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Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Form Name	Fee Payment	Remarks
1	201911030291	TEMP/E-1/31979/2019-DEL	4800	23946	FORM 1	Full	ROBOTIC GARDENING DEVICE

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FORM 2
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS (AMENDMENT) RULES, 2006

COMPLETE SPECIFICATION
[See Section 10; rule 13]

1. **TITLE OF THE INVENTION**

   "ROBOTIC GARDENING DEVICE"

2. **APPLICANT(S)**

   (a) **Name**   :   **Arpit Sharma,**

   (b) **Nationality** :   **India**

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                                   India

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

FIELD OF THE INVENTION

[001]   The present invention generally relates to the field of gardening devices used for agricultural spraying, anti-mosquito spraying, irrigation, misting, soft washing and musical fountain. The invention, particularly relates to a multi-purpose robotic gardening device operated by a mobile application.

BACKGROUND OF INVENTION

[002]   Each and every species of plants requires a different amount of water and supplements that too through different modes. Plants like roses prefer very fine mist as heavy jet spray can damage their flowers whereas others like aloe-vera can be watered by sprinklers. Moreover, the quality and quantity of supplements needed vary from plant to plant such as fertilizer for rose are different than palm.

[003]   For healthiest plants it is recommended that instead of filling the pots to the rim at once, much more effective way to irrigate them with water after every 15 minutes with just 10mI of water. It would reduce the chances of waterlogging and maintain the temperature of plant and soil. But this method is highly inconvenient by human beings.

[004]   In these polluted days organic farming is being encouraged and recommended as vegetables available in the market are lack of nutrition and toxic as well. So, it is advised that one should have their own terrace kitchen garden. Here the problem is that vegetables require intensive farming and nobody has the time to step up the stairs to

water them after regular intervals of time. Even if someone can manage to water their terrace garden, it is not advisable to spray fertilizers in human presence as they can be very toxic to humans.

[005]   A number of different types of devices and methods for multi-purpose robotic gardening device are available in the prior art. For example, the following patents are provided for their supportive teachings and are all incorporated by reference: CN207201610U discloses a utility model which relates to an intelligent insecticidal irrigation system which further includes an information acquisition device, sprinkling irrigation equipment, and a mobile phone terminal. The information acquisition device sends the gathered environmental information to a controller which generates suggestion messages.

[006]   Another prior art document, US9817380B2 discloses an irrigation system contained at commercial address or residential address. The system includes an irrigation controller that uses electrical signals to open and close valves, thereby turning sprinklers, misting nozzles etc on and off. The system includes a weather station that generates temperature data, precipitation data, and any other useful data that might be used by other components of the system.

[007]   Yet another prior art document, CN104904567A discloses a multifunctional mobile device for photovoltaic sprinkler irrigation using fertilizer application or pesticide application. The multifunctional mobile device comprises a supporting and moving system, a power generation system and water and fertilizer integration system.

[008]   Yet another prior art document, CN204579359U discloses a portable agricultural irrigation equipment of solar energy which includes removing irrigation equipment, solar power unit and control module. The solar power unit provides the power for removing irrigation equipment and control module.

[009]   There remains a constant need in society for a continuous flow of new and innovative novelty robotic gardening devices. It is in this context, that the subject invention is useful, not only to provide cheap and easy to operate/use.

[0010] In the view of the foregoing disadvantages inherent in the known types of robotic gardening devices now present in the prior art, the present invention provides an improved device. As such, the general purpose of the present invention, which will be described subsequently in greater detail, is to provide a new and improved multiple-purpose robotic gardening device which has all the advantages of the prior art and none of the disadvantages. The improved gardening device has other applications like misting, anti-mosquito, irrigation, soft washer and musical fountain.

SUMMARY OF THE INVENTION

[0011] In the view of the foregoing disadvantages inherent in the known types of robotic gardening device now present in the prior art, the present invention provides a multi-purpose robotic gardening device operated by smartphone application. As such, the general purpose of the present invention, which will be described subsequently in greater

detail, is to provide a new and improved multi-purpose robotic gardening device which has all the advantages of the prior art and none of the disadvantages.

[0012] An object of the invention is to provide a multi-purpose robotic gardening device operated by smartphone application, the device comprising; a pump; one or more magnetic relays; one or more solenoid valves, wherein the valves control the flow of fluid based on the voltage supply; one or more flow meter sensors, wherein the sensors measure the amount of fluid passed through the valves; a lead acid battery, a solar charger and a solar panel for generating and supplying power to the device.

[0013] It is another object of the present invention to provide the operation of the pumps and the valves is controlled by pre-programmed microcontroller.

[0014] Yet another object of the present invention to provide the device is used for agricultural spraying, anti-mosquito spraying, irrigation, misting, soft washing and musical fountain selected through the smartphone application.

[0015] Yet another object of the present invention to provide the smartphone application continuously communicates with the valves and the sensors of the device to measure and correct the performance parameters.

[0016] Yet another object of the present invention to provide preferably 8 output 12v solenoid valves controlled by the magnetic relays.

[0017] Yet another object of the present invention to provide the magnetic relays are controlled by the microcontroller.

[0018] Yet another object of the present invention to provide a method of gardening using a robotic gardening device operated by smartphone application, the method comprises the following steps:

(a) pressing "Quick Start", or "Set the Schedule" button in the app shows the output valve options;

(b) selecting the output valve and the pump;

(c) pressing "Set the Pattern" button in the app, turns the valves on and off;

(d) pressing "Smart Wind Directional" button, switch on the valve that are dedicated to the same wind direction as the current wind direction.

[0019] In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[0020] These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the

disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF DRAWINGS

[0021] For a better understanding of the embodiments of the systems and methods described herein, and to show more clearly how they may be carried into effect, references will now be made, by way of example, to the accompanying drawings, wherein like reference numerals represent like elements/components throughout and wherein:

[0022] Fig. 1 illustrates an exploded view of the multi-purpose robotic gardening device, according to an embodiment herein.

[0023] Fig. 2 illustrates an exploded view of the single line diagram of the multi-purpose robotic gardening device, according to an embodiment herein.

[0024] Fig. 3 illustrates closed machine labelling of the multi-purpose robotic gardening device, according to an embodiment herein.

[0025] Fig. 4 illustrates top and bottom view of the multi-purpose robotic gardening device, according to an embodiment herein.

[0026] Fig. 5 illustrates opened machine labelling of the multi-purpose robotic gardening device, according to an embodiment herein.

[0027] Fig. 6 illustrates details about parts (pump) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0028] Fig. 7 illustrates details about parts (solenoid valve) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0029] Fig. 8 illustrates details about parts (flow meter sensor) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0030] Fig. 9 illustrates details about parts (lead acid battery) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0031] Fig. 10 illustrates details about parts (solar charger) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0032] Fig. 11 illustrates details about parts (solar panel) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0033] Fig. 12 illustrates details about parts (fittings) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0034] Fig. 13 illustrates details about parts (motherboard) of the multi-purpose robotic gardening device, according to an embodiment herein.

[0035] Fig. 14 illustrates details about parts (relay boards) of the multi-purpose robotic gardening device, according to an embodiment herein.

DETAILED DESCRIPTION OF INVENTION

[0036] This patent describes the subject matter for patenting with specificity to meet statutory requirements. However, the description itself is not intended to limit the scope of this patent. The principles described herein may be embodied in many different forms.

[0037] Illustrative embodiments of the invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, the invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0038] The present invention provides a multi-purpose robotic gardening device 100 operated by smartphone application. The invention serves functions like agriculture spray, anti-mosquito, irrigation, misting, soft washer and musical foundation which is selected through the smartphone application. The smartphone application continuously communicates with the robotic gardening device 100 for controlling operations of valves 700 and flow meter sensors 800 of the device 100 to measure and correct the performance parameters. The robotic gardening device communicates with the application via a wired or wireless communication protocols. Such as Ethernet, LAN, WLAN, Bluetooth, and the like. Further, the application may be installed in a computing device that controls the robotic gardening device 100, and the computing device may

include and not limits a laptop, a desktop, a smartphone, an I-Pad, an information pad, and the like.

[0039] Reference will now be made in detail to the exemplary embodiment of the present disclosure. Before describing the detailed embodiments that are in accordance with the present disclosure, it should be observed that the embodiment resides primarily in combinations arrangement of the device according to an embodiment herein and as exemplified in FIGs. 1-14.

[0040] In the following description, for the purpose of explanation, numerous specific details are set forth in order to provide a thorough understanding of the arrangement of the device 100 according to an embodiment herein. It will be apparent, however, to one skilled in the art, that the present embodiment can be practiced without these specific details. In other instances, structures are shown in block diagram form only in order to avoid obscuring the present invention.

[0041] Fig. 1 depicts the overall diagram of the "Multi-purpose Robotic Gardening Device" 100 which can serve the functions like agriculture spray, anti-mosquito, irrigation, misting, soft washer and musical foundation which is selected through the smartphone application.

[0042] Fig. 2 depicts the single line diagram 200 of the device 100 where at the input side, according to the function selected through the app, the specific solenoid valve 700 switches on. For example, if "MISTING" function is selected, the valve 700 belonging to water switches on, and if "ANTI-MOSQUITO" function is selected, then valve 700 belong to mosquito-spray switches on and so on. At the output side, the selected output valves switch on. To the input valves, specific inputs are attached. For example, mosquito-spray bottle is attached to mosquito- spray input and so on.

[0043] The pump 600 is switched on at its speed selected through the app. The flow sensor 800 continuously reports to the app about the volume of liquid that passed through it and the flow rate at the moment.

[0044] Optionally, when liquids like fertilizer, mosquito spray, pesticide or liquid detergent are selected, their corresponding solenoid valve 700 switches on for a small duration and then the solenoid valve 700 corresponding to water switches on for much larger duration to dilute the solution, and hence, the resulting solution is sprayed by the machine. The concentration of the resulting solution can be controlled through the app.

[0045] Fig. 3 depicts the closed machine labeling 300 of the device 100 where power adapter 303 of 15V, 2.5 A is used for power backup in case sunlight is poor or machine has to be used for longer duration.

[0046] The solar plate 20 W 302 charges the 12V Lead acid batteries 900 with the help of solar charger fitted inside the machine. Input water is supplied through a tap 301 that is always kept on.

[0047] Fig. 4 depicts the top 400a and bottom 400b view of the device 100 where at the input side, as shown in the top view 400a, the nozzles are connected to the solenoid valve 700; and fertilizer, anti-mosquito and liquid detergent bottles.

[0048] At the output side, as shown in the bottom view 400b, the 8 output 1/2" output nozzles are connected to 1/2" pipe where each pipe is dedicated to single or multiple functions like misting, irrigation, fertilizer etc. There is an ON/OFF button to switch on/off the machine on the bottom so that it is prevented from rain.

[0049] There is a power back-up socket where pin of power adapter goes in.

[0050] Fig. 5 depicts an opened machine labeling 500 of the "multi-purpose robotic gardening device" 100.

[0051] Figure 6 depicts the details about the parts (pump 600) of the device 100.

[0052] Positive displacement pump 600 has built-in thermal protection. Its applications includes agricultural spraying, general industrial, automotive, marine/rv.

[0053] Its types includes: 5 chamber positive displacement diaphragm pump 600.

[0054] Its features include self-priming, capable of being run dry mode, demand liquid temperature: 140°f (60°c) max. Priming capabilities: 6 feet (1. 8 m) suction lift max pressure: 60 psi (4. 1 bar) inlet/outlet ports: 1/2″-14 mnpt weight: 7 lbs (3. 17 kg) duty cycle: continuous leads: 16 awg, 4. 5″ long with/leads, 2-pin connector voltage: 12v.

[0055] Figure 7 depicts the details about the parts (solenoid valve 700) of the device 100. Solenoid valve 700 - 12V DC 1/2″ electric solenoid water air valve 700 switch controls the flow of fluid and air. There are two ½" (Nominal NPT) outlets. Normally, the valve 700 is closed. When 12V DC is applied to the two terminals, the valve 700 opens and water can push through it. The valve 700 works with solenoid coil which operates electronically with DC 12-volt supply. As it is normally closed assembly, it opens the flow of liquid as soon as power ON and stops/blocks the flow when the supply voltage removed.

[0056] Figure 8 depicts the details about the parts (flow meter sensor 800) of the device 100. The flow meter sensor 800 includes a pinwheel sensor to measure the flow of liquid moved through it. There is an integrated magnetic hall effect sensor that outputs an electrical pulse with every revolution. The hall effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry. The sensor comes with three wires: red (5-

24VDC power), black (ground) and yellow (Hall effect pulse output). By counting the pulses from the output of the sensor, one can easily calculate water flow. Each pulse is approximately 2.25 millilitres.

[0057] Note this isn't a precision sensor, and the pulse rate does vary a bit depending on the flow rate, fluid pressure and sensor orientation. The pulse signal is a simple square wave so it's quite easy to log and convert into liters per minute using the following formula. Pulse frequency (Hz) / 7.5 = flow rate in L/min. Flow Rate (Litres/hour) = (Pulse frequency x 60 min) / 7.5Q

[0058] Features: Model: YF-S201; Sensor Type: Hall effect; Working Voltage: 5 to 18V DC (min tested working voltage 4.5V); Max current draw: 15mA @ 5V; Output Type: 5V TTL; Working Flow Rate: 1 to 30 Liters/Minute; Working Temperature range: -25 to +80℃; Working Humidity Range: 35%-80% RH; Accuracy: ±10%; Maximum water pressure: 2.0 MPa; Output duty cycle: 50% +-10%; Output rise time: 0.04us; Output fall time: 0.18us; Flow rate pulse characteristics: Frequency (Hz) = 7.5 * Flow rate (L/min); Pulses per Liter: 450; Durability: minimum 300,000 cycles; Cable length: 15cm; 1/2" nominal pipe connections, 0.78" outer diameter, 1/2" of thread; Size: 2.5" x 1.4" x 1.4" Connection details: Red wire : +5V Black wire : GND Yellow wire : PWM output.

[0059] Figure 9 depicts the details about the parts (lead acid battery 900) includes in the device 100.

[0060] Figure 10 depicts the details about the parts (solar charger 1000) includes in the device 100. Solar Charger 1000: Versatile charger kit for charging 6v, 12v and 24v lead acid batteries 900. The product gives thermal, short circuit and reverse input circuit protection, along with led indication for input. The product can be safely used for battery charging through solar.

[0061] Figure 11 depicts the details about the parts (solar panel 1100) includes in the device 100. Solar panel 1100: 20W Solar panel 1100 can be used for variety of functions and has the aluminium body makes the panel robust. It comes with five-meter-long cable which you can use to charge your devices and save on large units of electricity. Rated Power (Pmax) - 20W+- 3% Open Circuit Voltage (Voc) - 21.5V Short Circuit Current (Isc) - 1.30 A Voltage at maximum power (Vmp) - 17.7 V Current at maximum power (Imp) - 1.13 A Maximum system voltage - 600V.... Dimension of the product are 520 X 350 X 22 mm.

[0062] Figure 12 depicts the details about the parts (fittings i.e. ordinary tees and elbows 1200) included in the device 100.

[0063] Figure 13 depicts the details about the parts (Motherboard 1300- a costumed self-designed, dedicated microcontroller equipped with Wifi) includes in the device 100.

[0064] Figure 14 depicts the details about the parts (relay boards 1400) includes in the device 100. Relay boards 1400: Standard interface can be directly connected with microcontrollers. Red working status indicator lights are conducive to the safe use. Widely used for all MCU control, industrial sector, PLC control, smart home control. Specifications: Working voltage: 5V, channel: 8 channel, item size: 13.4 * 5.3 * 1.7cm / 5.28 * 2.09 * 0.67in, item weight: 116g / 4.11oz, package weight: 118g / 4.17oz, package includes: H9449 1 * 8 Channel relay module 1400.

[0065] In the smartphone application, if "Quick Start", or "Set the Schedule" button being pressed, only output valve 700 options are shown there. Then one or multiple output valve 700 and speed of pump 600 is selected by the operator. Upon pressing the "Set the Pattern" button (i.e. clock-wise, anti-clockwise or running) in the app, valves 700 turn on and off like decorative string lights giving a very pleasant view for misting, irrigation and musical fountain. There is a musical-fountain input for the water inlet as shown in the figure, so that same water pumped through fountain that is collected in some reservoir (not part of the machine) can be reused again and again.

[0066] Liquid used since the start and flow rate are calculated by flow sensor 800 in the machine and hence displayed in the app. On "Musical Fountain" function being selected on the app, and "start the Music" button being pressed, the audio equalizer gets turned in the app, and the amplitude of the sound in surroundings is continuously sent to the machine, which sets speed of the pump 600 according to the current amplitude, giving a

feel of singing /musical fountain. Signals can be sent from app to the machine and vice-versa through protocols like MQTT etc.

[0067] Current weather is uploaded on the app through internet via weather API. Direction is dedicated to each valve 700 preferably out of 8 directions, then whenever the operator presses "Smart Wind Directional "button, only those valve(s) 700 switch on that are dedicated to the same wind direction as the current wind direction and wherein the "current wind direction" is the direction of wind at that time retrieved from internet by the machine itself and "Valves dedicated to that direction" means valves 700 dedicated to certain direction in the app.

[0068] It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-discussed embodiments may be used in combination with each other. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description.

[0069] The benefits and advantages which may be provided by the present invention have been described above with regard to specific embodiments. These benefits and advantages, and any elements or limitations that may cause them to occur or to become more pronounced are not to be construed as critical, required, or essential features of any or all of the embodiments.

[0070] While the present invention has been described with reference to particular embodiments, it should be understood that the embodiments are illustrative and that the scope of the invention is not limited to these embodiments. Many variations, modifications, additions and improvements to the embodiments described above are possible. It is contemplated that these variations, modifications, additions and improvements fall within the scope of the invention.

[0071] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the present disclosure. Indeed, the novel methods, devices, and systems described herein may be embodied in a variety of other forms. Furthermore, various omissions, substitutions, and changes in the form of the methods, devices, and systems described herein may be made without departing from the spirit of the present disclosure.

I claim:

1. A multi-purpose robotic gardening device 100, said device 100 comprising;

a pump 600;

one or more magnetic relays 1400;

one or more solenoid valves 700, wherein said one or more solenoid valves 700 control flow of a fluid based on a voltage supply supplied to the robotic gardening device;

one or more flow meter sensors 800, wherein said one or more flow meter sensors 800 measure an amount of the fluid passed through said one or more solenoid valves 700; and

wherein the robotic gardening device communicates with a software application for controlling the pump, the magnetic relays, the one or more solenoid valves 700 and the one or more flow meter sensors 800 to measure, control and correct performance parameters of the pump, the magnetic relays, the one or more solenoid valves 700 and the one or more flow meter sensors 800.

2. The device 100 according to claim 1 further communicates with the software application via a wired or a wireless communication protocols.

3. The device 100 according to claim 1 further comprises a lead acid battery 900, a solar charger 1000 and a solar panel 1100 for generating and supplying power to said device 100.

4. The device 100 according to claim 3, where operation of said pump 600 and said one or more solenoid valves 700 is controlled by a pre-programmed microcontroller included in the device.

5. The device 100 according to claim 2, wherein said device 100 using the software application selects a number of functions, where in the function is at least one of agricultural spraying, anti-mosquito spraying, irrigation, misting, soft washing or musical fountain individually or in combination.

6. The device 100 according to claim 2, wherein the wired and wireless communication protocols include at least one of Ethernet, LAN, WLAN, IEEE, Bluetooth.

7. The device 100 according to claim 1 includes eight output 12v solenoid valves 700 controlled by said magnetic relays 1400.

8. The device 100 according to claim 4, wherein said magnetic relays 1400 are controlled by said microcontroller.

9. The device 100 according to claim 2 communicates with the software application which is installed in a computing device, the computing device includes at least one of a laptop, a desktop, a smart phone, an I-Pad, or an information pad.

11. The device 100 according to claim 2 operates control of the fluid, the fluid is at least one of water, anti-mosquito liquid, agricultural liquid fertilizers, or any other fluid suitable to be sprayed by the device 100.

12. A method of gardening using a robotic gardening device 100, said method comprises the following steps:

pressing a control button in a software application to start operation of the robotic gardening device 100, the software application communicates with the robotic gardening device 100, and the software application is installed in a computing device;

showing control options for output valve 700 and pump 600 via the software application;

selecting the control options for the output valve 700 and the pump 600 to start their operation and control their operation;

turning one or more solenoid valves 700 on and off via the software application for controlling a flow of a fluid based on a voltage supply supplied to the robotic gardening device, the turning one or more solenoid valves 700 on and off includes selecting a pattern for the flow of the fluid; and

turning one or more flow meter sensors 800 on and off via the software application for measuring an amount of the fluid passed through said one or more solenoid valves 700.

13. The method according to claim 12 further includes pressing "Smart Wind Directional" button for switching on said valve 700 for being dedicated to the same wind direction as the current wind direction.

14. The method according to claim 12, wherein the one or more flow meter sensors 800 calculates the flow of liquid and displays it via the software application.

15. The method according to claim 12, wherein the software application communicates with the Internet and updates the current weather via a weather API.

16. The method according to claim 12, wherein the robotic gardening device communicates with the computing device installed with the software application via a wired or a wireless communication protocols.

17. The method according to claim 12, wherein the computing device includes at least one of a laptop, a desktop, a smart phone, an I-Pad, or an information pad.

18. The method according to claim 12, wherein the fluid is at least one of water, anti-mosquito liquid, agricultural liquid fertilizers, or any other fluid suitable to be sprayed by the device 100.
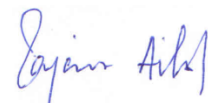
19. The method according to claim 12, wherein said device 100 using the software application selects a number of functions, where in the function is at least one of agricultural spraying, anti-mosquito spraying, irrigation, misting, soft washing or musical fountain individually or in combination.

20. The method according to claim 12, wherein the wired and wireless communication protocols include at least one of Ethernet, LAN, WLAN, IEEE, Bluetooth

Dated this 26th day of July, 2019

ARPIT SHARMA
By their Attorney

RAJAN AILAVADI
IN/PA-1063
of CIP LEGIT

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"ROBOTIC GARDENING DEVICE"

ABSTRACT

The present invention relates to a multi-purpose robotic gardening device operated by smartphone application. The invention serves functions like agriculture spray, anti-mosquito, irrigation, misting, soft washer and musical foundation which is selected through the smartphone application. The smartphone application continuously communicates with the valves and flow meter sensors of the device to measure and correct the performance parameters.

Figure 1