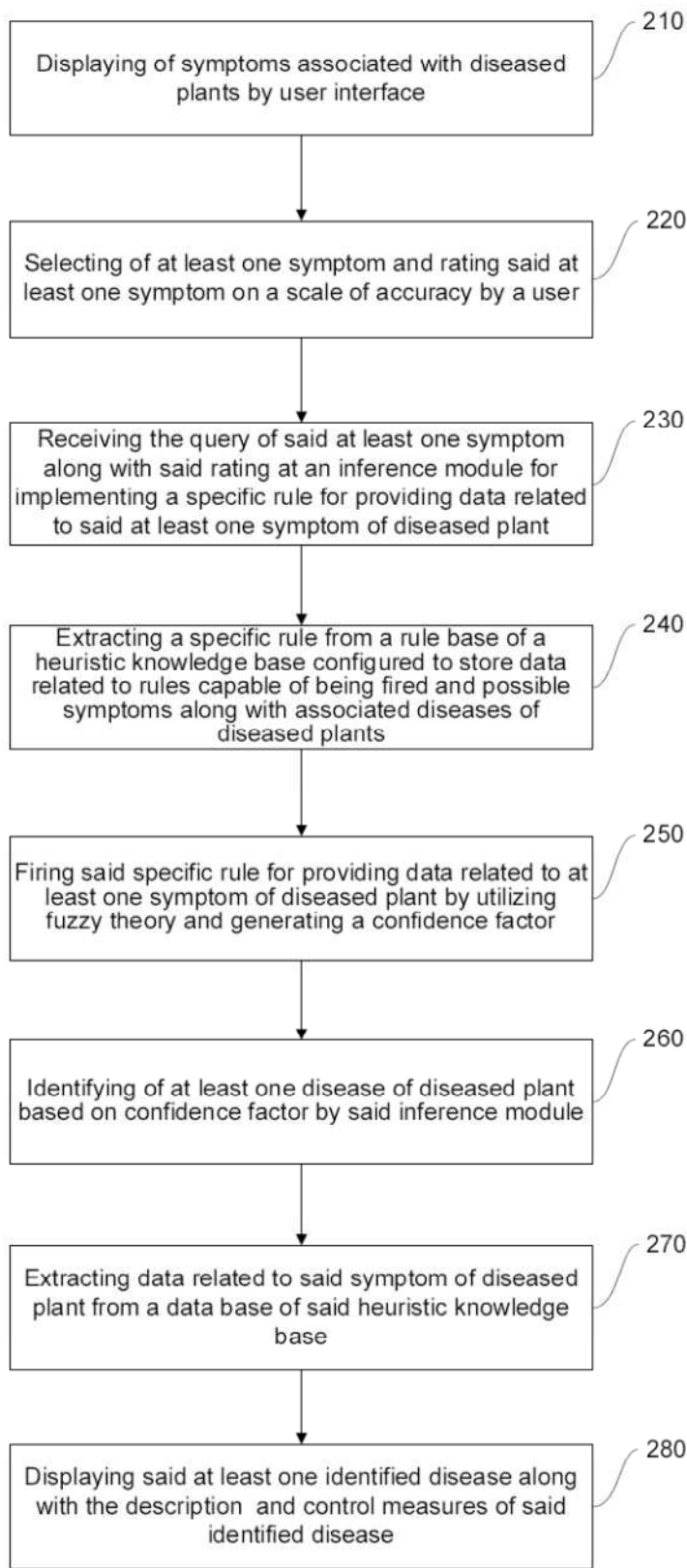


Fig. 3

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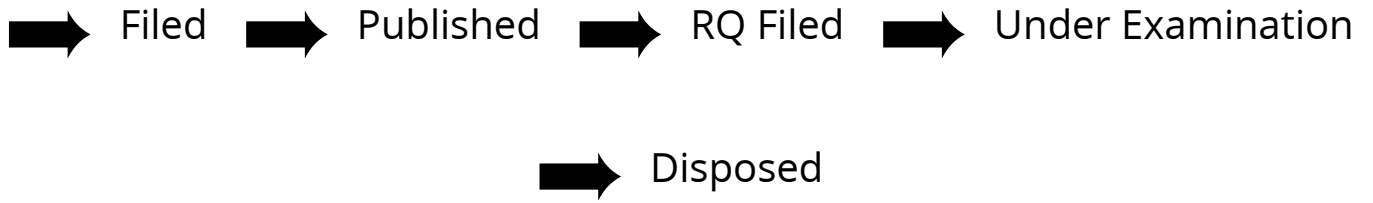
Application Details

APPLICATION NUMBER	201811043506
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	19/11/2018
APPLICANT NAME	Ela Kumar
TITLE OF INVENTION	A SYSTEM AND A METHOD FOR IDENTIFYING PLANT DISEASES
FIELD OF INVENTION	BIO-MEDICAL ENGINEERING
E-MAIL (As Per Record)	info@zeusip.com
ADDITIONAL-EMAIL (As Per Record)	nvarma@zeusip.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	14/08/2020

Application Status

APPLICATION STATUS	Awaiting Request for Examination
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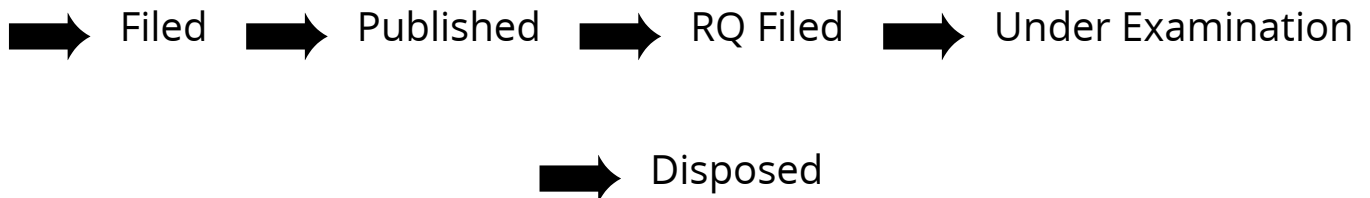
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Application Details

APPLICATION NUMBER	202011007586
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	22/02/2020

Application Status

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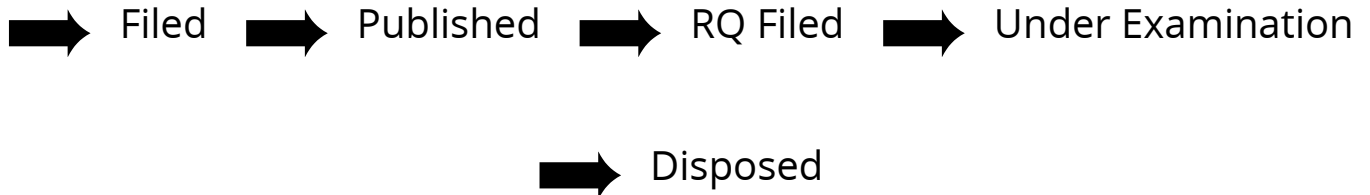


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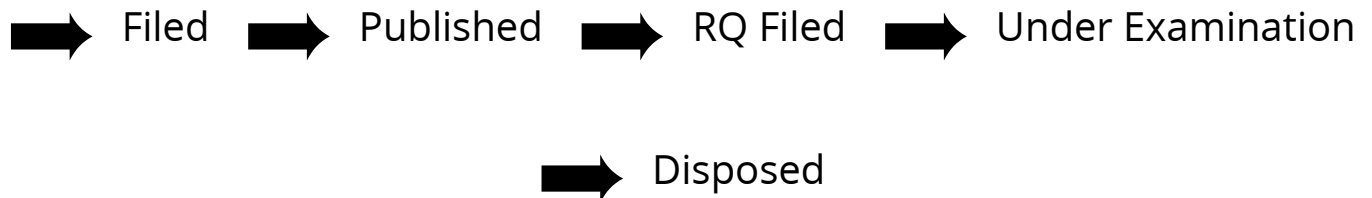
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Application Details

APPLICATION NUMBER	202011007588
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	22/02/2020

Application Status

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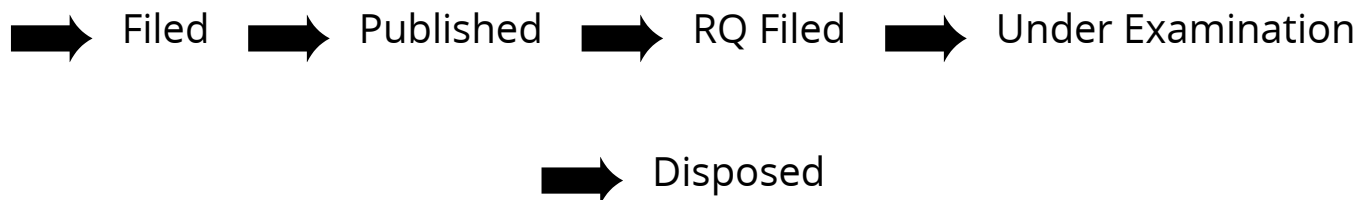
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Application Details

APPLICATION NUMBER	202011007589
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	22/02/2020

Application Status

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CERTIFICATE OF GRANT INNOVATION PATENT

Patent number: 2021105543

The Commissioner of Patents has granted the above patent on 27 October 2021, and certifies that the below particulars have been registered in the Register of Patents.

Name and address of patentee(s):

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Title of invention:

A FUZZY ENTROPY-BASED METHOD FOR CLASSIFICATION AND SELECTION OF MULTI-FACETED TEST CASE OF SOFTWARE

Name of inventor(s):

Pachariya, Manoj Kumar; Sharma, Arun and Kumar, Rajesh

Term of Patent:

Eight years from 15 August 2021

NOTE: This Innovation Patent cannot be enforced unless and until it has been examined by the Commissioner of Patents and a Certificate of Examination has been issued. See sections 120(1A) and 129A of the Patents Act 1990, set out on the reverse of this document.

Priority details:

Number	Date	Filed with
202121032982	22 July 2021	IN



Dated this 27th day of October 2021

Commissioner of Patents

PATENTS ACT 1990

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Application Details

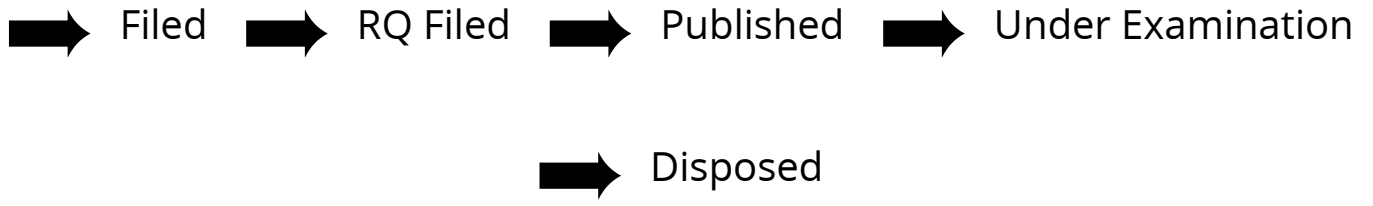
APPLICATION NUMBER	3361/DEL/1998
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	11/11/1998
APPLICANT NAME	1 . MAHESH PRASAD SRIVASTAVA 2 . SAVITA ROY 3 . RAVI KANT CHHAYA
TITLE OF INVENTION	"A METHOD OF DEPOSITING THIN FILM OF NON METALS"
FIELD OF INVENTION	MECHANICAL ENGINEERING
E-MAIL (As Per Record)	
ADDITIONAL-EMAIL (As Per Record)	
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	23/04/2004
PUBLICATION DATE (U/S 11A)	12/05/2006
Date Of Certificate Issue	29/04/2008
POST GRANT JOURNAL DATE	09/05/2008

Application Status

APPLICATION STATUS	Granted Application, Patent Number :218110
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Document Name	Created Date/Uploaded Date
3361-del-1998-abstract.pdf	21/08/2011
3361-del-1998-claims.pdf	21/08/2011
3361-del-1998-correspondence-others.pdf	21/08/2011
3361-del-1998-correspondence-po.pdf	21/08/2011
3361-del-1998-description (complete).pdf	21/08/2011
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Patent Search

Invention Title	"A METHOD OF DEPOSITING THIN FILM OF NON METALS"
Publication Number	19/2006
Publication Date	12/05/2006
Publication Type	INA
Application Number	3361/DEL/1998
Application Filing Date	11/11/1998
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	MECHANICAL ENGINEERING
Classification (IPC)	B05D 1/00

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Abstract:

This invention relates to a method of depositing thin film of non metals that is diamond like carbon on any substrate as herein described characterized by the step of dense plasma under an inert gas wherein inert gas is argon within the plasma chamber having a copper anode and a set of cathodes assembly a capacitor to provide focusing the dense plasma on non-metal pellet supported on anode, positioning a holder to hold any substrate away from the anode within the chamber wherein the between the anode and the substrate depend on the quality and thickness of film, heating the substrate, focusing of the said dense plasma to allow discharge of the the substrate and to form a film thereon.

Complete Specification

FIELD OF INVENTION

This invention relates to a method of depositing thin film of non metals such as diamond like carbon on substrates.

BACKGROUND OF INVENTION

It is known that diamond like carbon films are a non-crystalline material which may include a micro-crystalline phase. Such a material has several advantages in that it possesses extreme hardness in the range of 1000—3000 kg/mn² with a generally low-friction coefficient between 0.01 to 0.28. Further diamond like carbon films have high optical transparency and high electrical resistivity.

PRIOR ART

It is known to deposit thin films of diamond like carbon by the method of chemical vapour deposition. In one such known method employing hot wire chemical vapour deposition, the disadvantage is that of high substrate temperatures such as 106K and low deposition rates. Such a process has limited applications.

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Page last updated on: 26/06/2019

ABSTRACT

"A device for depositing thin films of metals and non metals and diamond like carbon on a substrate".

A device for depositing thin films of metals and non metals and diamond like carbon on a substrate comprising a plasma chamber with an anode made of cooper and filed with graphite and a plurality of cathodes; said anode having a support at the upper end for supporting said graphite; a high voltage source for charging a capacitor assembly; a spark gap for allowing the discharge from said capacitor assembly to the electrode assembly; a substrate holder disposed above and in a spaced relationship to said anode and adapted to be moved away or towards said anode, the substrate held to the lower end of said holder; a shutter disposed between said anode and substrate in an inoperative position.

WE CLAIM;

1. A device for depositing thin films of metals and non metals and diamond like carbon on a substrate comprising:
 - i) a plasma chamber with an anode made of copper and filled with graphite and a plurality of cathodes;
 - ii) said anode having a support at the upper end for supporting said graphite;
 - iii) a high voltage source for charging a capacitor assembly;
 - iv) a spark gap for allowing the discharge from said capacitor assembly to the electrode assembly;
 - v) a substrate holder disposed above and in a spaced relationship to said anode and adapted to be moved away or towards said anode, the substrate held to the lower end of said holder;
 - vi) a shutter disposed between said anode and substrate in an inoperative position.

2. The device as claimed in claim 1 wherein a heater is provided with said substrate for causing a heating of the substrate.

3. The device as claimed in claim 1 wherein said chamber is connected to a vacuum pump and a pressure gauge.

4. The device as claimed in claim 1 wherein a gas inlet is provided with said chamber.

5. The device as claimed in claim 1 comprising an insulator sleeve extending from the base and within said chamber, said anode disposed in a spaced relationship within said sleeve.
6. The device for forming thin films of metals, non metals and diamond like carbon on a substrate substantially as herein described and illustrated.

DATED THIS 7TH DAY OF NOVEMBER, 1998



(YOGYATA SINGH)
OF L.S.DAVAR & CO.,
APPLICANTS ATTORNEY.

(12)

Indian and Foreign Patents & Trade Marks
ESTABLISHED 1932

L. S. DAVAR & CO.

PATENT AND TRADE MARKS ATTORNEYS
5/1 (1st Floor), KALKAJI EXTENSION
NEW DELHI - 110019

Telegram : "DAVARCO"

Telephone : 6418980
6438162 (O)

Fax : (91 (11) 646-4443

E-mail : GAUTAM.DAWAR

@gems. vsnl. net. in

7th November, 1998

Case reply to
Delhi Office

3362/Del/198
11/11/98

The Controller of Patents,
The Patent Office Branch,
NEW DELHI

CASE-A

RE: New complete patent application
for "A device for depositing
thin films of metals and non
metals" in the name of Mahesh
Prasad Srivastava, Savita Roy and
Ravi Kant Chhaya University of
Delhi.

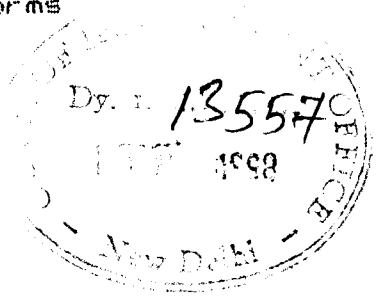
APR 12/11
11/11/98

534
11/11/98

Dear Sir,

With reference to the above, we send you herewith
the following documents:

1. Complete specification
(in triplicate);
2. Informal applications forms
(in triplicate);
3. Informal drawings
(in triplicate);
4. Fee of Rs.300/-



e/pe
11/11/98

Yours faithfully,

Encls as stated above.

Gsd/p.

Please reply to
Delhi Office

Indian and Foreign Patents & Trade Marks
ESTABLISHED 1932

L. S. DAVAR & CO.

PATENTS AND TRADE MARKS ATTORNEY'S
5/1 (1ST FLOOR) KALKAJI EXTENSION
NEW DELHI - 110019

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Telephone : 641-8980 (O)
643-8162
Fax : (91) (11) 646-4443
646-4498
E-mail : lsdavar@ndf.vsnl.net.in

September 27, 2002

**The Controller of Patents,
The Patent Office Branch,
New Delhi**

RE: Patent application no. 3362/Del/98

Dear Sir,

Kindly refer to your letter no. 3362/Del/98-521 dated nil.

Referring to para 2(a) we enclose herewith formal drawings.

Referring to paras 3 and 5, we submit that the applicants have not filed any foreign patent application and therefore we are unable to comply with this objection. However, we enclose herewith a statement on Form 3 in duplicate.

Referring to para 8, we are enclosing herewith formal application forms in triplicate together with Petition Under Rule 124 for condoning delay in filing the application forms. Prescribed fee of Rs.1000/- is sent herewith.

Referring to para 9, an executed Power of Attorney is enclosed herewith.

Kindly take the enclosed documents on record.

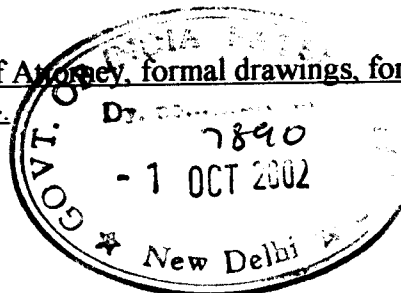
Yours faithfully,
Of L.S.DAVAR & CO.,

BY 
(R.P. YADAV)

Encl:

Form 3 in duplicate, Power of Attorney, formal drawings, formal application forms,
PUR-124 and fee of Rs.1000/-.

Rpy/pk.



Please reply to
Delhi Office

Indian and Foreign Patents & Trade Marks
ESTABLISHED 1932

L. S. DAVAR & CO.

PATENTS AND TRADE MARKS ATTORNEY'S
5/1 (1ST FLOOR) KALKAJI EXTENSION
NEW DELHI - 110019

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26438162
Fax : (91) (11) 26464443
26464498
E-mail : lsdavar@ndf.vsnl.net.in

April 13, 2004

7348
27/4

The Controller of Patents,
The Patent Office Branch,
New Delhi

3982 RQ-DEL/2004

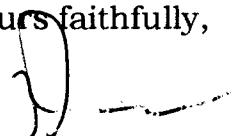
RE: Patent Application No. 3362/DEL/98 in the name of Mahesh Prasad Srivastava, Savita Roy and Ravi Kant Chhaya.

Dear Sir,

In connection with the above patent application, the request for examination of application on the prescribed form-19 alongwith the prescribed fee Rs.1000/- is enclosed.

Kindly take the enclosed document on record.

Yours faithfully,



(S.K.DUTT)
Advocate,
of L.S.DAVAR & CO.,

P1/cash
Sk
27/4

Encl: Form-19 with fee of Rs.1000/-
Skd/ds.

Please reply to
Delhi Office

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5/1 (1ST FLOOR) KALKAJI EXTENSION
NEW DELHI - 110019

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26464498
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SR

3362/DEL/200

7348

398/29-04/09

7267
11/5/09

May 1st, 2004

The Controller of Patents,
The Patent Office Branch,
New Delhi

Re: Patent Application No. 3362/Del/98 in the name Mahesh Prasad
Srivastava, Savita Roy and Ravi Kant Chhaya.

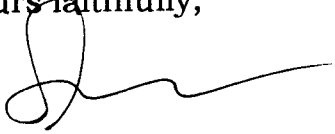
.....

Dear Sir,

In connection with the above patent application, the request for
examination of application on the prescribed form-19 alongwith the
prescribed fee Rs. 1000/- is enclosed.

Kindly take the enclosed document on record.

Yours faithfully,



(S.K.DUTT)
Advocate
Of L.S.DAVAR & CO.,

Encl: Form-19 with fee of Rs. 1000/-
Skd /

Please reply to
Delhi Of

27/6/05

Indian and Foreign Patents & Trade Marks
ESTABLISHED 1932
L. S. DAVAR & CO.
PATENTS AND TRADE MARKS ATTORNEY'S
5/1 (1ST FLOOR) KALKAJI EXTENSION
NEW DELHI - 110019

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26464498
51431140
E-mail : lsdavar@ndf.vsnl.net.in

7R

June 20, 2005

Final Date: 02. 09. 2005

To,
The Controller of Patents and Designs,
The Patent Office Branch,
New Delhi.

KIND ATTN: DR. RAJENDRA KUMAR LOHIA
Examiner of Patents & Designs

Re: Patent Application No. 3362/DEL/1998 in the name of Mahesh
prasad srivastava, savita roy and ravi kant chhaya.

Dear Sir,

Kindly refer to your letter no. 3362/DEL/1998/12539 dated 2nd
September, 2004 in respect of the subject application. We wish to submit
as under.

Regarding objection 1, we submit that the present invention does
constitute an invention under Section 21(i) of Patent Act 1970 as it is
first of its kind and has all inventive constructional features. kindly
waive the objection.

Regarding objection 2, we submit that we have reworded the claims. Re-
typed pages of claims is enclosed. Kindly waive the objection.

Regarding objection 3, we submit that explicit statement of invention is
given on page 6 para 3 of Complete Specification. Kindly waive the
objection.



Contd 2/-

-2-

Regarding objection 4, we submit that all three cited document are totally different from the present invention. Document US 2003052080 relates to a method for fabricating a nano-sized diamond whisker whereas the present invention device is used to deposit film of metals, non-metals and diamond like carbon and the constructional features are also totally different.

The cited document KR 2002094599 and JP 2003124209 relates to depositing of only copper film whereas the present invention device. The constructional feature are totally different from the present invention. The Learned Examiner will note from the above that all the three cited document are totally different and not relevant. We therefore request the Learned Examiner to waive the objection.

Regarding objection 5, we submit that proof of right under Section 7(2) & rule 10 of Patent Act 1970 is already with the application in the Form-1. kindly waive the objection.

Regarding objection 6, we submit that the application was filed with Complete Specification thereform Form-5 is not required. Kindly waive the objection.

Regarding objections 7 & 8, we submit that the applicant has not filed any application outside India for the same or substantially same invention. Kindly waive the objection.

Contd 3/-

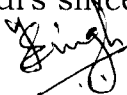
-3-

Referring to remaining objections, we have attended to them.

Acceptance of the complete specification is earnestly solicited.

Thanking you.

Yours sincerely,



(YOGYATA SINGH)

Encl: Application form, Complete specification, Drawing sheet, re-typed pages in triplicate and amended claims.

YS/s.

(21)

GOVERNMENT OF INDIA
PATENT OFFICE
DELHI BRANCH
W-5 WEST PATEL NAGAR
NEW DELHI - 110 008.

No. 3362/Del/98
L.S. Dewar & Co.
New Delhi

521

Formal Scrutiny Report

Dated:

Sub: Patent Application No. 3362/Del/98

Sir,

I am to acknowledge the receipt of application for patent forwarded with your letter No. _____ dt. 11.11.98 and to state that the application has been numbered 3362/Del/98 and dated 11.11.98

I would further inform you that all patents applications are take up for examination in the order in which they are received in the office. Your application will be taken up according to its turn and a statement of the objections, if any there to will be forwarded to you in due course.

The formal requirements which are to be complied with within 15 days from the date of issue of this letter are indicated parawise in the following formal scrutiny report.

1. The duplicate(s) and/or triplicate (s) of the Provisional/Complete Specification/Application form has/have not been filed.
2. (a) The drawing refered to in the specification have not been prepared on tracing cloth or transparent, semi-transparent sheet, film made of plastics, fibre glass or thick and durable paper in accordance with the instructions contained in Rule 16 of the Patents Rules 1972.
- (b) The drawing is not prepared on A4 size sheet with clear margin of 2.5 c.m. from the edges as mentioned under rule 19 of the Patent Rules, 1972.
- (c) The drawing have not been prepared as per requirements of Rule 19 of the Patents Rules, 1972.
3. A statement and an undertaking on form-3 as required under subsection (1) of section 8 of the Patents Act, 1970 has not been filed.
4. Certified copy of the convention documents has not been filed.
5. Details regarding the search and/or examination report in respect of the same or substantially the same invention filed in any country outside India and any amendment effected in the specification including claims should be submitted immediately as provided under section 8(2) of the Patents Act, 1970.

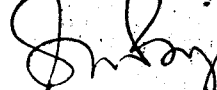
प्रियंक
D. S. DEWAR
दिनांक: 9/11/98

6. The complete specification does not contain claim/claims as required under section 10(4) of the Patents Act, 1970. The application is likely to be post-dated.
7. The pages _____ of Complete/Provisional specification are not legible.
8. ✓ The proof of right to make the application has not been filed within the stipulated period of 3 months under rule 11 of the patents Rule, 1972 thereof, a petition under rule 124 requesting the controller for extending the said time limit should be filed.
9. ✓ Power of Attorney in your favour should be produced.
10. Declaration of Inventorship (Form-5/6) has not filed along with complete specification.
11. You have intimated about the change in Name/Address/Address for Service/Corrections in the specification which will be considered only after your filing a request in the prescribe manner on Form - 13 with prescribed fee, Under Section 57 of the Act.
12. For the change of applicant, you are required to file a request in the prescribed manner on Form-6 with prescribed fee Under Section -29 of the Act.
13. Petition under rule 124 should be filed for taking the particulars of corresponding foreign applications filed, on record.
14. ✓ An abstract of the invention limited to 200 words should be filed.
15. If you intend to file your above said application under Section 5(2) of the Act, please intimate immediately to this office accordingly.

NOTE:

This report is not to be treated as "First Examination Report".

Your faithfully,



J/D/C/I/A/C/Examiner of
Patents & Designs

61



INTELLECTUAL
PROPERTY INDIA
PATENTS / DESIGNS / TRADE MARKS
GEOGRAPHICAL INDICATIONS

GOVERNMENT OF INDIA
PATENT OFFICE BRANCH
W - 5, WEST PATEL NAGAR
NEW DELHI - 110 008.

Tel No. (091)(011) 25871255 - 58 Fax No. 25876209, 25872532
E-mail : delhipatent@vsnl.com
Web Site : www.ipindia.nic.in

No : 3362/DEL/1998/12539
To

Dated the 02/09/2004

L.S. Davar & Co., 5/1, (1st Floor), Kalkaji Extension,
New Delhi-110 019.

SUB : FIRST EXAMINATION REPORT

REF : - PATENT APPLICATION NO. : 3362/DEL/1998

NAME OF APPLICANT : MAHESH PRASAD SRI STAVA, SA VTA ROY AND RAVI KANT CHHAYA

With reference to request no 3982/RQ-DEL/2004 made on 27/04/2004 by for examination the above quoted application has been examined under section 12 of the patent Act, 1970 as amended by the Patent(Amendment) Act-2002 and the first statement of objection is forwarded herewith for compliance.

The documents noted in the margin are enclosed herewith for amendment in these respects and should be resubmitted to this office **within 4 months from the date of issue of this statement U/R 24(4)** together with an observation that you would like to offer in connection therewith.

If any correction is made in any page of the specification that page should be freshly typed and filed in triplicate. The original pages in that case should be returned to this office duly cancelled.

The application referred to will be deemed to have been abandoned unless all requirements imposed by the said act and patents Rule 2003 are **complied within 12 months U/S 21(1). No extension of time beyond 12 months is allowed.**

The pages of the complete specification should be retyped wherever corrections on interpolation are made. The typed pages should preferably be on white papers in order that clear photocopies of the specification can be prepared at the time of publication of the specification.

(DR. RAJENDRA KUMAR LOHIA)
Examiner of Patents & Designs
For Controller of Patents & Designs

Encl. :-

- APPLICATION FORM
- COMPLETE SPECIFICATION
- DRAWING SHEET

NOTE : All Communication to be sent to the Controller of Patents at the above address.

भारत
DESPATCHER
दिनांक/Date.....
06 SEP 2004

3362

1. Subject matter of claims 1 to 6 does not constitute an invention under section 2(1)(j) of Patent Act 1970.
2. Claims are not clearly worded.
3. Claim 6 is not sufficiently definitive in the absence of explicit statement of invention.
4. Invention claimed in claim Prima-facie lacking in novelty instance Patent No. KR 2002094599, US 2003052080, JP 2003124209.
5. Proof of Right under section 7(2) & under rule 10 of Patent Act 1970.
6. Form 5 should be filed.
7. Details regarding application for patents which may be filed outside India from time to time for the same or substantially the same invention should be furnished within three months from the dates of filing of the said application (s) under clause (b) of sub section (1) of section 8 and rule 12(1) of the Indian patents (Amended) Act, 2002.
8. Details regarding the search and/or examination report including claims of the applications allowed, as referred to in Rule 12(3) of the Patents Rule 2003, in respect of same or substantially the same inventions filed in all the major Patent Offices, such as USPTO, EPO and JPO etc., along with appropriate translation where applicable, should be submitted within a period of 30 days from the date of receipt of this communication as provided under Section 8(2) of the Indian Patents (Amendment) Act, 2002.

GOVERNMENT OF INDIA
PATENT OFFICE BRANCH
Plot No. 33, Sector 14, Connaught Place & Industry
Boudhik Sampada Bhawan,
NEW DELHI-110 075.

Tel No.(28081920-926)

E-mail: delhipatent@vsnl.com

PATENTS / DESIGNS / TRADE MARKS

GEOGRAPHICAL INDICATIONS

No.3362/DEL/1998

/7218

13 SEP 2005

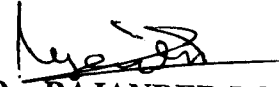
To

L. S. Davar & Co.
5/1 1st floor,
Kalkaji Extension
New Delhi - 19.

SUBJECT: INTIMATION OF GRANT THEREOF.
REFERENCE: PATENT APPLICATION No. 3362/DEL/1998

Sir,

Your above said application for patent has been found in order for grant however, letters patent thereof will be issued only after disposal of pre-grant opposition, if any, under section 25(1) of the Act.



(Dr. RAJANDER LOHIA)

Examiner of Patents and Designs.
For Controller of Patents and Designs.

ब्रेचक
DISPATCHER
दिनांक/Date.....
13 SEP 2005

Case-A

534
11/11/58

भारत शासक
GOVERNMENT OF INDIA
पेटेंट कार्यालय शाखा
THE PATENT OFFICE BRANCH
001811
Municipal Market Building, 3rd Floor Sarawati Marg, Karol Bagh, NEW DELHI-110005

पेटेंट आवेदन पत्र संख्या
Patent Application No. 3362/Del/58
अवशेष/पूर्व विधिगत और 100/300 रुपये।

तारीख
Dated 11/11/58
स्वीकृत/पत्र प्राप्त के साथ

पेटेंट के लिए आवेदन पत्र के अतिरिक्त के लिए यह दस्तावेज प्राप्त है।
RECEIVED documents purporting to be an application for a patent by Mahesh Prasad Srivastava, M.S. and others.

relating to A device for depositing thin films of:
metals and non metals.

together with PROVISIONAL Specification and fee of Rs. 100/- (Rupees 100/-) only.
COMPLETE ✓ 300/-
तारीख पर उक्त विवरण पत्र है।

आवेदन पत्र पर संख्या डाल दी गई है और
The application has been numbered and dated as of
तारीख 3362/Del/58
को

11/11/58

S. S. D. ...
एक पेटेंट अधिकारी
for Controller of Patents

L. S. D. ...
...

Case-11

534
11/11/58

सरकार भारत
GOVERNMENT OF INDIA
पेटेंट कार्यालय शाखा
THE PATENT OFFICE BRANCH

001811

Municipal Market Building, 3rd Floor Saraswati Marg, Karol Bagh, NEW DELHI-110005

पेटेंट आवेदन क्र संख्या
Patent Application No. 3362/Del/58
अन्यथा/पूर्व विधिगत और 100/300 रुपये।

तारीख
Dated 11/11/58
स्वयं/मान प्रेषण के साथ के साथ

पेटेंट के लिए आवेदन करने के उद्देश्य से निम्न पर दस्तावेज प्राप्त हुए।
RECEIVED documents purporting to be an application for a patent by Mahesh Prasad Srivastava, U.O. and others.

relating to A device for depositing thin films of:
metals and non metals.

साथ में PROVISIONAL Specification and fee of Rs. 100/- (Rupees 100 only).
COMPLETE ✓ 300/-
तारीख पर उक्त विज्ञापन प्राप्त है।

आवेदन क्र संख्या प्राप्त की गई है और
The application has been numbered and dated as of

संख्या 3362/Del/58
से

11/11/58

S. S. S. S. S.

सरकारी पेटेंट अधिकारी
Secy Controller of Patents

L. S. S. S. S. S.

FIELD OF INVENTION

This invention relates to a device for depositing thin films of metals and non metals, such as diamond like carbon. Though reference is made hereinafter to diamond like carbon, it is to be understood that a particular and advantageous application is with respect to diamond like carbon film, though the invention is not intended to be restricted thereto. In particular, this invention relates to a dense plasma focus device for depositing thin films of diamond like carbon.

BACKGROUND OF INVENTION

It is known that diamond like carbon films are metastable amorphous materials, which may include a micro crystalline phase. Such a material has several distinct advantages in that it possesses extreme hardness in the range of 1000-3000 kg/mm² with a generally low friction coefficient between 0.01 to 0.28. Further, diamond like carbon films have high optical transparency and high electrical resistivity.

PRIOR ART

It is known to deposit thin film of diamond like carbon by the method of chemical vapour

deposition. In one such known method employing hot wire chemical vapour deposition, the disadvantage is that of high substrate temperatures such as 10^3K , and low deposition rates. Such a process has limited applications.

Yet another method known in the art consists in an electron assisted chemical vapour deposition. Such a method is also attended with the disadvantage of a high substrate temperature of 10^3K during deposition, and further it is difficult to control the growth rate. Yet another disadvantage is the low quality of films, and consequentially it had limited applications.

A plasma assisted chemical vapour deposition method is also known in the art, and which could either be microwave or remote plasma assisted chemical vapour deposition. In the microwave chemical vapour deposition, the substrate is normally Si and which requires to be scratched by SiC. A disadvantage is that of high substrate temperatures in the vicinity of 900°C and low deposition rates, yet another disadvantage is that its rough surface topography limits its optical

and electronic application in the remote plasma assisted chemical vapour deposition, the substrates are normally Si₁ and Ni. The disadvantages are of high substrate temperature, low deposition rate and rough surface topography.

A physical vapour deposition method is known in the art and employing ion beam sputtering with a current density of source of 1 MA/Cm^2 at 1000 eV. A disadvantage of such a method is that of low deposition rates and also requires extremely low pressures, which adds to the costs.

It is also known in the art to employ a dual ion sputtering beam and wherein the substrate can be Si and variety of metals. A disadvantage of such a method is that the deposition rate depends on pressure.

OBJECTS OF THE PRESENT INVENTION

An object of the present invention is to propose a novel device for depositing thin films of metals and non metals such as diamond like carbon films.

Another object of this invention is to propose a device for depositing thin films of metals and

non metals such as diamond like carbon films which obviate the disadvantages of the prior art.

Yet another object of this invention is to propose a device for depositing thin films of metals and non metals such as diamond like carbon films which has high deposition rates.

Still another object of this invention is to propose a device for depositing thin films of metals and non metals such as diamond like carbon films which has smooth surface topography.

A further object of this invention is to propose a device for depositing thin films of metals and non metals such as diamond like carbon films which has the required optical transparency.

A still further object of this invention is to propose a device for depositing thin films of metals and non metals such as diamond like carbon films which have required structural, optical including IR and UV range, mechanical and electronic properties.

Yet a further object of this invention it to propose a device for depositing thin films of metals and non metals such as diamond like carbon films which has a high electrical restivity.

Another object of this invention is to propose a device for depositing thin films of metals and non metals such as diamond like carbon films on different substrates.

DESCRIPTION OF INVENTION

According to this invention there is provided a device for depositing thin films of metals and non metals and diamond like carbon on a substrate comprising:

- i) a plasma chamber with an anode made of copper and filled with graphite and a plurality of cathodes;
- ii) said anode having a support at the upper end for supporting said graphite;
- iii) a high voltage source for charging a capacitor assembly;
- iv) a spark gap for allowing the discharge from said capacitor assembly to the electrode assembly;
- v) a substrate holder disposed above and in a spaced relationship to said anode and adapted to be moved away or towards said anode, the substrate held to the lower end of said holder;
- vii) a shutter disposed between said anode and substrate in an inoperative position.

**DESCRIPTION OF INVENTION WITH REFERENCE TO
ACCOMPANYING DRAWINGS**

Further objects and advantages of this invention will be more apparent from the ensuing description when read in conjunction with the accompanying drawings and wherein:

Fig. 1 shows the device of the present invention:

Referring to fig.1. the device 1 of the present invention comprises a focus chamber 2 made of mild steel or stainless steel and has an insulator sleeve 3 which assists in the formation of the plasma. A high voltage charger 4 is connected to a capacitor C_1 . Which charges capacitor 4 is connected to a capacitor C_1 . A spark gas SG allows a discharge from capacitor C_1 to an electrode assembly consisting of a centrally disposed anode made up of

: 8 :

copper and field with graphite 5 and a set of symmetrically disposed cathodes 7. Thus, when capacitor C_1 discharges a plasma sheet is formed between anode 5 and backwall plate 8 and connected to cathodes 7. The height of the sleeve 3 determines the shape of plasma sheet.

Due to the magnetic field there is a force which moves the plasma sheet away from anode 5 and when it reaches cathodes 7, the radial component of current density and azimuthal magnetic field gives an axial force so that the plasma sheet moves at a high speed upwards. and when it reaches the top of anode 5, there is an axial component of current density and azimuthal magnetic field. but as current is in the opposite direction, it results in a collapsing of plasma radially inward. With such a compression, a high temperature and density plasma acts on the graphite 12 supported at the top of anode 5 and allows the flow of ions in a conical shower towards the substrate 10. and with the shutter in a withdrawn position. In accordance with this invention, a heater is provided at the holding end of a braze holder 11 for holding substrate 10,

The device has a vacuum pump 13 with a pressure gauge 14. Further, a gas inlet 15 is provided with device 1 for introduction of a gas, such as argon.

In operation, device 1 is first evacuated by vacuum pump 13. Then gas is then introduced through gas inlet 15.

Holder 11 can be moved along the vertical axis so as to allow the distance of substrate 10 to be varied from anode 5. Depending on the quality and thickness of film, substrate 10 is disposed at a distance of 1 to 10 cm from anode 5.

1. MAHESH PRASAD SRIVASTAVA
2. SAVITA ROY
3. RAVI KANT CHHAYA

ONE SHEET

3: 32/DE/98

01 SEP 2002

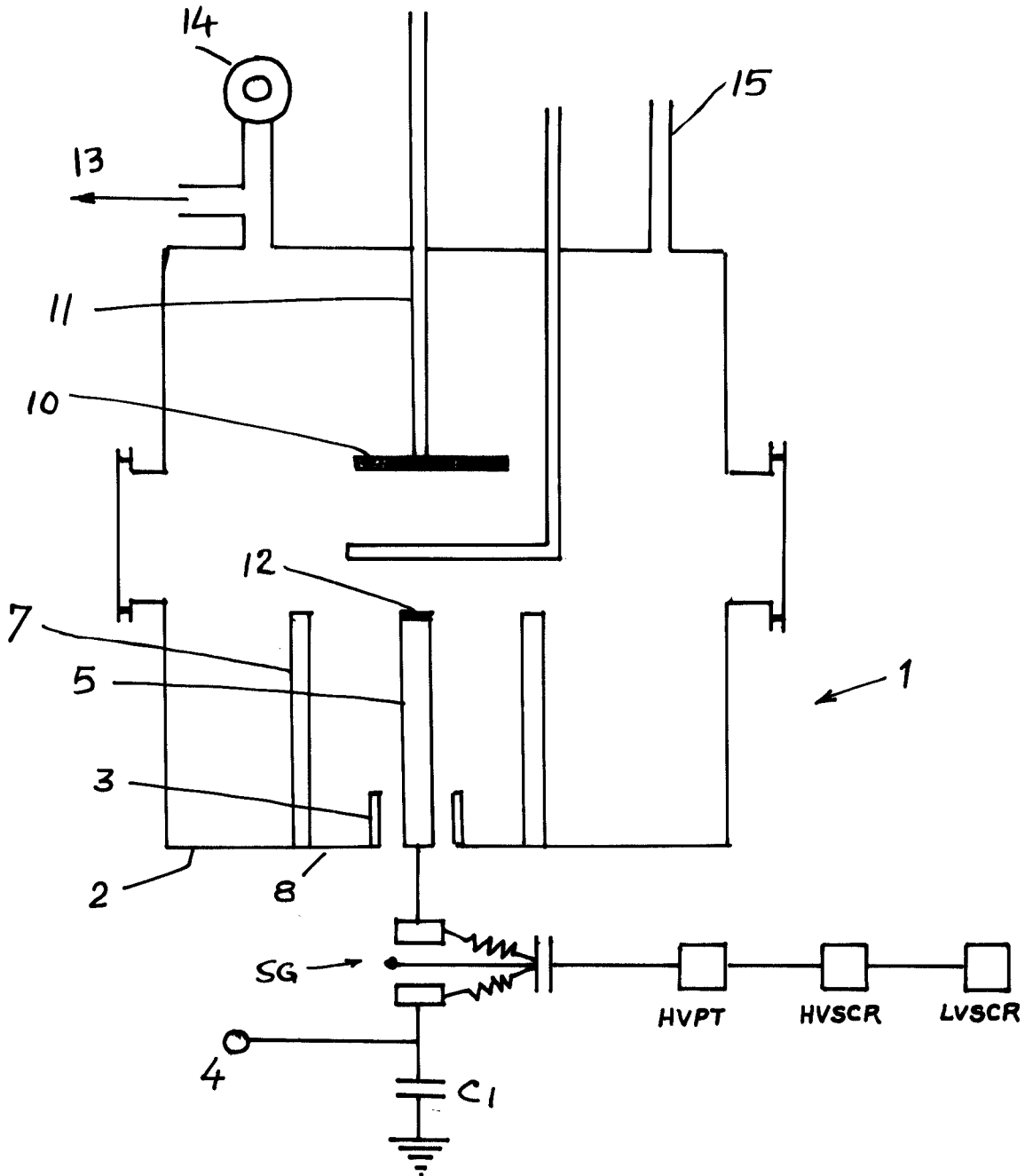


Fig. 1

R. P. Yadav
(R.P. YADAV)
OF L.S. DAVAR & CO.
APPLICANTS' AGENT

01 SEP 2002

THE PATENTS ACT 1970

FORM. 1A APPLICATION FOR PATENT BY THE TRUE AND FIRST INVENTOR IS THE SOLE OR JOINT APPLICANT, SECTION 7.

WE,
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT CHHAYA, Department of Physics and Astrophysics, University of Delhi, Delhi-110 007, all Indian Nationals, India.

hereby declare

- (I) that we are in possession of an invention for "A METHOD OF DEPOSITING THIN FILMS OF METALS AND NON METALS"
- (II) that we the said MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT CHHAYA claim (s) to be true and first inventor(s) thereof.

who claim(s) and are believed to be the true and first inventor(s) thereof (iv) that complete specification filed with this application are (and the complete specification) and any amended specification which may hereafter be filed in this behalf will be true of the inventor to which this application relates.

(v) that we believe that we are entitled to a patent for the said invention having regard to the provisions of the patent Act, 1970.

(vi) that to the best of me knowledge, information and belief the facts matters stated herein are correct and that there is no lawful ground of objection to the grand of patent to us on this application.

we request that a patent may be granted to us for the said invention.

we request that all notices, requisitions and communications relating to this application may be sent to L.S.DAVAR & CO., 5/1 (1st Floor), Kalkaji Extension, New Delhi-110 019.

Dated this 7th Day of NOVEMBER 1998.

To,
The Controller of Patents,
The Patent Office Branch,
New Delhi

m. p. srivastava
Signature.....
(MAHESH PRASAD SRIVASTAVA)
Savita Roy
(SAVITA ROY)
Ravi Kant Chhaya
(RAVI KANT CHHAYA)

ORIGINAL

THE PATENTS ACT, 1970

11 NOV 1998

FORM 1.

~~XX~~ APPLICATION FOR PATENT WHEN THE TRUE AND FIRST INVENTOR IS THE SOLE OR JOINT APPLICANT/~~BY THE ASSIGNEE OR LEGAL REPRESENTATIVE OF THE TRUE AND FIRST INVENTOR(S), SECTION 7,~~

I/We
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT CHHAYA,
Department of Physics and Astrophysics, University
of Delhi, Delhi-110 007, all Indian Nationals, India.

hereby declare :

(i) that I/~~XX~~we are in possession of an invention for
" A DEVICE FOR DEPOSITING THIN FILMS OF
METALS AND NON METALS"

MAHESH PRASAD SRIVASTAVA, SAVITA ROY
(ii) that I/we the said and CHHAYA KANT.

claim (s) to be the true and first inventor (s) thereof :

~~(i) that I/we the said~~

~~claim(s) to be the true and first inventor (s) thereof~~

DUPLICATE

who claim(s) and is/are believed to be the true and first inventor(s) thereof

(iv) that ~~provisional~~/complete specification filed with this application is
(and the complete specification) and any amended specification which may
hereafter be filed in this behalf will be true of the inventor to which this
application relates.


(v) that I/we believe that I/~~XX~~we are entitled to a patent for the said
invention having regard to the provisions of the patent Act, 1970.

(vi) that to the best of ~~my~~our knowledge, information and belief the facts
stated herein are correct and that there is no lawful ground of
objection to the grant of patent to ~~me~~us on this application.

I/we request that a patent may be granted to ~~me~~us for the said invention.
I/we request that all notices, requisitions and communications relating to
this application may be sent to L. S. DAVAR & CO., 5/1 (1st Floor)
Kalkaji Extension, New Delhi-110019

Dated this 7th Day of NOVEMBER, 1998

To
The Controller of Patents,
The Patent Office
~~Delhi~~/Delhi

Signed.....
OF L.S.DAVAR & CO.,
APPLICANTS ATTORNEY

Govt of India Patent Office
New Delhi
Received Rs. 1680 in cash.
Cheque/M.O./P.O./D.D.
on - 27/4/2004
Vide Entry No. 7348 in the
Register of Valuables
C. O. Cashier

FORM - 19

THE PATENTS ACT, 1970
(39 OF 1970)

REQUEST FOR EXAMINATION OF APPLICATION FOR PATENT
(See Section 11B; Rule 24 (1))

WE,
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT
CHHAYA, Department of Physics and Astrophysics, University of
Delhi, Delhi-110 007, all Indian Nationals, India.

hereby request that our application for patent No. 3362/DEL/98 filed on
11/11/98 for the invention "A device for depositing thin films of metals
and non-metals" shall be examined under sections 12 and 13 of the Act.

We hereby declare that we the applicant(s) for patent/person(s)
interested for the above mentioned application for patent.

As an evidence of our interest in the application for patent we hereby
transmit the following documents:

A copy of official filing receipt is enclosed.

Our address for service in India is:

L.S.DAVAR & CO.,
Patent and Trademarks Attorney,
5/1, (First Floor),
Kalkaji Extension,
New Delhi-110 019.

Dated this 13th day of April, 2004.



(S.K.DUTT)
OF L.S. DAVAR & CO.
APPLICANTS ATTORNEY

To,
The Controller of Patents,
The Patent Office Branch,
New Delhi

FORM - 19
THE PATENTS ACT, 1970
(39 OF 1970)

**REQUEST FOR EXAMINATION OF APPLICATION FOR
PATENT**

(See Section 11B; Rule 24 (1))

WE,
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT
CHHAYA, department of Physics and Astrophysics, University of
Delhi, Delhi- 110 007, all Indian Nationals, INDIA

hereby request that my application for patent no. No. 3362/Del/98
filed on 11/11/98 for the invention "A device for depositing thin
films of metals and non metals" shall be examined under sections
12 and 13 of the Act.

I hereby declare that I the applicant(s) for patent/person(s) interested for
the above mentioned application for patent.


As an evidence of my interest in the application for patent I hereby
transmit the following documents:

A copy of official filing receipt is enclosed.

My address for service in India is:

L.S.DAVAR & CO.,
Patent and Trademarks Attorney,
5/1, (First Floor),
Kalkaji Extension,
New Delhi-110 019.

Dated this 1st day of May, 2004



(S.K.DUTT)
Advocate

OF L.S. DAVAR & CO.
APPLICANTS ATTORNEY

To,
The Controller of Patents,
The Patent Office Branch,
New Delhi

C O M P L E T E

SPECIFICATION

Original
DUPLICATE

SECTION 10

TITLE

A DEVICE FOR DEPOSITING THIN FILMS OF METALS AND NON METALS"

APPLICANT

MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT CHHAYA,
Department of Physics and Astrophysics, University
of Delhi, Delhi-110 007, all Indian Nationals, India.

The following Specification Particularly describes and ascertains the nature of this invention and the manner in which is to be performed.

L. S. DAVAR & CO.
Patent & Trade Marks Attorneys,
CALCUTTA/DELHI

FORM-3

01 SEP 2002

THE PATENTS ACT, 1970
(39 of 1970)
STATEMENT AND UNDERTAKING UNDER SECTION 8
[See Rule 13]

WE,
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT
CHHAYA, Department of Physics and Astrophysics, University of Delhi,
Delhi-110 007, all Indian Nationals, India.

hereby declare :

- I) that we who have made this application alone/jointly with NIL made for the same/substantially same invention application (s) for patent in the other countries, the particulars of which are given below:

Name of the country	Date of application	Application no.	Status of the application.	Date of publication	Date of grant.
NIL	NIL	NIL	NIL	NIL	NIL

- II) that the rights in the application(s) has/have been assigned to NIL.
- III) that we undertake that upto the date of acceptance of the complete specification by the controller, I would keep the controller informed in writing the details regarding corresponding applications for patents filed outside India within three months from the date of filing of such application.

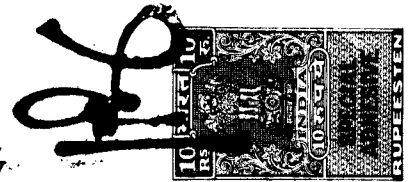
DATED THIS 27th DAY OF SEPTEMBER, 2002


(R.P. YADAV)
OF L.S. DAVAR & CO.,
APPLICANTS ATTORNEY

To,
The Controller of Patents,
The Patent Office Branch,
NEW DELHI

ORIGINAL

Applicable for
Patents & Trade Marks
in INDIA



POWER OF ATTORNEY



IN THE MATTER OF

WE, MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT
CHHAYA, Department of Physics and Astrophysics, University of Delhi, Delhi-110
007, all Indian Nationals, India.

I/We, the abovenamed applicant/s hereby authorise.....
G.S.DAVAR, S.K.DUTT, R.P.YADAV, P.S.DAVAR, M.K.CHAKRABORTY,
INDIRA BANERJEE, SUMITRA CHOWDHURY, SUDIPTA BANERJEE and all
representatives.....

of L. S. DAVAR & CO., having their offices at Flats 1B & 1C, 'Monalisa', 17, Camac Street,
Calcutta-700 017 and 5/1, Kalkaji Extn., New Delhi-110 019, India, all of Indian nationality, jointly and

severally to act on my/our behalf in connection with.....
Letters patent from Govt. of India in respect of an invention for "A METHOD OF DEPOSITING"
THIN FILMS OF METALS AND NON METALS"

including substituting and/or authorising any other person/s on their behalf and request that all notices,
requisitions and communications relating thereto may be sent to such agent at the above address.

I/We hereby revoke all previous authorisations, if any, in respect of the same matter or proceeding.

I/We also confirm all action already taken by them in this matter.

Dated this 27th day of September 2002
M. P. Srivastava
Savita Roy
Ravi Kant

* I/We, also authorise the said representatives of the firm of L. S. DAVAR & CO. jointly and severally
to complete Form TM-50 requesting entry of an address for service as part of my/our registration under
the authorisation.

Dated this _____ day of _____ 20

★★.....

*This additional endorsement should be signed only in the case of trademark matters.

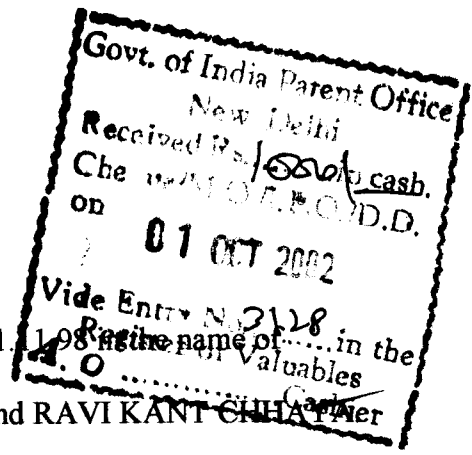
*Please enter the name and designation of the person signing.

(Note :-No legalisation of Signature in necessary).

THE PATENTS ACT, 1970

In the matter of Patent application no. 3362/Del/98 of 11.11.98

MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT CHHAYA



PETITION UNDER RULE 124

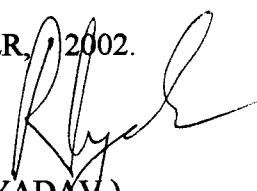
01 SEP 2002

WE,
MAHESH PRASAD SRIVASTAVA, SAVITA ROY and RAVI KANT
CHHAYA, Department of Physics and Astrophysics, University of Delhi,
Delhi-110 007, all Indian Nationals, India.

make this humble petition as follows:-

1. That the above mentioned patent application was filed on 11.11.98
2. That at the time of filing the complete specification, the applicants/inventors was/were not available and it was not possible to file the executed Application forms earlier.
3. That the applicants and the inventors have now duly signed the Application forms.
4. That the delay in filing the application forms is unintentional and could not be avoided.
5. That in view of the circumstances submitted above, the delay in filing the application forms may kindly be condoned.

DATED THIS 27th DAY OF SEPTEMBER, 2002.


(R.P.YADAV)
OF L.S.DAVAR & CO.,
APPLICANTS ATTORNEY

To,
The Controller of Patents,
The Patent Office Branch,
NEW DELHI

REMINDER - I.

To,

The Controller of Patents.
The Patent Office
Dwarka Sector-14,
New Delhi.

94(1)

Subject: Change of ~~new~~ address for service CBR NO. 9435 dated 9/11/2010

Respected Sir,

Last year on 9/11/2010, I had given an application for change of address for the two patents held jointly by Mahesh Prasad Srivastava, Savita Roy and Ran Kant Chaya. I had deposited the requisite fees whose Reference nos. are E-25/663/2010-DEL & E-25/664/2010-DEL for ^{patent} application nos. 232763 and 218110 respectively. The application nos. are 3362/DEL/1998 and 3361/DEL/1998 respectively.

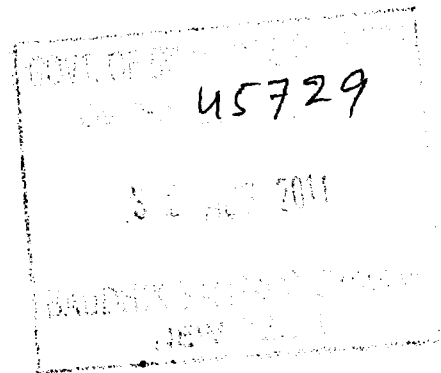
I request you to expedite the process and change the address for service as

" Dr. SAVITA ROY
ASSOCIATE PROFESSOR
PHYSICS DEPARTMENT
KALINDI COLLEGE
EAST PATEL NAGAR
NEW DELHI - 110008. "

Thanking You,
Yours truly

Savita Roy
30/8/2011.
(Dr. SAVITA ROY)

Mobil NO. 9810629598.



Encls.: Copy of evidence of paying fees for change of address for service.



Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion,
Ministry of Commerce & Industry,
Government of India

(<http://ipindia.nic.in/index.htm>)



(<http://ipindia.nic.in/index.htm>)

Document Name	Created Date/Uploaded Date
3362-DEL-1998-Correspondence Others-(30-08-2011).pdf	30/08/2011
3362-del-1998-abstract.pdf	21/08/2011
3362-del-1998-claims.pdf	21/08/2011
3362-del-1998-correspondence-others.pdf	21/08/2011
3362-del-1998-correspondence-po.pdf	21/08/2011
3362-del-1998-description (complete).pdf	21/08/2011
3362-del-1998-drawings.pdf	21/08/2011
3362-del-1998-form-1.pdf	21/08/2011
3362-del-1998-form-19.pdf	21/08/2011
3362-del-1998-form-2.pdf	21/08/2011
3362-del-1998-form-3.pdf	21/08/2011
3362-del-1998-gpa.pdf	21/08/2011
3362-del-1998-petition-others.pdf	21/08/2011

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[Policy & Programs \(http://ipindia.nic.in/policy-pages.htm\)](http://ipindia.nic.in/policy-pages.htm) [Achievements \(http://ipindia.nic.in/achievements-page.htm\)](http://ipindia.nic.in/achievements-page.htm)

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Patent Search

Invention Title	"A METHOD OF DEPOSITING THIN FILMS OF METALS AND NON METALS"
Publication Number	37/2008
Publication Date	12/09/2008
Publication Type	INA
Application Number	3362/DEL/1998
Application Filing Date	11/11/1998
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	CHEMICAL
Classification (IPC)	B05D 1/00

Inventor

Name	Address	Country	N
MAHESH PRASAD SRIVASTAVA	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I
SAVITA ROY	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I
RAVI KANT CHHAYA	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I

Applicant

Name	Address	Country	N
MAHESH PRASAD SRIVASTAVA	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I
SAVITA ROY	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I
RAVI KANT CHHAYA	DEPARTMENT OF PHYSICS AND ASTROPHYSICS, UNIVERSITY OF DELHI, DELHI-110007, INDIA.	India	I

Abstract:

"A device for depositing thin films of metals and non metals and diamond like carbon on a substrate". A device for depositing thin films of metals and non metals and like carbon on a substrate comprising a plasma chamber with an anode made of cooper and filed with graphite and a plurality of cathodes; said anode having a support upper end for supporting said graphite; a high voltage source for charging a capacitor assembly; a spark gap for allowing the discharge from said capacitor assembly electrode assembly; a substrate holder disposed above and in a spaced relationship to said anode and adapted to be moved away or towards said anode, the substrate held to the lower end of said holder; a shutter disposed between said anode and substrate in an inoperative position.

Complete Specification

iii) a high voltage source for charging a capacitor assembly; iv) a spark gap for allowing the discharge from said capacitor assembly to the electrode assembly; v) a substrate holder disposed above and in a spaced relationship to said anode and adapted to be moved away or towards said anode, the substrate held to the lower end of said holder; vi) a shutter disposed between said anode and substrate in an inoperative position.

- The device as claimed in claim 1 wherein a heater is provided with said substrate for causing a heating of the substrate.
- The device as claimed in claim 1 wherein said chamber is connected to a vacuum pump and a pressure gauge.
- The device as claimed in claim 1 wherein a gas inlet is provided with said chamber.
- The device as claimed in claim 1 comprising an insulator sleeve extending from the base and within said chamber, said anode disposed in a spaced relationship within said sleeve.
- The device for forming thin films of metals, non metals and diamond

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Page last updated on: 26/06/2019



Office of the Controller General of Patents, Designs & Trade Marks
 Department of Industrial Policy & Promotion,
 Ministry of Commerce & Industry,
 Government of India

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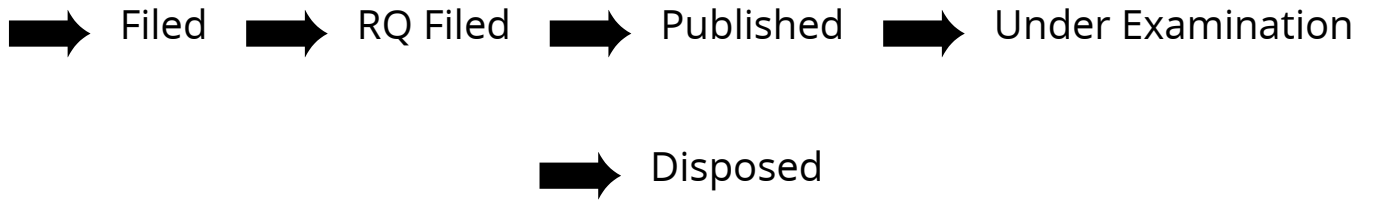
(<http://ipindia.nic.in/index.htm>)

Application Details	
APPLICATION NUMBER	3362/DEL/1998
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	11/11/1998
APPLICANT NAME	1 . MAHESH PRASAD SRIVASTAVA 2 . SAVITA ROY 3 . RAVI KANT CHHAYA
TITLE OF INVENTION	"A METHOD OF DEPOSITING THIN FILMS OF METALS AND NON METALS"
FIELD OF INVENTION	CHEMICAL
E-MAIL (As Per Record)	Isdavar@ndf.vsnl.net.in
ADDITIONAL-EMAIL (As Per Record)	Isdavar@ndf.vsnl.net.in
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	27/04/2004
PUBLICATION DATE (U/S 11A)	12/09/2008
Date Of Certificate Issue	30/03/2009
POST GRANT JOURNAL DATE	27/03/2009

Application Status	
APPLICATION STATUS	Granted Application, Patent Number :232763

[E-Register](#)

[View Documents](#)



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Office of the Controller General of Patents, Designs & Trade Marks
 Department of Industrial Policy & Promotion,
 Ministry of Commerce & Industry,
 Government of India

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Application Details

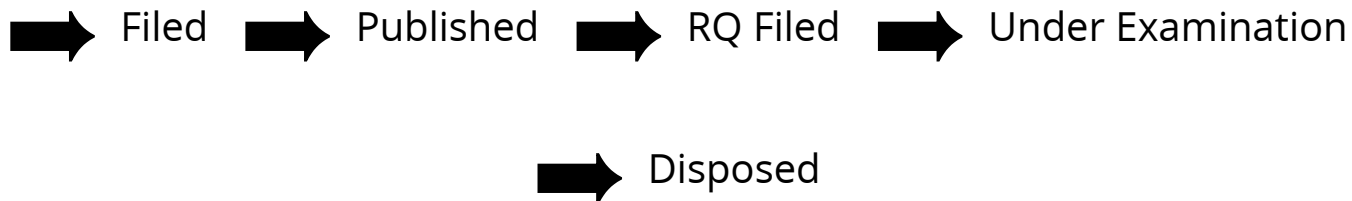
APPLICATION NUMBER	202111057295
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	09/12/2021
APPLICANT NAME	1 . Dr. MEGHA GUPTA CHAUDHARY 2 . Dr. JITENDRA KUMAR 3 . Dr. MANOJ KUMAR VYAS 4 . Dr SUSHIL KUMAR 5 . Dr. SURENDER KUMAR SHARMA 6 . Dr. PUNIT TYAGI 7 . Mr. PRAVEEN 8 . Mr. SACHIN 9 . Ms. SARITA 10 . Mr. PUNIT TOMAR
TITLE OF INVENTION	THERMAL ENERGY STORAGE DEVICE USAGE IN SOLAR AIR HEATER – AN EFFECTIVE ANALYSIS
FIELD OF INVENTION	MECHANICAL ENGINEERING
E-MAIL (As Per Record)	senanipindia@gmail.com
ADDITIONAL-EMAIL (As Per Record)	admin@senanip.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	17/12/2021

Application Status

APPLICATION STATUS

Awaiting Request for Examination

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