

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202121018506 A

(19) INDIA

(22) Date of filing of Application :22/04/2021

(43) Publication Date : 07/05/2021

(54) Title of the invention : DESIGN AND IMPLEMENTATION OF SMART AIR QUALITY DETECTION SYSTEM BASED ON IOT

|   |   |   |
|---|---|---|
| (51) International classification             | :G01N0033000000,<br>F24F0110500000,<br>F24F0011300000,<br>G01D0021020000,<br>H04L0029080000 | (71)Name of Applicant :<br>1)Dr. Sushma Jaiswal,CSIT, Guru Ghasidas Central University<br>Address of Applicant :Assistant Professor, CSIT, Guru Ghasidas Central University, C.G. Koni, Bilaspur, Chhattisgarh India 495009 Chhattisgarh India<br>2)Dr Sonal Goroba Chonde,H V Desai college<br>3)Prof. Annaiah H.,Government Engineering College<br>4)Dr. Jagadeesh Kumar Ega,Chaitanya Deemed to be University<br>5)Mr. T CH Anil Kumar,VFSTR (Deemed To Be University)<br>6)Arif Ali Rehman,Yanbu Industrial College<br>7)Mr. Syed Zainulabidin Hashmi,Blessing Health System<br>8)Dr Marxim Rahula Bharathi B,Aditya College of Engineering<br>9)P.Rajakumar,Sri Sairam Engineering College<br>10)Uma. B,Anna University<br>11)Karthikayani.k,SRM Institute of Science and Technology<br>12)Surendra Kumar Gupta,National Institute of Technology |
| (31) Priority Document No                     | :NA   | (72)Name of Inventor :<br>1)Dr. Sushma Jaiswal,CSIT, Guru Ghasidas Central University<br>2)Dr Sonal Goroba Chonde,H V Desai college<br>3)Prof. Annaiah H.,Government Engineering College<br>4)Dr. Jagadeesh Kumar Ega,Chaitanya Deemed to be University<br>5)Mr. T CH Anil Kumar,VFSTR (Deemed To Be University)<br>6)Arif Ali Rehman,Yanbu Industrial College<br>7)Mr. Syed Zainulabidin Hashmi,Blessing Health System<br>8)Dr Marxim Rahula Bharathi B,Aditya College of Engineering<br>9)P.Rajakumar,Sri Sairam Engineering College<br>10)Uma. B,Anna University<br>11)Karthikayani.k,SRM Institute of Science and Technology<br>12)Surendra Kumar Gupta,National Institute of Technology  |
| (32) Priority Date                            | :NA   |   |
| (33) Name of priority country                 | :NA   |   |
| (86) International Application No             | :NA   |   |
| Filing Date                                   | :NA   |   |
| (87) International Publication No             | : NA  |   |
| (61) Patent of Addition to Application Number | :NA   |   |
| Filing Date                                   | :NA   |   |
| (62) Divisional to Application Number         | :NA   |   |
| Filing Date                                   | :NA   |   |

(57) Abstract :

Pure air is the need of every human as air pollutants affect both human health and the surrounding environment. Air pollution causes both long term and short term health effects. Several researchers are attracted towards detection of air quality based on technology. This invention focuses on development of a smart system for detecting the quality of the air. This work involves design of an intelligent sensor able to detect the air quality automatically. This sensor system is able to monitor environmental parameters such as concentration of carbon dioxide (CO<sub>2</sub>), temperature, smoke, humidity and dust particles in the air. These parameters are key terms indicating the quality of the air. The sensed data is communicated wirelessly via Wi-Fi network utilizing the control system based on the modern protocol of MQTT. The user is able to access the sensed data from remote locations through wireless network. The technology of Internet of Things is involved for visualizing the measured data in real time from any location. This kind of real time air quality detecting system is high demanded in home automation applications.

No. of Pages : 11 No. of Claims : 6

|   |                        |                |                        |                          |  |
|---|------------------------|----------------|------------------------|--------------------------|--|
| <b>"FORM 1</b><br>THE PATENTS ACT 1970 (39 of 1970) and<br>THE PATENTS RULES, 2003<br><b>APPLICATION FOR GRANT OF PATENT</b><br>(See section 7, 54 and 135 and sub-rule (1) of rule 20) |                        |                |                        | (FOR OFFICE USE ONLY)    |  |
|   |                        |                |                        | Application No.          |  |
|   |                        |                |                        | Filing date:             |  |
|   |                        |                |                        | Amount of Fee paid:      |  |
|   |                        |                |                        | CBR No:                  |  |
|   |                        |                |                        | Signature:               |  |
| <b>1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)</b>  |                        |                |                        |                          |  |
| <b>2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]</b>   |                        |                |                        |                          |  |
| Ordinary (✓)  |                        | Convention ( ) |                        | PCT-NP ( )               |  |
| Divisional ( )  | Patent of Addition ( ) | Divisional ( ) | Patent of Addition ( ) | Divisional ( )           | Patent of Addition ( )   |
| <b>3A. APPLICANT(S)</b>   |                        |                |                        |                          |  |
| Name in Full  |                        | Nationality    | Country of Residence   | Address of the Applicant |  |
| <b>Dr. Sushma Jaiswal</b>   |                        | Indian         | India                  | House No.                | Assistant Professor, CSIT, Guru Ghasidas Central University,                         |
|   |                        |                |                        | Street                   | C.G, Koni,   |
|   |                        |                |                        | City                     | Bilaspur,  |
|   |                        |                |                        | State                    | Chhattisgarh   |
|   |                        |                |                        | Country                  | India  |
|   |                        |                |                        | Pin code                 | 495009   |
| <b>Dr Sonal Goroba Chonde</b>   |                        | Indian         | India                  | House No.                | Assistant professor, Department of Environmental Science, H V Desai college,         |
|   |                        |                |                        | Street                   | -  |
|   |                        |                |                        | City                     | Pune   |
|   |                        |                |                        | State                    | Maharashtra  |
|   |                        |                |                        | Country                  | India  |
|   |                        |                |                        | Pin code                 | -  |
| <b>Prof. Annaiah H.</b>   |                        | Indian         | India                  | House No.                | Assistant Professor Computer Science and Engineering Government Engineering College, |
|   |                        |                |                        | Street                   | -  |
|   |                        |                |                        | City                     | Hassan,  |
|   |                        |                |                        | State                    | Karnataka  |

|                                     |        |       |           |  |
|-------------------------------------|--------|-------|-----------|--|
|                                     |        |       | Country   | India  |
|                                     |        |       | Pin code  | -  |
| <b>Dr. Jagadeesh Kumar Ega</b>      | Indian | India | House No. | Professor, Chaitanya Deemed to be University           |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Hanamkonda   |
|                                     |        |       | State     | Telangana  |
|                                     |        |       | Country   | India  |
|                                     |        |       | Pin code  | -  |
| <b>Mr. T CH Anil Kumar</b>          | Indian | India | House No. | Assistant Professor, VFSTR (Deemed To Be University)   |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Vadlamudi  |
|                                     |        |       | State     | Andhra Pradesh   |
|                                     |        |       | Country   | India  |
|                                     |        |       | Pin code  | -  |
| <b>Arif Ali Rehman</b>              | Indian | India | House No. | Instructor, Yanbu Industrial College                   |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Yanbu Western Region,                                  |
|                                     |        |       | State     |  |
|                                     |        |       | Country   | Saudi Arabia   |
|                                     |        |       | Pin code  | -  |
| <b>Mr. Syed Zainulabidin Hashmi</b> | Indian | India | House No. | Data Scientist, Blessing Health System                 |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Peoria, IL   |
|                                     |        |       | State     | -  |
|                                     |        |       | Country   | United States Of America                               |
|                                     |        |       | Pin code  | -  |
| <b>Dr Marxim Rahula Bharathi B</b>  | Indian | India | House No. | Associate Professor, Aditya College of Engineering     |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Surampalem   |
|                                     |        |       | State     | Andhra Pradesh   |
|                                     |        |       | Country   | India  |
|                                     |        |       | Pin code  | -  |
| <b>P.Rajakumar</b>                  | Indian | India | House No. | Associate professor/EEE Sri Sairam Engineering College |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Chennai  |
|                                     |        |       | State     | Tamil Nadu   |
|                                     |        |       | Country   | India  |
|                                     |        |       | Pin code  | -  |
| <b>Uma. B</b>                       | Indian | India | House No. | Research Scholar Anna University                       |
|                                     |        |       | Street    | -  |
|                                     |        |       | City      | Chennai  |
|                                     |        |       | State     | Tamil Nadu   |
|                                     |        |       | Country   | India  |
|                                     |        |       |           |  |

|                             |        |       |           |   |
|-----------------------------|--------|-------|-----------|---|
|                             |        |       | Pin code  | -   |
| <b>Karthikayani.k</b>       | Indian | India | House No. | Assistant professor, SRM Institute of Science and Technology  |
|                             |        |       | Street    | -   |
|                             |        |       | City      | Chennai   |
|                             |        |       | State     | Tamil Nadu  |
|                             |        |       | Country   | India   |
|                             |        |       | Pin code  | -   |
| <b>Surendra Kumar Gupta</b> | Indian | India | House No. | Research Scholar,<br>Department of Electronics and<br>Communication Engineering<br>National Institute of Technology |
|                             |        |       | Street    | -   |
|                             |        |       | City      | Hamirpur  |
|                             |        |       | State     | Himachal Pradesh  |
|                             |        |       | Country   | India   |
|                             |        |       | Pin code  | -   |

**3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]**

|                    |                           |             |  |
|--------------------|---------------------------|-------------|--|
| Natural Person ( ) | Other than Natural Person |             |  |
|                    | Small Entity ( )          | Startup ( ) |  |

**4. INVENTOR(S) [Please tick (✓) at the appropriate category]**

|                         |         |        |
|-------------------------|---------|--------|
| Are all the inventor(s) | Yes (✓) | No ( ) |
|-------------------------|---------|--------|

same as the applicant(s)  
named above?

**If “No”, furnish the details of the inventor(s)**

| Name in Full | Nationality | Country of Residence | Address of the Inventor |  |
|--------------|-------------|----------------------|-------------------------|--|
|              |             |                      |                         |  |
|              |             |                      |                         |  |
|              |             |                      |                         |  |

**5. TITLE OF THE INVENTION**

**DESIGN AND IMPLEMENTATION OF SMART AIR QUALITY DETECTION SYSTEM BASED ON IOT**

|   |           |                        |
|---|-----------|------------------------|
| <b>6. AUTHORISED REGISTERED PATENT AGENT(S)</b>   | IN/PA     |                        |
|   | Name      |                        |
|   |           |                        |
| <b>7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA</b><br><b>Dr. Sushma Jaiswal</b><br>Assistant Professor, CSIT,<br>Guru Ghasidas Central University,<br>C.G, Koni, Bilaspur,<br>Chhattisgarh, India - 495009 | Name      |                        |
|   | Postal    |                        |
|   | Telephon  |                        |
|   | Mobile    | +91 6260651220         |
|   | Fax No.   |                        |
|   | E-mail ID | jaiswal_1302@yahoo.com |

|  |                    |             |  |                        |   |
|--|--------------------|-------------|--|------------------------|---|
| <b>8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION</b>   |                    |             |  |                        |   |
| Country  | Application Number | Filing date | Name of the applicant                          | Title of the invention | IPC (as classified in the convention country) |
|  |                    |             |  |                        |   |
| <b>9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)</b>   |                    |             |  |                        |   |
| International application number   |                    |             | International filing date                      |                        |   |
|  |                    |             |  |                        |   |
| <b>10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION</b>   |                    |             |  |                        |   |
| Original (first) application No.   |                    |             | Date of filing of original (first) application |                        |   |
|  |                    |             |  |                        |   |
| <b>11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT</b>   |                    |             |  |                        |   |
| Main application/patent No.  |                    |             | Date of filing of main application             |                        |   |
| <b>12. DECLARATIONS</b>  |                    |             |  |                        |   |
| <p><b>(i) Declaration by the inventor(s)</b></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 &amp; 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</p> <p>(b) Signature(s)</p> <p>(c) Name(s)</p>  |                    |             |  |                        |   |
| <p><b>(ii) Declaration by the applicant(s) in the convention country</b></p> <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> <p>I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.</p> <p>(a) Date</p> <p>(b) Signature(s)</p> <p>(c) Name(s) of the signatory</p> |                    |             |  |                        |   |

**(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/<br><del>provisional</del><br>specification)# | No. of pages- <b>8</b>                                    |     |         |
| No. of Claim(s)  | No. of claims- <b>6</b> and<br>No. of pages – <b>1</b>    |     |         |
| Abstract   | No. of pages- <b>1</b>                                    |     |         |
| No. of Drawing(s)                                      | No. of drawings - <b>2</b><br>and No. of pages - <b>1</b> |     |         |

# 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 International Preliminary Examination Authority (IPEA), as applicable (2 copies).

(c) Sequence listing in electronic form

(d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (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 ₹.....in Cash/ Banker's Cheque /Bank Draft bearing No..... Date.....on  
..... Bank.**

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters slated herein are correct and I/We request that a patent may be granted to me/us for the said invention. Dated this.....day of.....20.....

1. Dr. Sushma Jaiswal
2. Dr Sonal Goroba Chonde
3. Prof. Annaiah H.
4. Dr. Jagadeesh Kumar Ega
5. Mr. T CH Anil Kumar
6. Arif Ali Rehman
7. Mr. Syed Zainulabidin Hashmi
8. Dr Marxim Rahula Bharathi B
9. P.Rajakumar
10. Uma. B
11. Karthikayani.k
12. Surendra Kumar Gupta

To,

The Controller of Patents

The Patent Office, at..... 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 (x) 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.