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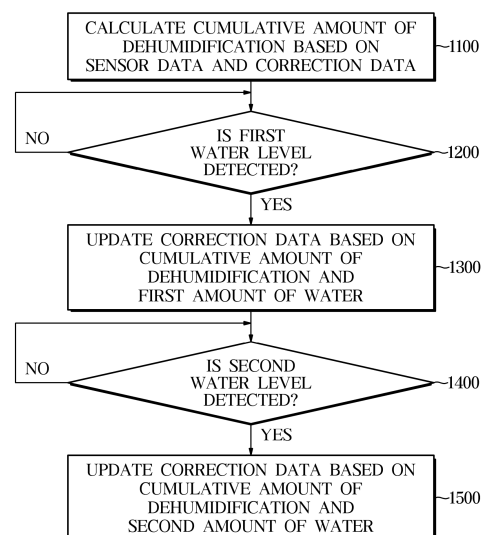
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(54) **DEHUMIDIFIER AND METHOD FOR CONTROLLING SAME**

(57) A dehumidifier including an environmental sensor configured to measure temperature and humidity of air and produce corresponding sensor data; a water tank configured to store water generated by a dehumidifying operation of the dehumidifier; a water level sensor configured to detect that a water level in the water tank reaches a predetermined water level; and at least one processor. The at least one processor is configured to calculate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor and correction data, and, based on the water level sensor detecting that the water level in the water tank reaches the predetermined water level, update the correction data based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level.

FIG. 8



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Description

[Technical Field]

- 5 **[0001]** The present disclosure relates to a dehumidifier configured to detect a water level of a water tank and a method for controlling the same.

[Background Art]

- 10 **[0002]** In general, a dehumidifier is a device that lowers indoor humidity by drawing humid air from indoor space into a main body of the dehumidifier, allowing the humid air to pass through a heat exchanger, which is composed of a condenser and an evaporator through which a refrigerant flows, to reduce humidity of the humid air and then discharging dehumidified air back into the indoor space.

- 15 **[0003]** The dehumidifier uses a method of taking heat from the surrounding air by evaporating a liquid refrigerant from the evaporator, and as the refrigerant evaporates, a temperature of the evaporator decreases and a temperature of the air passing through the evaporator also decreases.

[0004] Therefore, as the temperature around the evaporator decreases, moisture contained in the air is condensed and formed as dew on a surface of the evaporator.

- 20 **[0005]** A water tank for storing condensed water formed on the surface of the evaporator may be provided inside the dehumidifier.

[0006] If it is possible to accurately measure a water level of the water tank of the dehumidifier, various functions related to the water level of the water tank may be provided to a user, but the use of expensive sensors to detect the water level of the water tank is limited depending on the size, structure, and obstacles such as price increase of the dehumidifier.

- 25 [Disclosure]

[Technical Problem]

- 30 **[0007]** The present disclosure is directed to providing a dehumidifier capable of accurately estimating a water level of a water tank based on sensor data collected from sensors, and a method for controlling the same.

[0008] Further, the present disclosure is directed to providing a dehumidifier capable of providing various functions related to a water level of a water tank and a method for controlling the same.

[Technical Solution]

- 35 **[0009]** One aspect of the present disclosure provides a dehumidifier including an environmental sensor configured to measure a temperature and humidity of air and produce corresponding sensor data; a water tank configured to store water generated by a dehumidifying operation of the dehumidifier; a water level sensor configured to detect that a water level in the water tank reaches a predetermined water level; and at least one processor configured to calculate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor and correction data, and, based on the water level sensor detecting that the water level in the water tank reaches the predetermined water level, update the correction data based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level.

- 40 **[0010]** Another aspect of the present disclosure provides a method for controlling a dehumidifier that includes an environmental sensor configured to measure temperature and humidity of air and produce corresponding sensor data, a water tank configured to store water generated by a dehumidifying operation of the dehumidifier, and a water level sensor configured to detect that a water level in the water tank reaches a predetermined water level, wherein the method includes calculating a cumulative amount of dehumidification based on sensor data collected from the environmental sensor and correction data; and, based on the water level sensor detecting that the water level in the water tank reaches the predetermined water level, updating the correction data based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level.

[Description of Drawings]

- 55 **[0011]**

FIG. 1 illustrates an example of a front perspective view of a dehumidifier according to one embodiment.

FIG. 2 illustrates an example of a rear perspective view of the dehumidifier according to one embodiment.

FIG. 3 illustrates a water tank separated from a main body of the dehumidifier according to one embodiment.

FIG. 4 is a view for describing an example of components of the water tank of the dehumidifier according to one embodiment.

FIG. 5 is a conceptual diagram for describing dehumidification principle of the dehumidifier according to one embodiment.

FIG. 6 is a view for describing an example of a water level sensor of the dehumidifier according to one embodiment.

FIG. 7 is a control block diagram illustrating components of the dehumidifier according to one embodiment.

FIG. 8 is a flowchart illustrating an example of a method for controlling the dehumidifier according to one embodiment.

FIG. 9 is a diagram illustrating an example of a method for updating correction data when the dehumidifier according to one embodiment detects the reaching of a first water level.

FIG. 10 is a diagram illustrating an example of a method for updating correction data when the dehumidifier according to one embodiment detects the reaching of a second water level.

FIG. 11 illustrates an example of a lookup table corresponding to correction data according to one embodiment.

FIG. 12 illustrates an example of an artificial intelligence model according to one embodiment.

FIG. 13 is a flowchart illustrating an example of a method for controlling the dehumidifier according to one embodiment.

FIG. 14 illustrates an example of an interface, which is to display information related to the water level of the water tank, provided by the dehumidifier according to one embodiment and/or an external device.

FIG. 15 illustrates an example of an interface, which is to set a function related to the water level of the water tank, provided by the dehumidifier according to one embodiment and/or an external device.

FIG. 16 illustrates an example of an interface, which indicates that the water level of the water tank reaches a designated water level set by a user, provided by the dehumidifier according to one embodiment and/or an external device.

[Modes of the Invention]

[0012] Embodiments described in the disclosure and configurations shown in the drawings are merely examples of the embodiments of the disclosure, and may be modified in various different ways at the time of filing of the present application to replace the embodiments and drawings of the disclosure.

[0013] The terms used herein are used to describe the embodiments and are not intended to limit and / or restrict the disclosure

The expressions "A or B," "at least one of A or/and B," or "one or more of A or/and B," and the like used herein may include any and all combinations of one or more of the associated listed items. For example, the term "A or B," "at least one of A and B," or "at least one of A or B" may refer to all of the case (1) where at least one A is included, the case (2) where at least one B is included, or the case (3) where both of at least one A and at least one B are included.

[0014] The singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0015] In this disclosure, the terms "including", "having", and the like are used to specify features, numbers, steps, operations, elements, components, or combinations thereof, but do not preclude the presence or addition of one or more of the features, numeric values, steps, operations, elements, components, or combinations thereof.

[0016] When an element is said to be "connected", "coupled", "supported" or "contacted" with another element, this includes not only when elements are directly connected, coupled, supported or contacted, but also when elements are indirectly connected, coupled, supported or contacted through a third element.

[0017] Throughout the description, when an element is "on" another element, this includes not only when the element is in contact with the other element, but also when there is another element between the two elements.

[0018] It will be understood that when an element (e.g., a first element) is referred to as being "(operatively or communicatively) coupled with/to" or "connected to" another element (e.g., a second element), it can be directly coupled with/to or connected to the other element or an intervening element (e.g., a third element) may be present.

[0019] According to the situation, the expression "configured to" used herein may be used as, for example, the expression "suitable for," "having the capacity to," "designed to," "adapted to," "made to," or "capable of". The term "configured to" must not mean only "specifically designed to" in hardware.

[0020] Instead, the expression "a device configured to" may mean that the device is "capable of" operating together with another device or other components. For example, a "processor configured to perform A, B, and C" may mean a dedicated processor (e.g., an embedded processor) for performing a corresponding operation or a generic-purpose processor (e.g., a central processing unit (CPU) or an application processor) which may perform corresponding operations by executing one or more software programs which are stored in a memory device.

[0021] The terms, such as "first," "second", and the like used herein may refer to various elements of various embodiments of the disclosure, but do not limit the elements.

[0022] In the following description, terms such as "unit", "part", "block", "member", and "module" indicate a unit for processing at least one function or operation. For example, those terms may refer to at least one process processed by at least one hardware such as Field Programmable Gate Array (FPGA), Application Specific Integrated Circuit (ASIC), at least one software stored in a memory or a processor

Reference will now be made in detail to embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Parts which are not associated with the description are omitted in order to particularly describe the disclosure, and like reference numerals refer to like elements throughout the specification.

[0023] The disclosure will be described more fully hereinafter with reference to the accompanying drawings.

[0024] FIG. 1 illustrates an example of a front perspective view of a dehumidifier according to one embodiment. FIG. 2 illustrates an example of a rear perspective view of the dehumidifier according to one embodiment. FIG. 3 illustrates a water tank separated from a main body of the dehumidifier according to one embodiment.

[0025] Referring to FIGS. 1 to 3, a dehumidifier 1 may include a main body 10.

[0026] The main body 10 may include an input interface 301 (refer to FIG. 7) configured to receive a user input related to the dehumidifier 1.

[0027] The main body 10 may include an output interface 302 (refer to FIG. 7) configured to output information related to the dehumidifier 1.

[0028] The dehumidifier 1 may include a water tank 100 provided to be removable from the main body 10.

[0029] The water tank 100 may store water (condensed water) generated by a dehumidifying operation of the dehumidifier 1.

[0030] In one embodiment, the water tank 100 may further include a handle 120. The handle 120 may be rotatably coupled to the water tank 100. Additionally, the handle 120 may be removably coupled to the water tank 100. The handle 120 may be rotatably coupled to the water tank 100 so as to be gripped in a process in which the water tank 100 is separated from the main body 10 in a sliding manner and in a process in which the water tank 100, which is separated from the main body 10, is lifted and transported.

[0031] A recessed member 102 recessed toward an inside of the water tank 100 to be adjacent to the handle 120 may be formed on a front surface of the water tank 100. A user can easily attach and detach the water tank 100 from the main body 10 using the handle 120 formed on the water tank 100.

[0032] The water tank 100 may further include a cover 110. The cover 110 may be provided with a drain hole 111 provided to open to drain condensed water stored inside the water tank 100 to an outside. Accordingly, a user can easily remove condensed water through the drain hole 111 without having to open or close the cover 110 in the process of removing condensed water inside the water tank 100. Further, the cover 110 may be provided with an inlet hole 112.

[0033] Water, which is generated by the dehumidifying operation of the dehumidifier 1 may flow into the water tank 100 through the inlet hole 112.

[0034] The cover 110 may be removably coupled to the water tank 100. The cover 110 may form a portion of an exterior of the water tank 100. Particularly, the cover 110 may form an upper exterior of the water tank 100.

[0035] A water tank seating portion 46 may be formed in the main body 10. The water tank 100 may be removably coupled to the water tank seating portion 46 to form at least one of front, side, rear, or upper surfaces of the dehumidifier 1 together with the main body 10.

[0036] The water tank 100 may be seated in a recessed space 14a formed in the main body 10 to have a shape corresponding to a lower surface of the water tank 100.

[0037] The water tank seating portion 46 may be exposed to the outside when the water tank 100 is separated.

[0038] A fastening portion 47 may be provided on the water tank seating portion 46. The fastening portion 47 may be provided on the water tank seating portion 46 to be elastically deformed.

[0039] An intake port 15a may be formed in the main body 10. The main body 10 may be equipped with a filter 20 to purify air flowing into the main body 10 through the intake port 15a. The filter 20 may serve to filter out foreign substances in the air flowing into the main body 10.

[0040] The filter 20 may be removable from the main body 10 to facilitate replacement.

[0041] Air outside the main body 10 may flow into the main body 10 through the filter 20 and the intake port 15a.

[0042] The filter 20 may include at least one of a pre-filter provided to remove relatively large dust contained in the air, a deodorizing filter provided to remove odors, a dust collection filter provided to collect dust by electrical action, and a HEPA filter provided to remove fine dust.

[0043] A discharge port 16a may be formed in the main body 10. The air that flows into the main body 10 through the intake port 15a is discharged to the outside through the discharge port 16a.

[0044] In one embodiment, the discharge port 16a may be opened and closed by a discharge louver 17 coupled to the main body 10. When the dehumidifier 1 operates according to a user input received through the input interface 301, the discharge louver 17 may move upward and the discharge port 16a may be opened. When the operation of the dehumidifier 1 stops, the discharge louver 17 may move downward to shield the discharge port 16a. Accordingly, it is possible to prevent malfunction of the dehumidifier 1 caused by foreign substances penetrating into the main body 10.

[0045] FIG. 4 is a view for describing an example of components of the water tank of the dehumidifier according to one embodiment. FIG. 5 is a conceptual diagram for describing dehumidification principle of the dehumidifier according to one embodiment.

[0046] Referring to FIGS. 4 and 5, the dehumidifier 1 may include a dehumidification cycle for dehumidification. The dehumidification cycle may include a compressor 50, an expansion device, and a heat exchanger 60 through which a refrigerant is circulated. The dehumidification cycle may include a refrigerant pipe connecting the compressor 50, the expansion device, and the heat exchanger 60. The dehumidification cycle may be disposed inside the main body 10 of the dehumidifier 1.

[0047] The heat exchanger 60 may dehumidify the air, which flows into the main body 10, through the heat exchange with the surrounding air.

[0048] The heat exchanger 60 may include a condenser 60a and an evaporator 60b.

[0049] The condenser 60a may perform heat exchange between the refrigerant and air using a phase change (e.g., condensation) of the refrigerant. For example, while the refrigerant is condensed in the condenser 60a, the refrigerant may release heat to the surrounding air.

[0050] In the same manner as the condenser 60a, the evaporator 60b may perform heat exchange between the refrigerant and surrounding air using a phase change (e.g., evaporation) of the refrigerant. For example, while the refrigerant evaporates in the evaporator 60b, the refrigerant may absorb heat from the surrounding air.

[0051] The dehumidifier 1 may perform the dehumidifying operation through a phase change process of the refrigerant circulating through the condenser 60a and the evaporator 60b. For this circulation of the refrigerant, the dehumidifier 1 may include the compressor 50 configured to compress the refrigerant. The compressor 50 may draw refrigerant gas through an inlet portion and compress the refrigerant gas. The compressor 50 may discharge high-temperature and high-pressure refrigerant gas through an outlet portion.

[0052] The refrigerant may sequentially circulate the compressor 50, the condenser 60a, the expansion device, and the evaporator 60b through the refrigerant pipe.

[0053] The dehumidifier 1 may include the expansion device to lower the pressure of the refrigerant flowing into the evaporator 60b.

[0054] For example, the expansion device may lower a temperature and pressure of a refrigerant using a throttling effect. The expansion device may include an orifice provided to reduce a cross-sectional area of a flow path. The temperature and pressure of the refrigerant that passes through the orifice may be lowered.

[0055] For example, the expansion device may be implemented as an electronic expansion valve configured to adjust an opening ratio (ratio of a cross-sectional area of a flow path of the valve in a partially opened state to a cross-sectional area of the flow path of the valve in a fully opened state). Depending on the opening ratio of the electronic expansion valve, an amount of refrigerant passing through the expansion device may be controlled.

[0056] The dehumidifier 1 may include an accumulator. The accumulator may be connected to the inlet portion of the compressor 50. Low-temperature and low-pressure refrigerant evaporated in the evaporator 60b may flow into the accumulator.

[0057] When a refrigerant, in which refrigerant liquid and refrigerant gas are mixed, is introduced, the accumulator may separate the refrigerant liquid from the refrigerant gas and provide the refrigerant gas, from which the refrigerant liquid is separated, to the compressor 50.

[0058] The dehumidifier 1 may include a fan 70. For example, the fan 70 may be disposed near the condenser 60a. The fan 70 may blow air passing through the condenser 60a. The fan 70 may also allow air to flow into the main body 10 of the dehumidifier 1.

[0059] As the fan 70 rotates, external air may flow into the main body 10 through the intake port 15a (refer to FIG. 2) and

air, which passes through the heat exchanger 60, may be discharged to the outside of the main body 10 through the discharge port 16a.

[0060] That the dehumidifier 1 performs the dehumidifying operation may include operating the fan 70 and the compressor 50.

[0061] The heat exchanger 60 may dehumidify air containing moisture, and may guide condensed water, formed on the heat exchanger 60, to the water tank 100.

[0062] That is, water generated by the dehumidifying operation of the dehumidifier 1 may be guided to the water tank 100.

[0063] The water tank 100 may include a storage space 103. Water generated by the dehumidifying operation of the dehumidifier 1 may be stored in the storage space 103 formed inside the water tank 100. The inlet hole 112 may be formed on an upper surface of the water tank 100 facing the main body 10 while coupled to the water tank seating portion 46, to allow condensed water, which is transferred from the heat exchanger 60 along the flow path formed in the main body 10, to flow into the storage space 103. In one embodiment, the inlet hole 112 may be formed in the cover 110 of the water tank 100. The inlet hole 112 may have a hole or slit shape, and the shape of the inlet hole 112 is not limited thereto.

[0064] The recessed member 102 recessed toward the inside of the water tank 100 to be adjacent to the handle 120 may be formed on the water tank 100. The recessed member 102 may be formed on an upper portion of a front surface of the water tank 100. The recessed member 102 may be welded to the front surface of the water tank 100. It is appropriate that the recessed member 102 is vibration welded to the front surface of the water tank 100. A user can insert his/her hand into the recessed member 102, grasp the handle 120, and then pull the water tank 100 to separate the water tank 100 from the main body 10.

[0065] The handle 120 may be removably coupled to the water tank 100. Particularly, the handle 120 may be removably coupled to a handle mounting portion 104 formed on an inner wall of the water tank 100. The handle mounting portion 104 may be provided on the inner wall of the water tank 100. The handle mounting portion 104 may have a shape that protrudes toward the inside of the water tank 100, that is, toward the storage space 103 of the water tank 100. A fastening hole 105 may be provided in the handle mounting portion 104.

[0066] The handle 120 may be provided with a fastening protrusion 123 provided to be coupled to the fastening hole 105.

[0067] The water tank 100 may further include a detection target 130 and a target housing 140 in which the detection target 130 is accommodated. The detection target 130 is configured to detect a water level of condensed water stored inside the water tank 100, and may be detected by a water level sensor 150 (refer to FIG. 6), which will be described later.

[0068] The target housing 140 may be installed on one inner wall of the water tank 100.

[0069] The detection target 130 may float together within the target housing 140 due to buoyancy as the level of condensed water stored inside the water tank 100 increases. The detection target 130 may be referred to as a floating member in that the detection target 130 is provided to float on water.

[0070] In one embodiment, when the water level sensor 150 is implemented as a magnetic sensor, the detection target 130 may include a magnet.

[0071] Meanwhile, according to the type of water level sensor 150, the dehumidifier 1 may not include the detection target 130.

[0072] FIG. 6 is a view for describing an example of a water level sensor of the dehumidifier according to one embodiment.

[0073] Referring to FIG. 6, the dehumidifier 1 may include the water level sensor 150 disposed in the main body 10.

[0074] A height of the detection target 130 may change inside the target housing 140 according to a change in the water level of the water tank 100.

[0075] The water level sensor 150 may detect that the water level of the water tank 100 reaches a predetermined water level.

[0076] Detecting that the water level of the water tank 100 reaches the predetermined water level may include detecting that the water level of the water tank 100 is the predetermined water level and/or detecting that the water level of the water tank 100 is above the predetermined water level.

[0077] The water level sensor 150 may include at least one of a first water level sensor 150a and a second water level sensor 150b.

[0078] In one embodiment, the water level sensor 150 may include the first water level sensor 150a. In one embodiment, the first water level sensor 150a may detect that the water level of the water tank 100 reaches a first water level h1.

[0079] The first water level sensor 150a may be provided near the first water level h1 of the water tank 100.

[0080] When the water level of the water tank 100 reaches the first water level h1, the detection target 130 may float to a position corresponding to the first water level h1 due to buoyancy. When the detection target 130 rises to the position corresponding to the first water level h1, the first water level sensor 150a may detect the detection target 130. That the detection target 130 is detected by the first water level sensor 150a may include that the water level of the water tank 100 reaches the first water level h1 is detected.

[0081] In one embodiment, the water level sensor 150 may include the second water level sensor 150b. In one

embodiment, the second water level sensor 150b may detect that the water level of the water tank 100 reaches a second water level h2.

[0082] The second water level sensor 150b may be provided near the second water level h2 of the water tank 100.

[0083] When the water level of the water tank 100 reaches the second water level h2, the detection target 130 may float to a position corresponding to the second water level h2 due to buoyancy. When the detection target 130 rises to a position corresponding to the second water level h2, the second water level sensor 150b may detect the detection target 130. That the detection target 130 is detected by the second water level sensor 150b may include that the water level of the water tank 100 reaches the second water level h2 is detected.

[0084] The second water level h2 may be higher than the first water level h1. For example, the first water level h1 may correspond to a vicinity of half the water level of the water tank, and the second water level h2 may correspond to a vicinity of the full water level of the water tank. However, the first water level h1 and the second water level h2 are not limited thereto.

[0085] According to various embodiments, the position of the first water level sensor 150a may be changed according to the user's design. For this, the dehumidifier 1 may be designed to allow the position of the first water level sensor 150a to be adjusted.

[0086] According to various embodiments, the water level sensor 150 may be implemented as a variety of sensors in addition to a sensor configured to detect the detection target 130.

[0087] For example, the water level sensor 150 may include a capacitance sensor, an electrode sensor, etc. configured to detect that the water level of the water tank 100 reaches a predetermined water level.

[0088] FIG. 7 is a control block diagram illustrating components of the dehumidifier according to one embodiment.

[0089] Referring to FIG. 7, the dehumidifier 1 according to one embodiment may include the user interface device, the water level sensor 150, a water tank detection sensor 160, an environmental sensor 170, the compressor 50, the fan 70, a communication interface 400 and/or a controller 200.

[0090] The user interface device 300 may allow a user and the dehumidifier 1 to interact with each other.

[0091] The user interface device 300 may include the output interface 302 and the input interface 301.

[0092] At least one output interface 302 may transmit various information related to the operation of the dehumidifier 1 to a user by generating sensory information.

[0093] For example, the at least one output interface 302 may transmit information related to settings of the dehumidifier 1 and an operating time of the dehumidifier 1 to a user. Information regarding the operation of the dehumidifier 1 may be output through a display, an indicator, and/or a voice. The at least one output interface 302 may include a Liquid Crystal Display (LCD) panel, an indicator, a Light Emitting Diode (LED) panel, a speaker, etc.

[0094] In one embodiment, the at least one output interface 302 may output sensory information (e.g., visual information, auditory information, etc.) related to the water level of the water tank 100.

[0095] The at least one input interface 301 may convert sensory information received from a user into an electrical signal.

[0096] The at least one input interface 301 may include a power button for turning on the dehumidifier 1, a setting button for setting an operation mode of the dehumidifier 1, a control button for controlling an intensity of the compressor 50 and/or the fan 70, and/or a timer button for setting a dehumidifying time of the dehumidifier 1.

[0097] Each button may include a visual indicator (e.g. text, icon, etc.) provided to indicate a function thereof.

[0098] The at least one input interface 301 may include a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or a microphone, etc.

[0099] In the present disclosure, a 'button' may be replaced by a User Interface (UI) element, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or a microphone.

[0100] The power button is a button to turn on or off the dehumidifier 1.

[0101] When the dehumidifier 1 is turned on, the setting button and/or the timer button may be activated.

[0102] When the dehumidifier 1 is turned on, the compressor 50 and the fan 70 may operate. That is, when the dehumidifier 1 is turned on, the dehumidifying operation may be performed.

[0103] The setting button is a button to change the operation mode of the dehumidifier 1. The operation mode of the dehumidifier 1 may include a clothes mode, a smart mode, a normal mode, a low noise mode, etc.

[0104] An operating frequency of the compressor 50 and a rotation speed of the fan 70 may vary according to each mode.

[0105] The control button is a button for adjusting the operating frequency of the compressor 50 and/or the rotation speed of the fan 70 of the dehumidifier 1. According to the manipulation of the control button, the operating frequency of the compressor 50 and/or the rotation speed of the fan 70 may be adjusted.

[0106] The timer button is a button for setting the operating time of the dehumidifier 1. The dehumidifier 1 may perform the dehumidifying operation for the operating time set by the timer button, and may terminate the dehumidifying operation when the operating time set by the timer button is expired.

[0107] The dehumidifier 1 may process a user input received through the input interface 301 or output information related to the dehumidifier 1 through the output interface 302.

[0108] For example, a user input received through the input interface 301 may be transmitted to the controller 200. As another example, the controller 200 may control the output interface 302 to output information related to the dehumidifier 1.

[0109] The water level sensor 150 may detect that the water level of the water tank 100 reaches a predetermined water level. The water level sensor 150 may transmit an electrical signal, which corresponds to a fact that the water level of the water tank 100 reaches the predetermined water level, to the controller 200.

[0110] For example, the first water level sensor 150a may transmit an electrical signal to the controller 200 in response to the water level of the water tank 100 reaching the first water level h1. As another example, the second water level sensor 150b may transmit an electrical signal to the controller 200 in response to the water level of the water tank 100 reaching the second water level h2.

[0111] The controller 200 may detect that the water level of the water tank 100 reaches the first water level h1 in response to receiving an electrical signal from the first water level sensor 150a. The controller 200 may detect that the water level of the water tank 100 reaches the second water level h2 in response to receiving an electrical signal from the second water level sensor 150b.

[0112] The water tank detection sensor 160 may detect attachment and detachment of the water tank 100.

[0113] For example, the water tank detection sensor 160 may be provided at the fastening portion 47 (refer to FIG. 3) of the water tank seating portion 46 (refer to FIG. 3).

[0114] The water tank detection sensor 160 may detect whether the water tank 100 is coupled to the main body 10.

[0115] For example, the water tank detection sensor 160 may detect elastic deformation of the fastening portion 47.

[0116] The water tank detection sensor 160 may transmit an electrical signal corresponding to whether the water tank 100 is attached or detached, to the controller 200.

[0117] The controller 200 may identify whether the water tank 100 is coupled to the main body 10 or is separated from the main body 10, based on the electrical signal received from the water tank detection sensor 160.

[0118] The environmental sensor 170 may measure a temperature and humidity of air around the dehumidifier 1, and produce corresponding sensor data.

[0119] The environmental sensor 170 may include at least one temperature sensor 170a and at least one humidity sensor 170b.

[0120] Sensor data collected from the environmental sensor 170 may include temperature data and humidity data. The temperature data may include temperature data of air that did not pass through the heat exchanger 60 (hereinafter 'intake air') and temperature data of air that passes through the heat exchanger 60 (hereinafter 'discharge air'). Humidity data may include humidity data of intake air and humidity data of discharge air.

[0121] The at least one temperature sensor 170a may measure a temperature of air surrounding the dehumidifier 1. The at least one temperature sensor 170a may transmit temperature data of the air surrounding the dehumidifier 1 to the controller 200.

[0122] The at least one temperature sensor 170a may include a first temperature sensor 170a configured to measure a temperature of air (intake air) drawn into the main body 10 from the outside of the main body 10, and a second temperature sensor 170a configured to measure a temperature of air (discharge air) discharged to the outside of the main body 10.

[0123] The first temperature sensor 170a may be formed around the intake port 15a. The first temperature sensor 170a may measure the temperature of the intake air. The first temperature sensor 170a may transmit temperature data of the intake air to the controller 200.

[0124] The second temperature sensor 170a may be formed around the discharge port 16a. The second temperature sensor 170a may measure the temperature of the discharge air. The second temperature sensor 170a may transmit temperature data of the discharge air to the controller 200.

[0125] The at least one humidity sensor 170b may measure humidity of air around the dehumidifier 1. The at least one humidity sensor 170b may transmit humidity data of the air surrounding the dehumidifier 1 to the controller 200.

[0126] The at least one humidity sensor 170b may include a first humidity sensor 170b configured to measure humidity of air drawn into the main body 10 from the outside of the main body 10, and a second humidity sensor 170b configured to measure humidity of air discharged from the inside of the main body 10 to the outside of the main body 10.

[0127] The first humidity sensor 170b may be formed around the intake port 15a. The first humidity sensor 170b may measure the humidity of the intake air. The first humidity sensor 170b may transmit humidity data of the intake air to the controller 200.

[0128] The second humidity sensor 170b may be formed around the discharge port 16a. The second humidity sensor 170b may measure the humidity of the discharge air. The second humidity sensor 170b may transmit humidity data of the discharge air to the controller 200.

[0129] The fan 70 may include a fan motor. The fan motor may include a motor configured to control a rotation speed. For example, the fan motor may be a BLDC motor.

[0130] That the controller 200 controls the fan 70 may include that the controller 200 controls the fan motor. The controller 200 may control the rotation speed of the fan 70 by controlling the fan motor.

[0131] The controller 200 may rotate the fan 70 based on the start of the dehumidifying operation of the dehumidifier 1.

[0132] The compressor 50 may operate based on a control signal from the controller 200.

[0133] The controller 200 may operate the compressor 50 based on the start of the dehumidifying operation of the dehumidifier 1.

[0134] The dehumidifier 1 may include the communication interface 400 for wired and/or wireless communication with external devices (e.g., servers, user devices, and/or other home appliances).

[0135] The communication interface 400 may include at least one of a short-range communication module or a long-range communication module.

[0136] The communication interface 400 may transmit data to an external device or receive data from the external device. For example, the communication interface 400 may establish communication with a server and/or a user device and/or other home appliance, and transmit and receive various types of data.

[0137] For the communication, the communication interface 400 may establish a direct (e.g., wired) communication channel or a wireless communication channel between external devices, and support the performance of the communication through the established communication channel. According to one embodiment, the communication interface 400 may include a wireless communication module (e.g., a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module (e.g., a local area network (LAN) communication module, or a power line communication module). Among these communication modules, the corresponding communication module may communicate with an external device through a first network (e.g., a short-range wireless communication network such as Bluetooth, wireless fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or a second network (e.g., a long-range wireless communication network such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., LAN or WAN)). These various types of communication modules may be integrated as one component (e.g., a single chip) or implemented as a plurality of separate components (e.g., multiple chips).

[0138] The short-range wireless communication module may include a Bluetooth communication module, a Bluetooth Low Energy (BLE) communication module, a near field communication module, a WLAN (Wi-Fi) communication module, and a Zigbee communication module, an infrared data association (IrDA) communication module, a Wi-Fi Direct (WFD) communication module, an ultrawideband (UWB) communication module, an Ant+ communication module, a microwave (uWave) communication module, etc., but is not limited thereto.

[0139] The long-range wireless communication module may include a communication module that performs various types of long-range wireless communication, and may include a mobile communication interface. The mobile communication interface transmits and receives radio signals with at least one of a base station, an external terminal, and a server on a mobile communication network.

[0140] According to one embodiment, the communication interface 400 may communicate with an external device such as a server, a user device and other home appliances through an access point (AP). The access point (AP) may connect a local area network (LAN), to which the dehumidifier 1, other home appliance, a server and/or a user device is connected, to a wide area network (WAN) to which the server is connected. The dehumidifier 1, other home appliance, and/or a user device may be connected to the server through the wide area network (WAN).

[0141] The controller 200 may process a user input received from the input interface 301.

[0142] The controller 200 may process data collected from various sensors (e.g., the water level sensor 150, the water tank detection sensor 160, and the environmental sensor 170).

[0143] The controller 200 may control various components of the dehumidifier 1 (e.g., the output interface 302, the compressor 50, the fan 70, and the communication interface 400).

[0144] The controller 200 may include at least one processor 201 configured to control the operation of the dehumidifier 1 and at least one memory 202 configured to store programs and data for controlling the operation of the dehumidifier 1.

[0145] The at least one memory 202 may store data necessary for various embodiments. The memory 202 may be implemented as a memory embedded in the dehumidifier 1 or as a memory removable from the dehumidifier 1 depending on the data storage purpose. For example, data for driving the dehumidifier 1 may be stored in a memory embedded in the dehumidifier 1, and data for the expansion function of the dehumidifier 1 may be stored in a memory that is removable from the dehumidifier 1. Meanwhile, the memory embedded in the dehumidifier 1 may be implemented as at least one of volatile memory (e.g., dynamic RAM (DRAM), static RAM (SRAM), or synchronous dynamic RAM (SDRAM), etc.), and non-volatile memory (e.g., one time programmable ROM (OTPROM), programmable ROM (PROM), erasable and programmable ROM (EPROM), electrically erasable and programmable ROM (EEPROM), mask ROM, flash ROM, flash memory (e.g. NAND flash or NOR flash, etc.), hard drive, or solid state drive (SSD)). The memory removable from the dehumidifier 1 may be implemented as a memory card (e.g., compact flash (CF), secure digital (SD), micro secure digital (Micro-SD), mini secure digital (Mini-SD), extreme digital (xD), multi-media card (MMC), etc.), and external memory (e.g., USB memory) that is connectable to a USB port.

[0146] The at least one processor 201 generally controls the operation of the dehumidifier 1. Particularly, the at least one processor 201 may be connected to each component of the dehumidifier 1 and generally control the operation of the dehumidifier 1. For example, the at least one processor 201 may be electrically connected to the memory 202 to control the

overall operation of the dehumidifier 1. The processor 201 may be composed of one or multiple processors.

[0147] By executing at least one instruction stored in the memory 202, the at least one processor 201 may perform the operation of the dehumidifier 1 according to various embodiments.

[0148] The at least one processor 201 may include at least one of a Central Processing Unit (CPU), a Graphics Processing Unit (GPU), an Accelerated Processing Unit (APU), a Many Integrated Core (MIC), a Digital Signal Processor (DSP), a Neural Processing Unit (NPU), a hardware accelerator or a machine learning accelerator. The at least one processor 201 may control one or any combination of the other components of the dehumidifier 1 and may perform operations related to the communication or the data processing. The at least one processor 201 may execute at least one program or instruction stored in the memory 202. For example, the at least one processor 201 may perform at least one method according to one embodiment of the present disclosure by executing at least one instruction stored in the memory 202.

[0149] When a method according to at least one embodiment of the present disclosure includes a plurality of operations, the plurality of operations may be performed by one processor or by a plurality of processors. For example, when a first operation, a second operation, and a third operation are performed by the method according to at least one embodiment, the first operation, the second operation, and the third operation may be all performed by a first processor. Alternatively, the first operation and the second operation may be performed by the first processor (e.g., a general-purpose processor) and the third operation may be performed by a second processor (e.g., an artificial intelligence-specific processor).

[0150] The at least one processor 201 may be implemented as a single core processor including one core, or at least one multicore processor including a plurality of cores (e.g., homogeneous multi-core or heterogeneous multi-core). When the at least one processor 201 is implemented as a multi-core processor, each of the plurality of cores included in the multi-core processor may include processor internal memory such as cache memory and on-chip memory, and a common cache shared by multiple cores may be included in the multi-core processor. In addition, each of the plurality of cores (or some of the plurality of cores) included in the multi-core processor may independently read and execute program instructions for implementing the method according to at least one embodiment of the present disclosure. Further, the entire (or some) of the plurality of cores may be linked so as to read and perform program instructions for implementing the method according to at least one embodiment of the present disclosure.

[0151] When a method according to at least one embodiment of the present disclosure includes a plurality of operations, the plurality of operations may be performed by one core among a plurality of cores included in a multi-core processor, or by a plurality of cores. For example, when a first operation, a second operation, and a third operation are performed by the method according to at least one embodiment, the first operation, the second operation, and the third operation may be performed by a first core included in the multi-core processor, or the first operation and the second operation may be performed by the first core included in the multi-core processor and the third operation may be performed by a second core included in the multi-core processor.

[0152] In embodiments of the present disclosure, a processor may refer to a system-on-chip (SoC) in which at least one processor and other electronic components are integrated, a single-core processor, a multi-core processor, or a core included in a single-core processor or a multi-core processor. The core may be implemented as CPU, GPU, APU, MIC, DSP, NPU, hardware accelerator, or machine learning accelerator, but the embodiments of the present disclosure are not limited thereto.

[0153] The at least one memory 202 may store an algorithm for controlling the compressor 50 and/or the fan 70 according to the operation mode of the dehumidifier 1.

[0154] The at least one memory 202 may store an algorithm for calculating an amount of dehumidification based on sensor data collected from the environmental sensor 170.

[0155] In one embodiment, the at least one processor 201 may calculate the amount of dehumidification based on sensor data collected from the environmental sensor 170.

[0156] For example, the at least one processor 201 may calculate the amount of dehumidification based on absolute humidity of the discharge air and absolute humidity of the intake air.

[0157] The at least one processor 201 may calculate the absolute humidity of discharge air and the absolute humidity of intake air based on sensor data collected from the environmental sensor 170.

[0158] A well-known method may be applied to the method by which the at least one processor 201 calculates the absolute humidity of discharge air and the absolute humidity of intake air based on sensor data collected from the environmental sensor 170.

[0159] The absolute humidity is a weight ratio (kg/kgDA) between moisture contained in humid air and dry air.

[0160] In one embodiment, the at least one processor 201 may consider the operating frequency of the compressor 50 when calculating the amount of dehumidification based on sensor data collected from the environmental sensor 170.

[0161] As a result, the amount of dehumidification may be determined based on [Formula 1] below.

[Formula 1]

$$\text{Amount of dehumidification (kg/h)} = (X1 - X2) * M$$

[0162] X1 (kg/kgDA) means absolute humidity of intake air, and X2 (kg/kgDA) means absolute humidity of discharge air, M means mass flow rate, and the mass flow rate means a weight of air flowing during unit time. The mass flow rate may be determined depending on the rotation speed of the fan 70.

[0163] The at least one processor 201 may determine a cumulative amount of dehumidification by integrating the calculated amount of dehumidification over time.

[0164] The cumulative amount of dehumidification calculated by the at least one processor 201 may correspond to an amount of condensed water generated in the heat exchanger 60. Accordingly, the cumulative amount of dehumidification calculated by the at least one processor 201 may correspond to the water level of the water tank 100.

[0165] Meanwhile, even when the at least one processor 201 calculates the cumulative amount of dehumidification through the above-described method, an error may occur between a cumulative amount of dehumidification calculated according to various variables and conditions and an amount of water corresponding to the water level of the water tank 100.

[0166] The at least one memory 202 may store correction data that is used when calculating the amount of dehumidification based on sensor data collected from the environmental sensor 170. In one embodiment, the correction data may be stored in non-volatile memory of the memory 202.

[0167] Accordingly, the correction data may not be lost even when power is not supplied to the dehumidifier 1.

[0168] In one embodiment, when calculating the cumulative amount of dehumidification, the at least one processor 201 may use the correction data to minimize the error between the calculated cumulative amount of dehumidification and the amount of water corresponding to the water level of the water tank 100.

[0169] As a result, the amount of dehumidification may be determined based on [Formula 2] below.

[Formula 2]

$$\text{Amount of dehumidification (kg/h)} = (X1 - X2) * M + \Delta X$$

[0170] ΔX corresponds to a correction amount corresponding to a temperature and humidity of air around the dehumidifier 1.

[0171] The at least one memory 202 may store the correction data related to ΔX , and the at least one processor 201 may calculate the amount of dehumidification by recalling ΔX value stored in the at least one memory 202.

[0172] When it is assumed that an amount of dehumidification calculated without applying ΔX is 2kg/h and ΔX is 0.1, an amount of dehumidification that is corrected by applying ΔX is 2.1kg/h.

[0173] The at least one processor 201 may calculate a cumulative amount of dehumidification by accumulating the corrected amount of dehumidification over time.

[0174] According to the present disclosure, when the dehumidifier 1 calculates a cumulative amount of dehumidification, it is possible to calculate a more accurate cumulative amount of dehumidification by using correction data. Accordingly, even when the dehumidifier 1 is not provided with a sensor configured to measure an accurate water level of the water tank 100, the dehumidifier 1 may estimate the accurate water level of the water tank 100.

[0175] The at least one processor 201 may update ΔX by updating the correction data stored in the at least one memory 202. A method by which the at least one processor 201 updates the correction data will be described later.

[0176] The at least one memory 202 may store an algorithm for detecting a water emptying event. The water emptying event may include at least one event that may be strongly estimated that a user empties the water tank 100.

[0177] When the water emptying event is detected, it may be estimated that a user empties the water tank 100.

[0178] In one embodiment, the at least one processor 201 may detect the water emptying event.

[0179] For example, the at least one processor 201 may detect the water emptying event based on the detection of the separation of the water tank 100 by the water tank detection sensor 160 and based on the detection of the coupling of the water tank 100 after a predetermined time elapses.

[0180] As another example, the at least one processor 201 may detect the water emptying event in response to a change from a state in which the predetermined water level (e.g., the first water level h1 or the second water level h2) is detected by the water level sensor 150 to a state, in which a predetermined water level (e.g., the first water level h1 or the second water level h2) is not detected by the water level sensor 150.

[0181] Further, when considering that the first water level h1 is lower than the second water level h2, it is appropriate that the at least one processor 201 may detect the water emptying event in response to a change from a state, in which the first

water level h1 is detected by the first water level sensor 150a to a state, in which the first water level h1 is not detected by the first water level sensor 150a.

[0182] As another example, the at least one processor 201 may detect the water emptying event in response to the detection of the separation of the water tank 100 by the water tank detection sensor 160 in the state in which the predetermined water level (e.g., the first water level h1 or the second water level h2) is detected by the water level sensor 150, and in response to the state in which the predetermined water level (e.g., the first water level h1 or the second water level h2) is not detected by the water level sensor 150 after the detection of the coupling of the water tank 100 by the water tank detection sensor 160.

[0183] Further, when considering that the first water level h1 is lower than the second water level h2, it is appropriate that the at least one processor 201 may detect the water emptying event in response to the detection of the separation of the water tank 100 by the water tank detection sensor 160 in the state in which the first water level h1 is detected by the first water level sensor 150a, and in response to the state in which the first water level h1 is not detected by the first water level sensor 150a after the detection of the coupling of the water tank 100 by the water tank detection sensor 160.

[0184] Components shown in FIG. 7 are examples of components of the dehumidifier 1, and the dehumidifier 1 according to one embodiment may further include some components in addition to the components shown in FIG. 7. Alternatively, some of the components (e.g., the water tank detection sensor 160) shown in FIG. 7 may not be included.

[0185] FIG. 8 is a flowchart illustrating an example of a method for controlling the dehumidifier according to one embodiment.

[0186] Referring to FIG. 8, the processor 201 may calculate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor 170 and correction data stored in the memory 202 (1100).

[0187] In one embodiment, the processor 201 may start calculating a cumulative amount of dehumidification in response to the start of the dehumidifying operation of the dehumidifier 1. The start of the dehumidifying operation of the dehumidifier 1 may include the start of the operation of the compressor 50.

[0188] In one embodiment, the processor 201 may initialize the calculated accumulated amount of dehumidification in response to the detection of the water emptying event.

[0189] That is, the processor 201 may calculate a cumulative amount of dehumidification by accumulating an amount of dehumidification from a time at which the water emptying event is detected until a new water emptying event is detected.

[0190] For example, when the water emptying event is detected, the processor 201 may initialize a cumulative amount of dehumidification to 0 (zero) or initialize the cumulative amount of dehumidification to a predefined value. In one embodiment, the predefined value may be a value associated with correction data.

[0191] In one embodiment, in response to the detection of the reaching of a predetermined water level by the water level sensor 150, the processor 201 may update correction data, which is stored in the memory 202, based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level (1300 and 1500).

[0192] In the present disclosure, for convenience of description, an amount of water corresponding to the first water level h1 is defined as a first amount of water, and an amount of water corresponding to the second water level h2 is defined as a second amount of water.

[0193] The first amount of water corresponding to the first water level h1, and the second amount of water corresponding to the second water level h2 may be defined in advance according to the size of the water tank 100.

[0194] In one embodiment, in response to the detection of the reaching of the first water level h1 by the first water level sensor 150a, the processor 201 may update correction data, which is stored in the memory 202, based on a difference between the cumulative amount of dehumidification and the first amount of water (1300).

[0195] Updating the correction data stored in the memory 202 based on the difference between the cumulative amount of dehumidification and the first amount of water may include updating a lookup table included in the correction data and/or updating an artificial intelligence model included in the correction data.

[0196] FIG. 9 is a diagram illustrating an example of a method for updating correction data when the dehumidifier according to one embodiment detects the reaching of a first water level.

[0197] Referring to FIG. 9, the processor 201 may initialize a cumulative amount of dehumidification at a time t0 of detecting the water emptying event. Initializing the cumulative amount of dehumidification at the time t0 of detecting the water emptying event may include not only initializing the cumulative amount of dehumidification as soon as the water emptying event is detected, but also initializing the cumulative amount of dehumidification when the water emptying event is detected and the dehumidifier is turned on or initializing the cumulative amount of dehumidification when the water emptying event is detected and the dehumidifying operation of the dehumidifier 1 starts.

[0198] In other words, initializing the cumulative amount of dehumidification at the time t0 of detecting the water emptying event may include initializing the cumulative amount of dehumidification before a predetermined time elapses after the water emptying event is detected and the dehumidifying operation of the dehumidifier 1 starts.

[0199] The processor 201 may calculate the cumulative amount of dehumidification based on the sensor data collected from the environmental sensor 170 from a time t1 at which the dehumidifying operation of the dehumidifier 1 starts, and the

correction data stored in the memory 202.

[0200] The processor 201 may compare the first amount of water and the cumulative amount of dehumidification at a time t_2 at which the reaching of the first water level h_1 is detected by the first water level sensor 150a.

[0201] As shown in FIG. 9, when the cumulative amount of dehumidification is calculated as 1.98L and the first amount of water corresponds to 2L, a difference between the cumulative amount of dehumidification and the first amount of water is +0.02L.

[0202] When it is assumed that a period of time between the start time t_1 of the dehumidifying operation and the time t_2 at which the reaching of the first water level h_1 is detected is 1 hour, and when ΔX is +0.02 (kg/h), the cumulative amount of dehumidification is the same as the first amount of water.

[0203] The processor 201 may store a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the first amount of water, in the memory 202.

[0204] An error between a cumulative amount of dehumidification, which is calculated according to temperature and humidity conditions of intake air, and an amount of water actually stored in the water tank 100 may vary. Accordingly, a correction amount ΔX corresponding to the temperature and humidity conditions of the intake air is required.

[0205] In one embodiment, the processor 201 may match a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the first amount of water, with the temperature and humidity conditions of the intake air and store the matched information in the memory 202.

[0206] For example, when a temperature of intake air is 20°C and humidity of the intake air is 60%, a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the first amount of water, may be stored as a correction amount ΔX corresponding to the temperature condition of 20°C and the humidity condition of 60%.

[0207] In one embodiment, when the temperature and humidity of the intake air change according to the dehumidifying operation of the dehumidifier 1, the processor 201 may determine a storage position of the correction amount ΔX based on an extent to which the temperature and humidity of the intake air change.

[0208] For example, when the temperature of the intake air rises from 20°C to 21°C and the humidity falls from 60% to 50% due to the dehumidifying operation, the processor 201 may store half a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the first amount of water, as a correction amount ΔX corresponding to the temperature condition of 20°C and the humidity condition of 60%, and store the other half the correction amount ΔX as a correction amount ΔX corresponding to the temperature condition of 20°C and the humidity condition of 50%.

[0209] As another example, when the temperature of the intake air rises from 20°C to 21°C and the humidity falls from 60% to 50% due to the dehumidifying operation, the processor 201 may store a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the first amount of water, as a correction amount ΔX corresponding to the temperature condition of 20.5°C and the humidity condition of 55%.

[0210] In one embodiment, in response to the detection of the reaching of the first water level h_1 by the first water level sensor 150a (yes in 1200), the processor 201 may correct the calculated cumulative amount of dehumidification to the first amount of water.

[0211] In one embodiment, the processor 201 may correct the calculated accumulated amount of dehumidification to the first amount of water and then continuously accumulate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor 170 and correction data stored in the memory 202.

[0212] In one embodiment, in response to the detection of the reaching of the second water level h_2 by the second water level sensor 150b (yes in 1400), the processor 201 may update the correction data stored in the memory 202 based on a difference between the cumulative amount of dehumidification and the second amount of water (1500).

[0213] Updating the correction data stored in the memory 202 based on the difference between the cumulative amount of dehumidification and the second amount of water may include updating a lookup table included in the correction data and/or updating an artificial intelligence model included in the correction data.

[0214] FIG. 10 is a diagram illustrating an example of a method for updating correction data when the dehumidifier according to one embodiment detects the reaching of a second water level.

[0215] Referring to FIG. 10, the processor 201 may correct the cumulative amount of dehumidification to the first amount of water at the time t_2 of detecting the reaching of the first water level h_1 and continuously calculate the cumulative amount of dehumidification.

[0216] That is, at the time t_2 of detecting the reaching of the first water level h_1 , the processor 201 may change the cumulative amount of dehumidification to the first amount of water, and calculate the cumulative amount of dehumidification based on sensor data collected from the environmental sensor 170 and correction data stored in the memory 202.

[0217] The processor 201 may compare the second amount of water and the cumulative amount of dehumidification at a time t_3 at which the reaching of the second water level h_2 is detected by the second water level sensor 150b.

[0218] As shown in FIG. 10, when the cumulative amount of dehumidification is calculated as 4.01L and the second amount of water corresponds to 4L, a difference between the cumulative amount of dehumidification and the second amount of water is -0.01L.

[0219] When it is assumed that a period of time between the time t_2 , at which the reaching of the first water level h_1 is detected, and the time t_3 , at which the reaching of the second water level h_2 is detected, is 1 hour, and when ΔX is -0.01 (kg/h), the cumulative amount of dehumidification is the same as the second amount of water.

[0220] The processor 201 may store a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the second amount of water, in the memory 202.

[0221] In one embodiment, the processor 201 may match a correction amount ΔX , which allows the cumulative amount of dehumidification to be the same as the second amount of water, with the temperature and humidity conditions of the intake air and store the matched information in the memory 202.

[0222] In one embodiment, the second water level h_2 may correspond to a full water level.

[0223] In one embodiment, the processor 201 may stop the dehumidifying operation in response to the detection of the reaching of the second water level h_2 by the second water level sensor 150b.

[0224] Stopping the dehumidifying operation may include stopping the operation of the compressor 50 and the fan 70.

[0225] In one embodiment, in response to the detection of the reaching of the second water level h_2 by the second water level sensor 150b, the processor 201 may output sensory information indicating that the water level of the water tank 100 reaches the full water level.

[0226] Outputting sensory information indicating that the water level of the water tank 100 reaches the full water level may include outputting visual information (e.g., indicator lighting) indicating that the water level of the water tank 100 reaches the full water level and/or outputting auditory information (e.g., sound) indicating that the water level of the water tank 100 reaches the full water level.

[0227] In one embodiment, in response to the detection of the reaching of the second water level h_2 by the second water level sensor 150b, the processor 201 may notify an external device that the water level of the water tank 100 reaches the full water level, through the communication interface 400.

[0228] Notifying an external device (e.g., a server or a user device) that the water level of the water tank 100 reaches the full water level, through the communication interface 400 may include notifying the external device that the water level of the water tank 100 reaches the full water level, through wireless communication.

[0229] Notifying the external device that the water level of the water tank 100 reaches the full water level, through the communication interface 400 may include transmitting a signal indicating that the water level of the water tank 100 reaches the full water level, to the external device.

[0230] A user can recognize that the water level of the water tank 100 of the dehumidifier 1 reaches the full water level, separate the water tank 100 from the main body, empty the water, and then couple the water tank 100 to the main body.

[0231] The processor 201 may detect the water emptying event according to the user's water emptying behavior.

[0232] The processor 201 may initialize the cumulative amount of dehumidification based on the detection t_4 of the water emptying event.

[0233] According to the present disclosure, it is possible to provide the dehumidifier 1 capable of updating the correction data by comparing the cumulative amount of dehumidification and the amount of water corresponding to the actual water level of the water tank 100, and capable of more accurately estimating the water level of the water tank 100 as the period of use increases, by using the correction data.

[0234] Meanwhile, the operations shown in FIG. 8 may be performed by the processor 201 of the dehumidifier 1 or by a processor included in an external device (e.g., a server).

[0235] Correction data described above or described later may be stored in a memory included in an external device (e.g., a server).

[0236] The dehumidifier 1 may transmit sensor data collected from the environmental sensor 170 to an external device through the communication interface 400.

[0237] The external device may calculate a cumulative amount of dehumidification based on the sensor data received from the dehumidifier 1 and correction data stored in a memory 202 of the external device.

[0238] The external device may transmit data regarding the calculated cumulative amount of dehumidification to the dehumidifier 1.

[0239] The dehumidifier 1 may transmit a signal indicating that the reaching of the first water level h_1 is detected, to the external device through the communication interface 400.

[0240] When the external device receives the signal indicating that the reaching of the first water level h_1 is detected, from the dehumidifier 1, the external device may update the correction data stored in the memory 202 of the external device based on the difference between the cumulative amount of dehumidification and the first amount of water.

[0241] The dehumidifier 1 may transmit a signal indicating that the reaching of the second water level h_2 is detected to the external device through the communication interface 400.

[0242] When the external device receives a signal indicating that the reaching of the second water level h_2 is detected, from the dehumidifier 1, the external device may update the correction data stored in the memory 202 of the external device based on the difference between the cumulative amount of dehumidification and the second amount of water.

[0243] The dehumidifier 1 may transmit a signal indicating that the water emptying event is detected to the external

device through the communication interface 400.

[0244] When the external device receives the signal indicating that the water emptying event is detected from the dehumidifier 1, the external device may initialize the cumulative amount of dehumidification.

[0245] According to one embodiment of the present disclosure, it is possible to provide the external device capable of updating the correction data by comparing the cumulative amount of dehumidification and the amount of water corresponding to the actual water level of the water tank 100, and capable of more accurately estimating the water level of the water tank 100 as the period of use increases, by using the correction data.

[0246] Meanwhile, even when a user empties the water in the water tank 100, the water in the water tank 100 may not be completely removed depending on the user's habits.

[0247] Because the cumulative amount of dehumidification is initialized to 0 (zero) or a value similar to 0 (zero) in response to the detection of the water emptying event, it is highly likely that the cumulative amount of dehumidification, which is calculated from when the water emptying event is detected until the water level of the water tank 100 reaches the first water level h1, is different from the actual water level of the water tank 100.

[0248] That is, when the water in the water tank 100 is not completely removed, the water level of the water tank 100 may increase in a state in which some water remains in the water tank 100. Accordingly, it is not appropriate that the cumulative amount of dehumidification is always initialized to 0 (zero).

[0249] According to various embodiments, the processor 201 may determine an initial value of the cumulative amount of dehumidification using correction data that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water.

[0250] That is, when the processor 201 detects that the water level of the water tank 100 reaches the first water level h1, the processor 201 may determine the initial value of the cumulative amount of dehumidification based on the difference between the cumulative amount of dehumidification and the first amount of water.

[0251] In one embodiment, whenever the water level of the water tank 100 reaches the first water level h1, the processor 201 may accumulate and store the difference between the cumulative amount of dehumidification and the first amount of water, as one of a plurality of factors. The processor 201 may determine an average value of the plurality of factors as an initial value of the cumulative amount of dehumidification.

[0252] For example, when the average value of the plurality of factors corresponding to the difference between the cumulative amount of dehumidification and the first amount of water is 0.1L, the processor 201 may determine the initial value of the cumulative amount of dehumidification as 0.1L. Thereafter, the processor 201 may initialize the cumulative amount of dehumidification as 0.1L in response to the detection of the water emptying event.

[0253] Meanwhile, when the water level of the water tank 100 reaches the first water level h1, the cumulative amount of dehumidification is corrected to the first amount of water. Accordingly, a cumulative amount of dehumidification, which is calculated until the water level of the water tank 100 reaches the second water level after the reaching of the first water level h1 is detected, may be relatively similar to the actual water level of the water tank 100.

[0254] According to various embodiments, the processor 201 may correct the cumulative amount of dehumidification using the correction data that is updated based on the difference between the cumulative amount of dehumidification and the second amount of water.

[0255] That is, the processor 201 may perform the operation 1100 by using the correction data that is updated based on the difference between the cumulative amount of dehumidification and the second water amount.

[0256] In one embodiment, the processor 201 may perform the operation 1100 by using correction data that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water (correction data updated when the water level of the water tank 100 reaches the first water level h1), and correction data that is updated based on the difference between the cumulative amount of dehumidification and the second amount of water (correction data updated when the water level of the water tank 100 reaches the second water level h2).

[0257] In one embodiment, the processor 201 may determine an initial value of the cumulative amount of dehumidification based on the correction data that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water, and may perform the operation 1100 by using the correction data that is updated based on the difference between the cumulative amount of dehumidification and the second amount of water.

[0258] In one embodiment, the processor 201 may perform the operation 1100 by using correction data that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water, and correction data that is updated based on the difference between the cumulative amount of dehumidification and the second amount of water, and the processor 201 may determine an initial value of the cumulative amount of dehumidification based on correction data that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water.

[0259] FIG. 11 illustrates an example of a lookup table corresponding to correction data according to one embodiment.

[0260] Referring to FIG. 11, correction data stored in the memory 202 according to one embodiment may include a lookup table 202a in which a correction amount corresponding to temperature and humidity conditions is recorded.

[0261] The lookup table 202a may include a correction amount ΔX corresponding to the temperature and humidity

conditions.

[0262] The lookup table 202a may be updated by the processor 201.

[0263] In one embodiment, the processor 201 may update the lookup table 202a by matching a temperature and humidity of air measured by the environmental sensor 170 with temperature and humidity conditions recorded in the lookup table 202a and by storing a difference between a cumulative amount of dehumidification and a predetermined amount of water, as one of a plurality of factors for determining the correction amount ΔX .

[0264] For example, when a temperature of air (e.g., temperature of intake air) and humidity of air (e.g., humidity of intake air) measured by the environmental sensor 170 correspond to 15°C and 60%, respectively, and a difference between a cumulative amount of dehumidification and a predetermined amount of water is 0.003L, 0.003L, which is the difference between the cumulative amount of dehumidification and the predetermined amount of water, may be stored as one of a plurality of factors b2 for determining correction amount ΔX corresponding to the temperature condition of 15°C and the humidity condition of 60%, in the lookup table 202a.

[0265] As mentioned above, the processor 201 may update the plurality of factors b2 for determining the correction amount ΔX whenever the water level of the water tank 100 of the dehumidifier 1 reaches the first water level h1 and/or the second water level h2.

[0266] In dehumidifying operations b1 performed in the past, the plurality of factors b2 determined under the temperature condition of 15°C and the humidity condition of 60% may be used to determine a correction amount ΔX corresponding to the temperature condition of 15°C and the humidity condition of 60%.

[0267] In one embodiment, the processor 201 may determine an average value of the plurality of factors b2 stored in the lookup table 202a as the correction amount ΔX .

[0268] For example, when the factors are stored as {-0.001, -0.001, 0.001, 0.003} in the dehumidifying operations b1 performed in the past, the correction amount ΔX may be determined as 0.001 corresponding to avg {-0.001, -0.001, 0.001, 0.003}.

[0269] According to the present disclosure, it is possible to provide the dehumidifier 1 capable of calculating an accurate correction amount ΔX that meets the temperature and humidity conditions of the intake air as the dehumidifying operation is performed and a number of times, in which the water level of the water tank 100 reaches the first water level h1 and/or the second water level h2, increased.

[0270] In one embodiment, the lookup table 202a stored in the memory 202 may be updated based on the difference between the cumulative amount of dehumidification and the first amount of water, and may be updated based on the difference between the cumulative amount of dehumidification and the second amount of water.

[0271] In one embodiment, the lookup table 202a stored in the memory 202 may include a first lookup table that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water, and a second lookup table that is updated based on the difference between cumulative amount of dehumidification and the second amount of water.

[0272] In one embodiment, the operation 1100 may be performed based on a single lookup table 202a that is updated based on the difference between the cumulative amount of dehumidification and the first amount of water, and updated based on the difference between the cumulative amount of dehumidification and the second amount of water.

[0273] In one embodiment, the processor 201 may determine an initial value of the cumulative amount of dehumidification based on the first lookup table and perform the operation 1100 based on the second lookup table.

[0274] In one embodiment, the processor 201 may perform the operation 1100 based on the first lookup table and the second lookup table, and determine an initial value of the cumulative amount of dehumidification based on the first lookup table.

[0275] As mentioned above, according to various embodiments, the lookup table 202a may be stored in the memory of the external device (e.g., a server).

[0276] FIG. 12 illustrates an example of an artificial intelligence model according to one embodiment.

[0277] Referring to FIG. 12, an artificial intelligence model 202b according to one embodiment may output a correction amount.

[0278] The artificial intelligence model 202b is characterized in that it is created through training. Here, being created through training means that a basic artificial intelligence model is trained using a large number of training data by a learning algorithm, thereby creating a predefined operation rule or artificial intelligence model set to perform desired characteristics (or purpose). Such training may be performed in the device itself in which the artificial intelligence according to the present disclosure is performed, or may be performed through a separate server and/or system. Examples of learning algorithms include supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning, but are not limited thereto.

[0279] The artificial intelligence model may be composed of a plurality of neural network layers. Each of the plurality of neural network layers has a plurality of weight values, and a neural network operation is performed through an operation result of the previous layers and an operation between the plurality of weight values. The plurality of weights of the plurality of neural network layers may be optimized by the training result of the artificial intelligence model 202b. For example, the

plurality of weights may be updated so that a loss value or a cost value obtained from the artificial intelligence model during the training process is reduced or minimized. Artificial neural networks may include deep neural networks (DNN), for example, convolutional neural network (CNN), deep neural network (DNN), recurrent neural network (RNN), restricted Boltzmann Machine (RBM), deep belief network (DBN), bidirectional recurrent deep neural network (BRDNN), or deep Q-networks, but is not limited thereto.

[0280] In one embodiment, updating the correction data stored in memory 202 may include training the artificial intelligence model 202b.

[0281] The processor 201 may train the artificial intelligence model 202b by using sensor data (temperature data and humidity data) collected from the environmental sensor 170 and data related to the cumulative amount of dehumidification (hereinafter 'cumulative amount of dehumidification data') as training data.

[0282] The artificial intelligence model 202b may be trained based on training data including temperature data, humidity data, and cumulative amount of dehumidification data.

[0283] The cumulative amount of dehumidification data may include data related to a difference value between the cumulative amount of dehumidification and the first amount of water when it is detected that the water level of the water tank 100 reaches the first water level h1.

[0284] For example, when the dehumidifying operation of the dehumidifier 1 starts, the processor 201 may input temperature data collected from the environmental sensor 170 to a first input layer (x1) and input humidity data collected from the environmental sensor 170 to a second input layer (x2). In response to the detection that the water level of the water tank 100 reaches the first water level h1, the processor 201 may input data, which is related to the difference value between the cumulative amount of dehumidification and the first amount of water, to a third input layer (x3).

[0285] The artificial intelligence model 202b may be trained using data input to the first input layer (x1), the second input layer (x2), and the third input layer (x3) as training data.

[0286] The artificial intelligence model 202b may be trained to output a correction amount ΔX when receiving the temperature (e.g., the temperature of the intake air) corresponding to the temperature data collected by from environmental sensor 170 and the humidity (e.g., the humidity of the intake air) corresponding to the humidity data.

[0287] For example, when the dehumidifying operation of the dehumidifier 1 starts, the processor 201 may input temperature data collected by from environmental sensor 170 to a fourth input layer (x4) and input humidity data collected from the environmental sensor 170 to a fifth input layer (x5). The trained artificial intelligence model 202b may output a correction amount ΔX through an output layer (y1) based on the temperature data input to the fourth input layer (x4) and the humidity data input to the fifth input layer (x5).

[0288] The processor 201 may correct the cumulative amount of dehumidification based on the correction amount ΔX that is output through the output layer (y1).

[0289] According to various embodiments, the trained artificial intelligence model 202b may output the cumulative amount of dehumidification through the output layer (y1) based on the temperature data input to the fourth input layer (x4) and the humidity data input to the fifth input layer (x5). The processor 201 may utilize the cumulative amount of dehumidification output by the trained artificial intelligence model 202b as the cumulative amount of dehumidification to which the correction data is applied.

[0290] As mentioned above, according to various embodiments, the artificial intelligence model 202b may be stored in the memory of the external device (e.g., a server).

[0291] According to the present disclosure, it is possible to provide the dehumidifier 1 capable of identifying an accurate water level of the water tank 100 by continuously updating the correction data stored in the memory 202.

[0292] FIG. 13 is a flowchart illustrating an example of a method for controlling the dehumidifier according to one embodiment.

[0293] Referring to FIG. 13, the dehumidifier 1 according to one embodiment may estimate the water level of the water tank 100 based on the cumulative amount of dehumidification (2100).

[0294] In one embodiment, the processor 201 may estimate the water level of the water tank 100 based on the cumulative amount of dehumidification.

[0295] Estimating the water level of the water tank 100 may include estimating an amount of water stored in the water tank 100.

[0296] The processor 201 may estimate the cumulative amount of dehumidification as the amount of water stored in the water tank 100.

[0297] In one embodiment, in response to detecting that the water level of the water tank 100 reaches a predetermined water level by the water level sensor 150, the processor 201 may correct the cumulative amount of dehumidification to the predetermined water level.

[0298] That is, the processor 201 may correct the estimated water level to the predetermined water level in response to detecting that the water level of the water tank 100 reaches the predetermined level by the water level sensor 150.

[0299] For example, the processor 201 may correct the estimated water level to the first water level h1 in response to detecting that the water level of the water tank 100 reaches the first water level h1 by the first water level sensor 150a.

[0300] For example, the processor 201 may correct the estimated water level to the second water level h_2 in response to detecting that the water level of the water tank 100 reaches the second water level h_2 by the second water level sensor 150b.

[0301] In one embodiment, in response to detecting that the water level of the water tank 100 reaches a predetermined water level by the water level sensor 150, the processor 201 may correct the estimated water level to the predetermined water level, and then estimate a water level of the water tank 100 based on a cumulative amount of dehumidification.

[0302] The dehumidifier 1 according to one embodiment may provide the estimated water level of the water tank 100 to a user (2150).

[0303] Providing the estimated water level of the water tank 100 to the user may include notifying the user of the water level of the water tank 100 that is estimated in real time.

[0304] In one embodiment, the processor 201 may display the estimated water level of the water tank 100 through the output interface 302 of the dehumidifier 1.

[0305] In one embodiment, the processor 201 may transmit information related to the estimated water level of the water tank 100 to an external device (e.g., a server or a user device) through wireless communication.

[0306] FIG. 14 illustrates an example of an interface, which is to display information related to the water level of the water tank, provided by the dehumidifier according to one embodiment and/or an external device.

[0307] Referring to FIG. 14, an interface U1 provided through the output interface 302 of the dehumidifier 1 and/or the output interface of the external device according to one embodiment may be confirmed.

[0308] The output interface 302 of the dehumidifier 1 according to one embodiment may output a visual display K1 indicating the water level of the water tank 100 estimated by the dehumidifier 1 and/or the external device.

[0309] The output interface of the external device according to one embodiment may output a visual display K1 indicating the water level of the water tank 100 estimated by the dehumidifier 1 and/or the external device.

[0310] The visual display K1 indicating the water level of the water tank 100 may include an interface element indicating the water level of the water tank 100 and/or an interface element indicating an amount of water corresponding to the water level of the water tank 100, and/or an interface element indicating the water level as a percentage of the full water level.

[0311] According to various embodiments, the interface element indicating the water level of the water tank 100 may represent the water level of the water tank 100 as a percentage value.

[0312] According to various embodiments, the interface U1 provided through the output interface of the dehumidifier 1 or the output interface of the external device according to one embodiment may include information related to the humidity of the intake air, the set humidity of the dehumidifier 1, the operation mode and/or the operation state of the dehumidifier 1.

[0313] FIG. 15 illustrates an example of an interface, which is to set a function related to the water level of the water tank, provided by the dehumidifier according to one embodiment and/or an external device.

[0314] Referring to FIG. 15, a user can set a notification of a designated water level through an interface U2 for setting functions related to the water level of the water tank 100 and provided by the dehumidifier 1 and/or the external device.

[0315] A user can set a limit on the designated water level through the interface for setting functions related to the water level of the water tank 100 and provided by the dehumidifier 1 and/or the external device.

[0316] The interface for setting functions related to the water level of the water tank 100 may be provided through the output interface 302 of the dehumidifier 1 and/or the output interface of the external device.

[0317] A user input for setting functions related to the water level of the water tank 100 may be received through the input interface 301 of the dehumidifier 1 and/or the input interface of the external device.

[0318] In one embodiment, the interface U2 for setting functions related to the water level of the water tank 100 may include an interface K2 for receiving a user input for setting a designated water level notification.

[0319] The interface K2 for setting the designated water level notification may include an interface element for turning on/off the designated water level notification function and/or an interface element for setting the designated water level.

[0320] The interface element for setting the designated water level may be configured to select any one of the water levels from a specific water level to the full water level. For example, the interface element for setting the designated water level may be provided in the form of a bar and a pointer for selecting a point in the bar shape, and a user can set the designated water level by moving the pointer.

[0321] However, the form of the interface element for setting the designated water level is not limited thereto.

[0322] Through the interface K2 for setting the designated water level notification, a user can set the designated water level and turn on/off the designated water level notification function.

[0323] The designated water level notification function is a function in which the dehumidifier 1 and/or the external device notifies a user that the water level of the water tank 100 reaches the designated water level designated by the user.

[0324] In one embodiment, the interface U2 for setting the function related to the water level of the water tank 100 may include an interface K3 for receiving a user input for setting a designated water level limit.

[0325] The interface K3 for setting the designated water level limit may include an interface element for turning on/off the designated water level limit function and/or an interface element for setting the designated water level.

[0326] The interface element for setting the designated water level may be configured to select any one of the water

levels from a specific water level to the full water level. For example, the interface element for setting the designated water level may be provided in the form of a bar and a pointer for selecting a point in the bar shape, and a user can set the designated water level by moving the pointer.

[0327] However, the form of the interface element for setting the designated water level is not limited thereto.

[0328] Through the interface K3 for setting the designated water level limit, a user can set the designated water level and turn on/off the designated water level limit function.

[0329] The designated water level limit function is a function in which the dehumidifier 1 stops the dehumidifying operation when the water level of the water tank 100 reaches the designated water level designated by a user.

[0330] Users who have difficulty emptying the water tank 100 due to the weight of the water tank 100 when the water tank 100 reaches the full water level, can empty the water tank 100 at the designated water level they want, by using the designated water level limit function.

[0331] In one embodiment, the interface U2 for setting the function related to the water level of the water tank 100 may include an interface K4 for receiving a user input for setting a customized water level notification function.

[0332] The interface K4 for setting the customized water level notification function may include an interface element for turning on/off the customized water level notification function.

[0333] The customized water level notification function may analyze the user's pattern and automatically set the customized water level suitable for the user, and may be a function in which the dehumidifier 1 and/or the external device notifies the user that the water level of the water tank 100 reaches the customized water level that is automatically set.

[0334] In one embodiment, the dehumidifier 1 may determine a customized water level based on data regarding a cumulative amount of dehumidification at the time of detecting the water emptying event.

[0335] For example, the dehumidifier 1 may accumulate and store a cumulative amount of dehumidification at the time of detecting the water emptying event, that is, a cumulative amount of dehumidification immediately before initialization, and determine an average value thereof as a customized water level.

[0336] As mentioned above, the dehumidifier 1 configured to accurately estimate the water level of the water tank 100, may provide various functions related to the water level of the water tank 100 to a user.

[0337] Referring again to FIG. 13, the dehumidifier 1 may perform the designated water level notification function based on the designated water level notification function being turned on (yes in 2200).

[0338] In response to the estimated water level of the water tank 100 reaching the first designated water level set according to the user input (yes in 2210), the dehumidifier 1 may provide the designated water level notification (2220).

[0339] FIG. 16 illustrates an example of an interface, which indicates that the water level of the water tank reaches a designated water level set by a user, provided by the dehumidifier according to one embodiment and/or an external device.

[0340] Referring to FIG. 16, in response to the estimated water level of the water tank 100 reaching a first designated water level, the dehumidifier 1 and/or the external device according to one embodiment may output an interface U3 indicating that the water level of the water tank 100 reaches a designated water level set by a user.

[0341] In one embodiment, in response to the estimated water level of the water tank 100 reaching the first designated water level, the processor 201 may output sensory information indicating that the estimated water level of the water tank 100 reaches the first designated water level, through the output interface 302.

[0342] The sensory information indicating that the water level of the water tank 100 reaches the first designated water level may include visual information (e.g., visual indicator) and/or auditory information (e.g., sound notification).

[0343] In one embodiment, in response to the estimated water level of the water tank 100 reaching the first designated water level, the processor 201 may notify the external device that the water level of the water tank 100 reaches the first designated water level, through the communication interface 400.

[0344] Notifying the external device that the water level of the water tank 100 reaches the designated water level, through the communication interface 400 may include notifying the external device that the water level of the water tank 100 reaches the first designated water level, through wireless communication.

[0345] Notifying the external device that the water level of the water tank 100 reaches the designated water level, through wireless communication may include transmitting a signal indicating that the water level of the water tank 100 reaches the first designated water level, to the external device through the wireless communication.

[0346] When the external device receives the signal from the dehumidifier 1 indicating that the water level of the water tank 100 reaches the first designated water level, the external device may notify a user that the water level of the water tank 100 reaches the first designated water level, through the output interface.

[0347] Referring again to FIG. 13, the dehumidifier 1 may perform the designated water level limit function based on the designated water level limit function being turned on (yes in 2300).

[0348] In response to the estimated water level of the water tank 100 reaching the second designated water level set according to the user input (yes in 2310), the dehumidifier 1 may stop the dehumidifying operation of the dehumidifier 1 (2320).

[0349] Stopping the dehumidifying operation of the dehumidifier 1 may include stopping the compressor 50 and/or the fan 70 of the dehumidifier 1.

[0350] In one embodiment, the processor 201 may stop the dehumidifying operation of the dehumidifier 1 in response to the estimated water level of the water tank 100 reaching the second designated water level set according to the user input.

[0351] In one embodiment, the external device may transmit an instruction to stop the dehumidifying operation to the dehumidifier 1 through the wireless communication in response to the estimated water level of the water tank 100 reaching the second designated water level set according to the user input.

[0352] The dehumidifier 1 receiving the instruction to stop the dehumidifying operation from the external device may stop the dehumidifying operation.

[0353] When the dehumidifying operation of the dehumidifier 1 is stopped, water no longer fills the water tank 100.

[0354] According to the present disclosure, it is possible to provide the dehumidifier 1 configured to provide various functions related to the water level of the water tank 100 of the dehumidifier 1 by accurately identifying the water level of the water tank 100 of the dehumidifier 1.

[0355] Meanwhile, the dehumidifier 1 according to one embodiment may include various devices including the water tank 100 that is removable from the main body and the dehumidification cycle that dehumidifies the surrounding air.

[0356] For example, the dehumidifier 1 may include a clothes care machine and/or a shoe care machine that has a function of dehumidifying air inside a main body and includes a water tank 100 that is removable from the main body.

[0357] The dehumidifier 1 according to one embodiment of the present disclosure may include the main body 10, the environmental sensor 170 configured to measure a temperature and humidity of air, the water tank 100 configured to store water generated by the dehumidifying operation and provided to be removable from the main body, the water level sensor 150 configured to detect that a water level of the water tank 100 reaches a predetermined water level, the memory 202 configured to store at least one instruction and correction data, and the at least one processor 201 connected to the environmental sensor, the water level sensor, and the memory. By executing the at least one instruction, the at least one processor 201 may calculate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor and the correction data stored in the memory 201, and update the correction data stored in the memory 202 based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level, in response to the detection of the reaching of the predetermined water level by the water level sensor 150.

[0358] By executing the at least one instruction, the at least one processor 201 may initialize the cumulative amount of dehumidification in response to the detection of a water emptying event.

[0359] By executing the at least one instruction, the at least one processor 201 may detect the water emptying event in response to a change from a state, in which the predetermined water level is detected by the water level sensor 150, to a state, in which the predetermined water level is not detected by the water level sensor 150.

[0360] The water level sensor 150 may include the first water level sensor 150a configured to detect that the water level of the water tank 100 reaches the first water level h1, and the second water level sensor 150b configured to detect that the water level of the water tank 100 reaches the second water level h2 higher than the first water level h1.

[0361] By executing the at least one instruction, the at least one processor 201 may update the correction data stored in the memory 202 based on a difference between the cumulative amount of dehumidification and the first amount of water corresponding to the first water level h1 in response to the detection of the reaching of the first water level h1 by the first water level sensor 150a.

[0362] By executing the at least one instruction, the at least one processor 201 may correct the cumulative amount of dehumidification to the first amount of water corresponding to the first water level h1 based on the detection of the reaching of the first water level h1 by the first water level sensor 150a, and update the correction data stored in the memory 202 based on the difference between the cumulative amount of dehumidification and the second amount of water corresponding to the second water level h2, based on the detection of the reaching of the second water level h2 by the second water level sensor 150b.

[0363] By executing the at least one instruction, the at least one processor 201 may estimate a water level of the water tank 100 based on the cumulative amount of dehumidification, and correct the cumulative amount of dehumidification to the predetermined amount of water in response to the detection of the reaching of the predetermined water level by the water level sensor 150.

[0364] By executing the at least one instruction, the at least one processor 201 may display the estimated water level of the water tank 100 through the output interface 302 of the dehumidifier or transmit information related to the estimated water level of the water tank 100 to the external device through wireless communication.

[0365] By executing the at least one instruction, the at least one processor 201 may receive the user input to set the designated water level notification, and in response to the estimated water level of the water tank 100 reaching the designated water level set according to the user input, the at least one processor 201 may output sensory information indicating that the water level of the water tank 100 reaches the designated water level, through the output interface 302 of the dehumidifier 1 or notify the external device that the water level of the water tank 100 reaches the designated water level, through the wireless communication.

[0366] By executing the at least one instruction, the at least one processor 201 may receive the user input to set the

designated water level limit, and stop the dehumidifying operation in response to the estimated water level of the water tank 100 reaching the designated water level set according to the user input.

[0367] The correction data stored in the memory 202 may include the lookup table 202a in which a correction amount corresponding to a temperature condition and a humidity condition is recorded.

[0368] By executing the at least one instruction, the at least one processor 201 may update the lookup table 202a by matching the temperature and humidity of air measured by the environmental sensor 170 with the temperature condition and the humidity condition and by storing the difference between the cumulative amount of dehumidification and the predetermined amount of water, as one of the plurality of factors for determining the correction amount.

[0369] By executing the at least one instruction, the at least one processor 201 may determine the average value of the plurality of factors stored in the lookup table 202a as the correction amount.

[0370] The correction data stored in the memory 202 may include the artificial intelligence model 202b trained based on training data including temperature data, humidity data, and cumulative amount of dehumidification data, and trained to output a correction amount in response to receiving the temperature of air and the humidity of air.

[0371] By executing the at least one instruction, the at least one processor 201 may train the artificial intelligence model 202b by using the temperature and humidity of air measured by the environmental sensor and the difference between the cumulative amount of dehumidification and the predetermined amount of water, as the training data.

[0372] The method for controlling the dehumidifier 1 may include calculating the cumulative amount of dehumidification based on sensor data collected from the environmental sensor 170 and pre-stored correction data, and updating the pre-stored correction data based on the difference between the cumulative amount of dehumidification and the predetermined amount of water corresponding to the predetermined water level in response to the detection of the reaching of the predetermined water level by the water level sensor 150.

[0373] The calculating of the cumulative amount of dehumidification may include initializing the cumulative amount of dehumidification in response to the detection of a water emptying event.

[0374] The method for controlling the dehumidifier 1 may further include detecting the water emptying event in response to a change from a state, in which the predetermined water level is detected by the water level sensor 150, to a state, in which the predetermined water level is not detected by the water level sensor 150.

[0375] The updating of the pre-stored correction data may include updating the correction data stored in the memory based on a difference between the cumulative amount of dehumidification and the first amount of water corresponding to the first water level h1 in response to the detection of the reaching of the first water level h1 by the first water level sensor 150a.

[0376] The updating of the pre-stored correction data may further include correcting the cumulative amount of dehumidification to the first amount of water corresponding to the first water level h1 based on the detection of the reaching of the first water level h1 by the first water level sensor 150a, and updating the correction data stored in the memory 202 based on the difference between the cumulative amount of dehumidification and the second amount of water corresponding to the second water level h2, based on the detection of the reaching of the second water level h2 by the second water level sensor 150b.

[0377] The method for controlling the dehumidifier 1 may include estimating a water level of the water tank 100 based on the cumulative amount of dehumidification, and correcting the cumulative amount of dehumidification to the predetermined amount of water in response to the detection of the reaching of the predetermined water level by the water level sensor 150.

[0378] The method for controlling the dehumidifier 1 may further include displaying the estimated water level of the water tank 100 through the output interface 302 of the dehumidifier 1 or transmitting information related to the estimated water level of the water tank 100 to the external device through wireless communication.

[0379] The method for controlling the dehumidifier 1 may further include receiving the user input to set the designated water level, and performing the predetermined operation in response to the estimated water level of the water tank 100 reaching the designated water level set according to the user input.

[0380] The predetermined operation may include at least one of outputting sensory information indicating that the water level of the water tank 100 reaches the designated water level, through the output interface 302 of the dehumidifier 1, notifying the external device that the water level of the water tank 100 reaches the designated water level, through the wireless communication, or stopping the dehumidifying operation.

[0381] Meanwhile, the disclosed embodiments may be embodied in the form of a recording medium storing instructions executable by a computer. The instructions may be stored in the form of program code and, when executed by a processor, may generate a program module to perform the operations of the disclosed embodiments. The recording medium may be embodied as a computer-readable recording medium.

[0382] The computer-readable recording medium includes all kinds of recording media in which instructions which can be decoded by a computer are stored. For example, there may be a Read Only Memory (ROM), a Random Access Memory (RAM), a magnetic tape, a magnetic disk, a flash memory, and an optical data storage device.

[0383] Storage medium readable by machine, may be provided in the form of a non-transitory storage medium. "Non-

transitory" means that the storage medium is a tangible device and does not contain a signal (e.g., electromagnetic wave), and this term includes a case in which data is semi-permanently stored in a storage medium and a case in which data is temporarily stored in a storage medium. For example, "non-transitory storage medium" may include a buffer in which data is temporarily stored.

[0384] The method according to the various disclosed embodiments may be provided by being included in a computer program product. Computer program products may be traded between sellers and buyers as commodities. Computer program products are distributed in the form of a device-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or are distributed directly or online (e.g., downloaded or uploaded) between two user devices (e.g., smartphones) through an application store (e.g., Play Store™). In the case of online distribution, at least a portion of the computer program product (e.g., downloadable app) may be temporarily stored or created temporarily in a device-readable storage medium such as the manufacturer's server, the application store's server, or the relay server's memory.

[0385] While the present disclosure has been particularly described with reference to exemplary embodiments, it should be understood by those of skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the present disclosure.

Claims

1. A dehumidifier comprising:

an environmental sensor configured to measure temperature and humidity of air and produce corresponding sensor data;
 a water tank configured to store water generated by a dehumidifying operation of the dehumidifier;
 a water level sensor configured to detect that a water level in the water tank reaches a predetermined water level;
 and
 at least one processor configured to:

calculate a cumulative amount of dehumidification based on sensor data collected from the environmental sensor, and correction data; and,
 based on the water level sensor detecting that the water level in the water tank reaches the predetermined water level, update the correction data based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level.

2. The dehumidifier of claim 1, wherein the at least one processor is configured to:

initialize the cumulative amount of dehumidification based on detection of a water emptying event.

3. The dehumidifier of claim 2, wherein the at least one processor is configured to:

detect the water emptying event based on a change from a state in which the water level sensor detects that the water level in the water tank reaches the predetermined water level, to a state in which the water level sensor does not detect that the water level in the water tank reaches the predetermined water level.

4. The dehumidifier of claim 1, wherein

the water level sensor includes a first water level sensor configured to detect that the water level in the water tank reaches a first water level, and a second water level sensor configured to detect that the water level in the water tank reaches a second water level higher than the first water level, and
 the at least one processor is configured to:
 based on the first water level sensor detecting that the water level in the water tank reaches the first water level, update the correction data based on a difference between the cumulative amount of dehumidification and a first amount of water corresponding to the first water level.

5. The dehumidifier of claim 1, wherein

the water level sensor includes a first water level sensor configured to detect that the water level in the water tank reaches a first water level, and a second water level sensor configured to detect that the water level in the water tank reaches a second water level higher than the first water level, and
 the at least one processor is configured to:

based on the first water level sensor detecting that the water level in the water tank reaches the first water level, correct the cumulative amount of dehumidification to a first amount of water corresponding to the first water level, and

based on the second water level sensor detecting that the water level in the water tank reaches the second water level, update the correction data based on a difference between the cumulative amount of dehumidification and a second amount of water corresponding to the second water level.

6. The dehumidifier of claim 1, wherein the at least one processor is configured to:
estimate a water level of the water tank based on the cumulative amount of dehumidification, and based on the water level sensor detecting that the water level of the water tank reaches the predetermined water level, correct the cumulative amount of dehumidification to the predetermined amount of water.

7. The dehumidifier of claim 6, wherein the at least one processor is configured to:
display the estimated water level of the water tank through an output interface of the dehumidifier or transmit information related to the estimated water level of the water tank to an external device through wireless communication.

8. The dehumidifier of claim 6, wherein the at least one processor is configured to:

receive a user input to set a designated water level notification, and
based on the estimated water level of the water tank reaching the designated water level set according to the received user input, output sensory information indicating that the water level of the water tank reaches a designated water level, through an output interface of the dehumidifier, or notify an external device that the water level of the water tank reaches the designated water level, through wireless communication.

9. The dehumidifier of claim 6, wherein the at least one processor is configured to:

receive a user input to set a designated water level limit, and
stop the dehumidifying operation in response to the estimated water level of the water tank reaching a designated water level set according to the user input.

10. The dehumidifier of claim 1, wherein

the correction data includes a lookup table in which a correction amount corresponding to a temperature condition and a humidity condition is stored, and
the at least one processor is configured to:
update the lookup table by matching the temperature and humidity of air measured by the environmental sensor with the temperature condition and the humidity condition and by storing a difference between the cumulative amount of dehumidification and the predetermined amount of water as one of a plurality of factors for determining the correction amount.

11. The dehumidifier of claim 10, wherein the at least one processor is configured to:
determine an average value of the plurality of factors stored in the lookup table as the correction amount.

12. The dehumidifier of claim 1, further comprising:

an artificial intelligence model stored in a memory,
wherein the at least one processor is configured to train the artificial intelligence model by using the temperature and humidity of air measured by the environmental sensor and the difference between the cumulative amount of dehumidification and the predetermined amount of water, as training data, to output a correction amount.

13. A method for controlling a dehumidifier that includes an environmental sensor configured to measure temperature and humidity of air and produce corresponding sensor data, a water tank configured to store water generated by a dehumidifying operation of the dehumidifier, and a water level sensor configured to detect that a water level in the water tank reaches a predetermined water level, the method comprising:

calculating a cumulative amount of dehumidification based on sensor data collected from the environmental sensor, and correction data; and

based on the water level sensor detecting that the water level in the water tank reaches the predetermined water level, updating the correction data based on a difference between the cumulative amount of dehumidification and a predetermined amount of water corresponding to the predetermined water level.

- 5 **14.** The method for controlling the dehumidifier of claim 13, wherein
the calculating of the cumulative amount of dehumidification includes initializing the cumulative amount of dehumidification based on detection of a water emptying event.
- 10 **15.** The method for controlling the dehumidifier of claim 14, further comprising:
detecting the water emptying event based on a change from a state in which the water level sensor detects that the water level in the water tank reaches the predetermined water level to a state in which the water level sensor does not detect that the water level in the water tank reaches the predetermined water level.

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FIG. 1

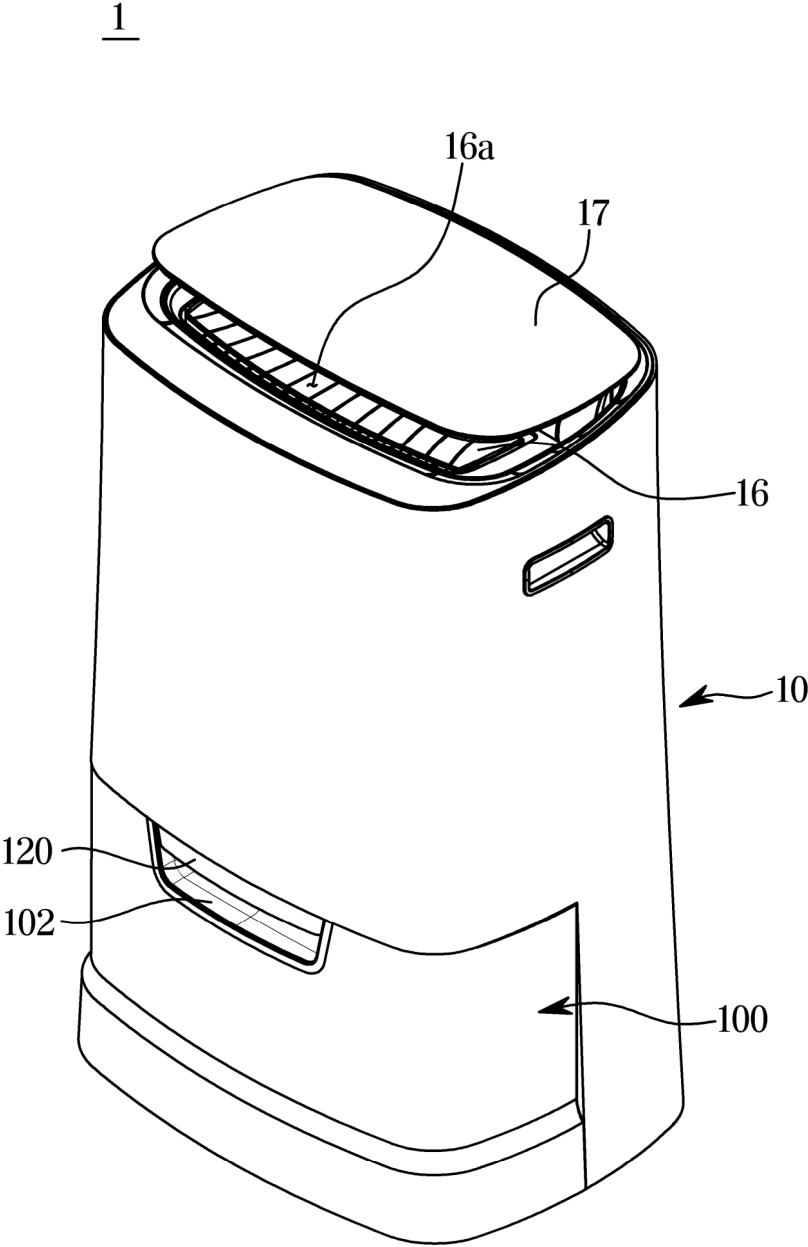


FIG. 2

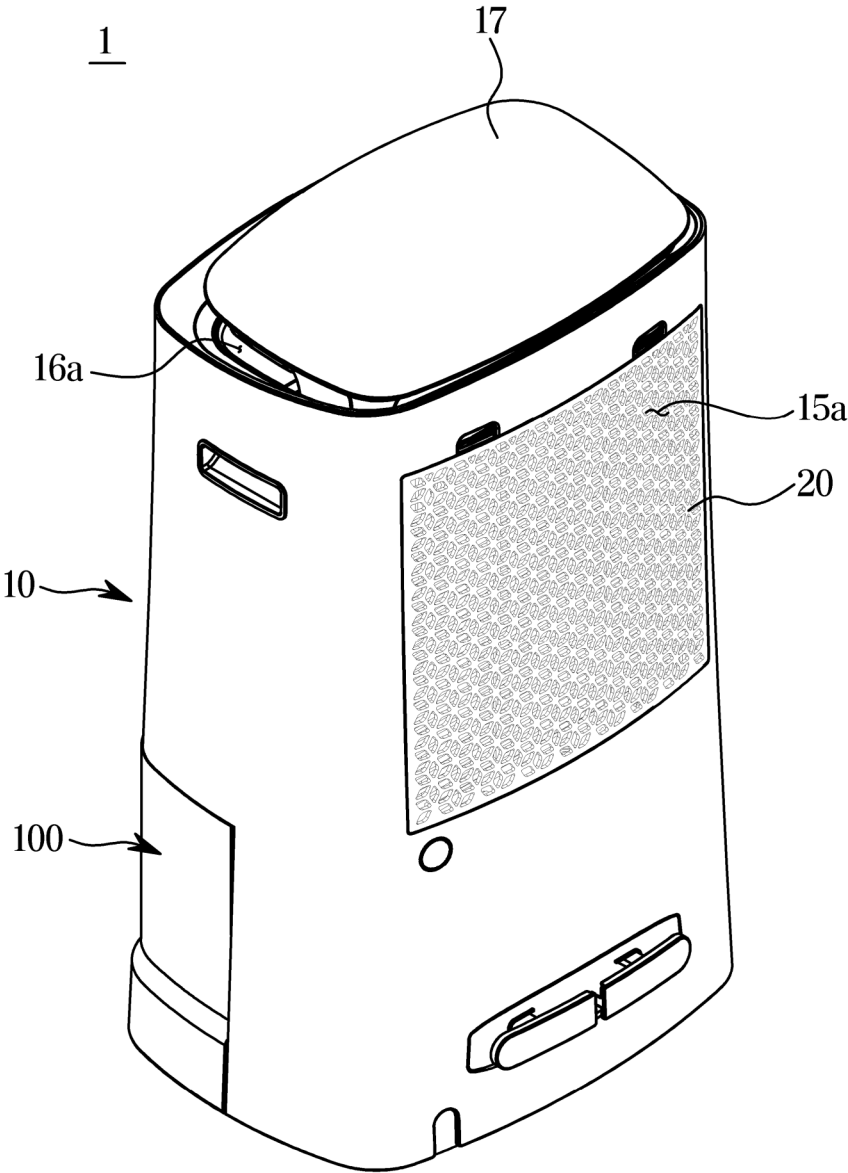


FIG. 3

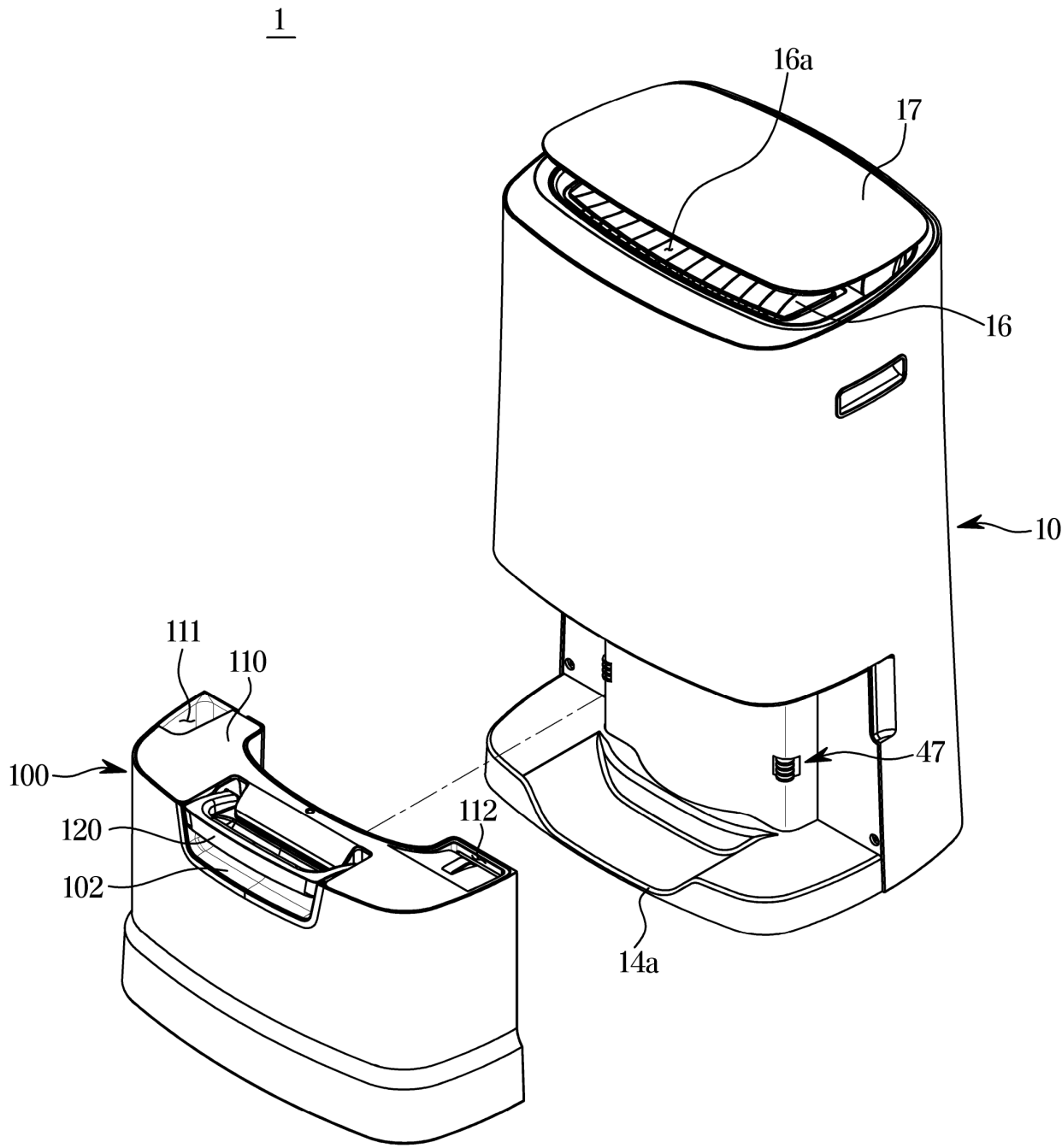


FIG. 4

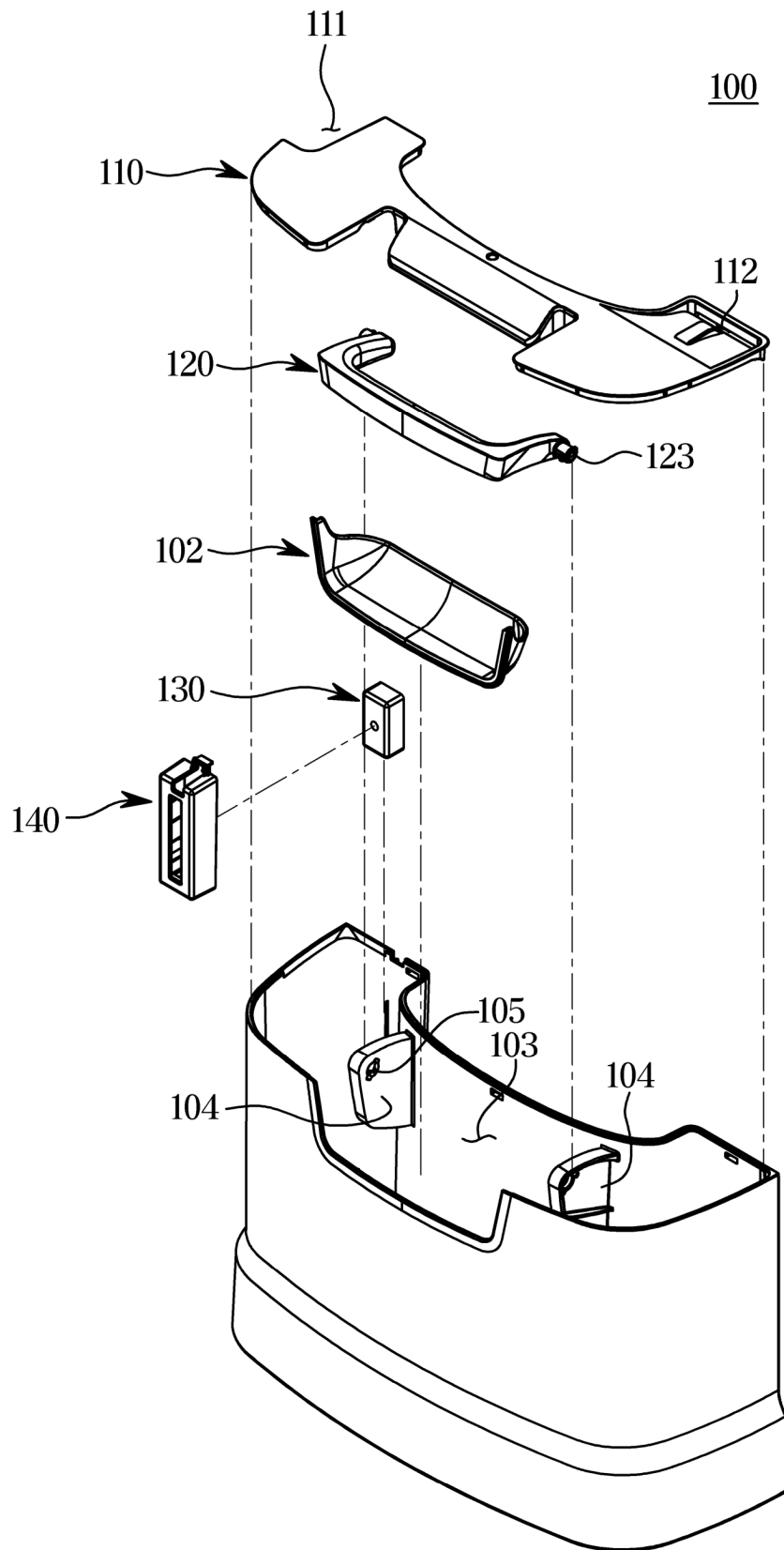


FIG. 5

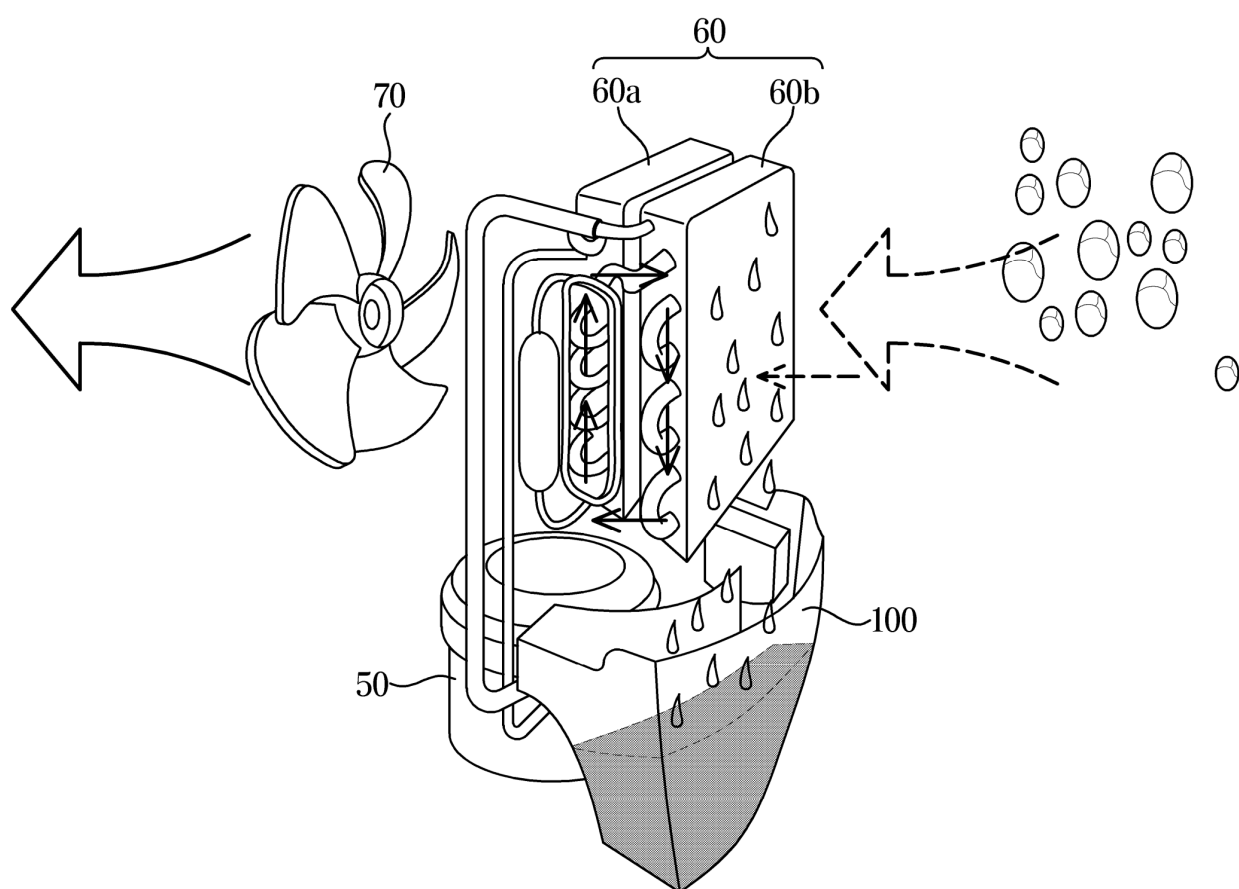


FIG. 6

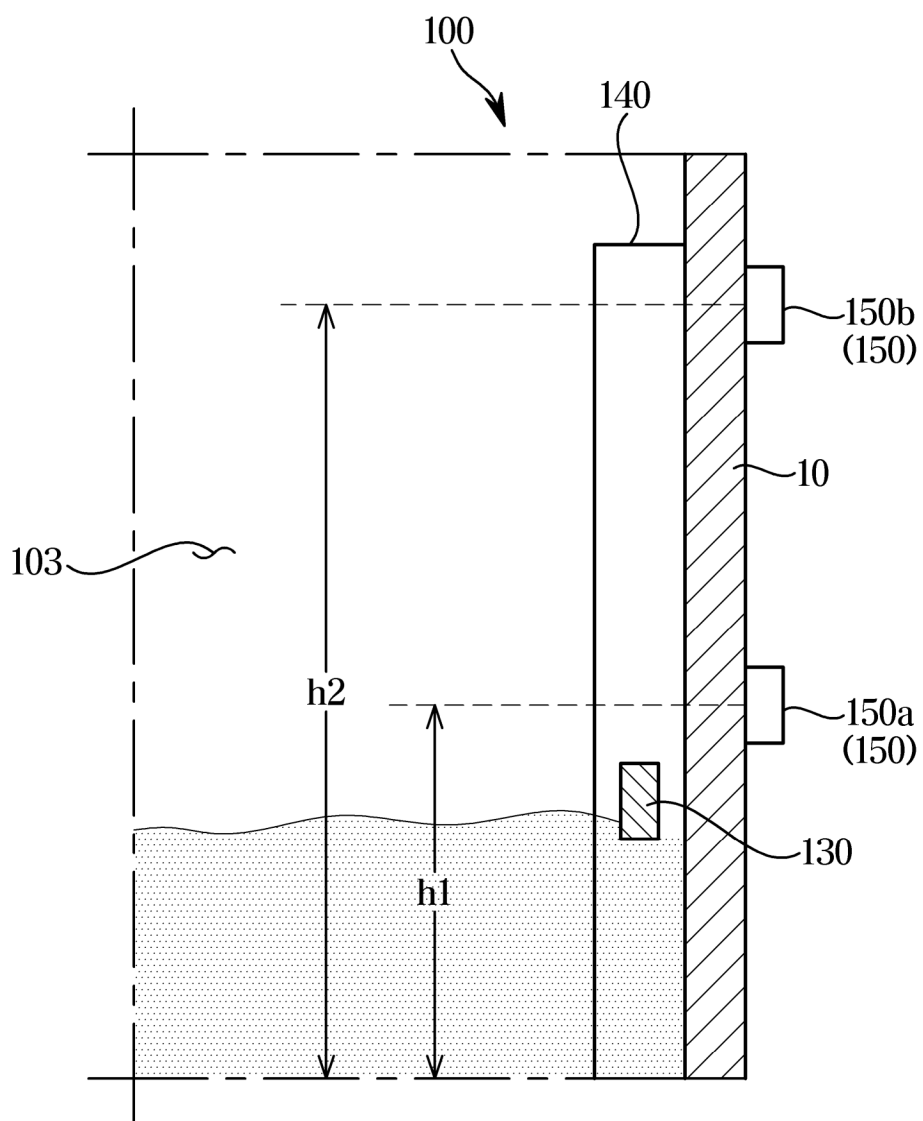


FIG. 7

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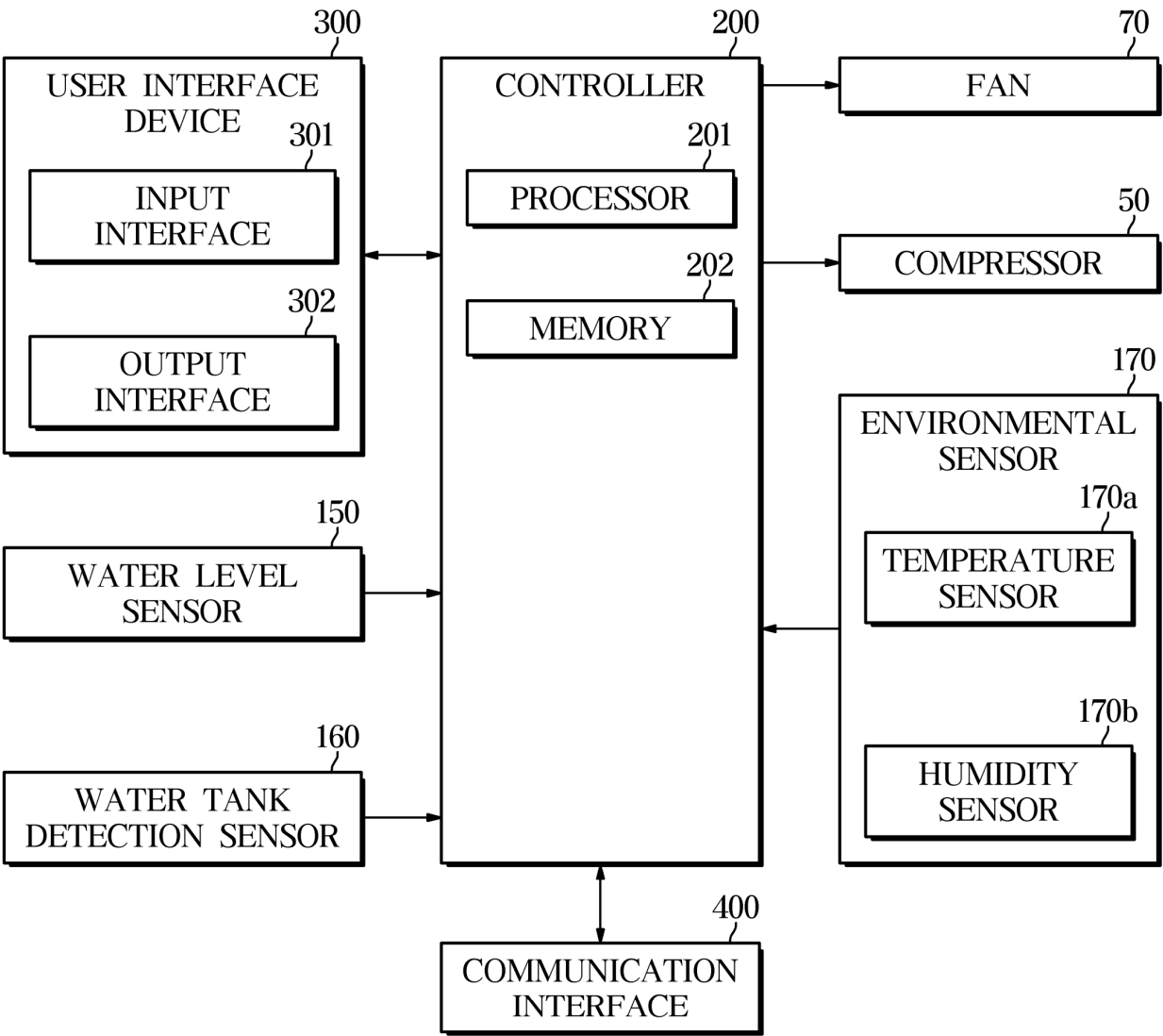


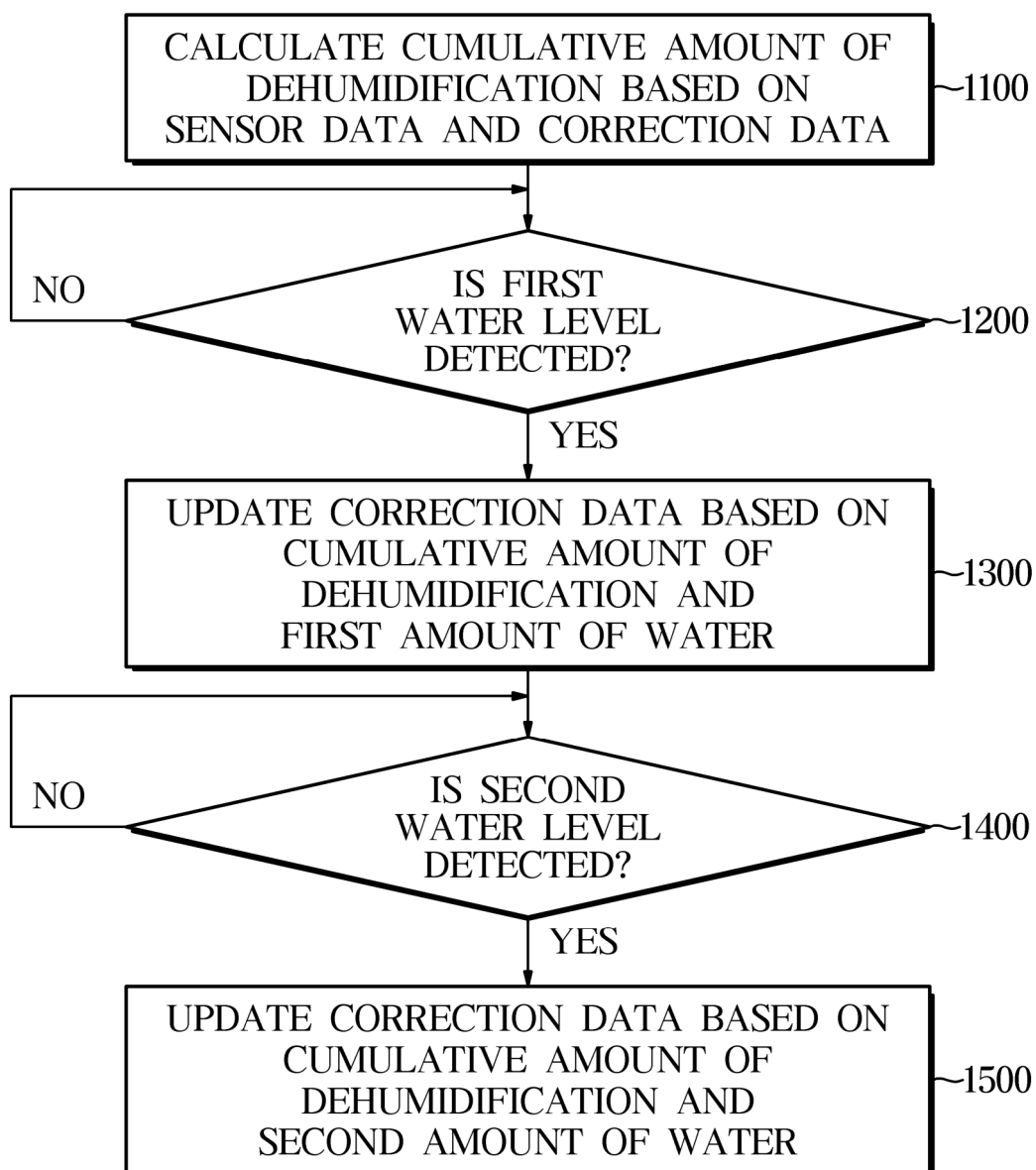
FIG. 8

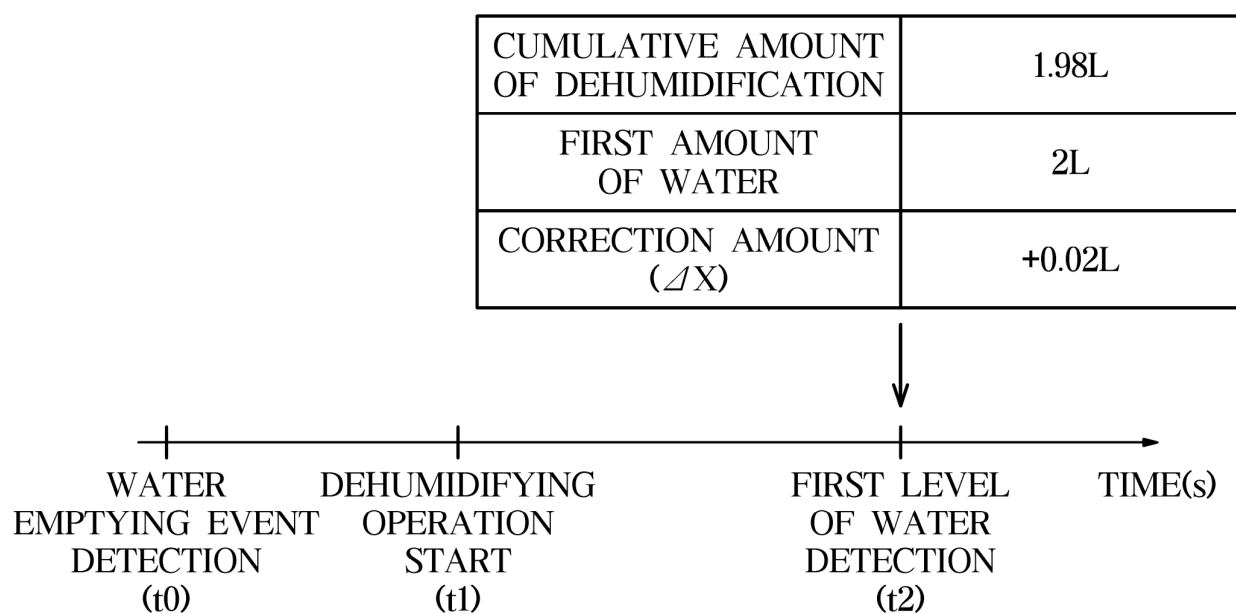
FIG. 9

FIG. 10

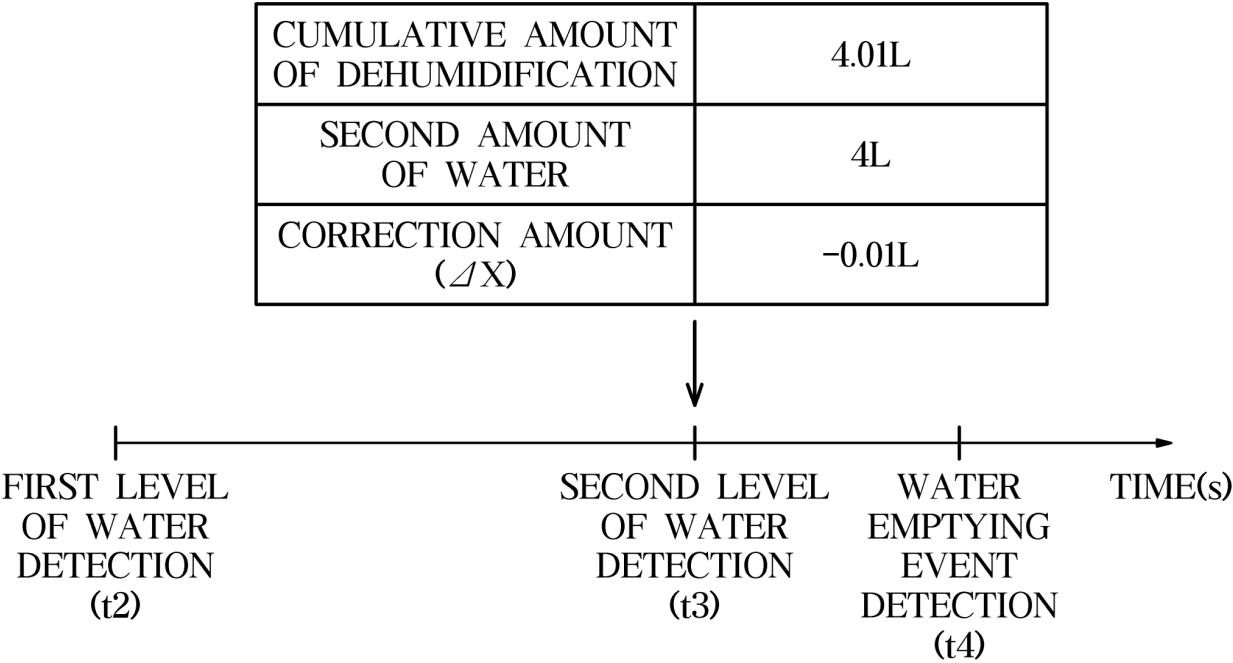


FIG. 11

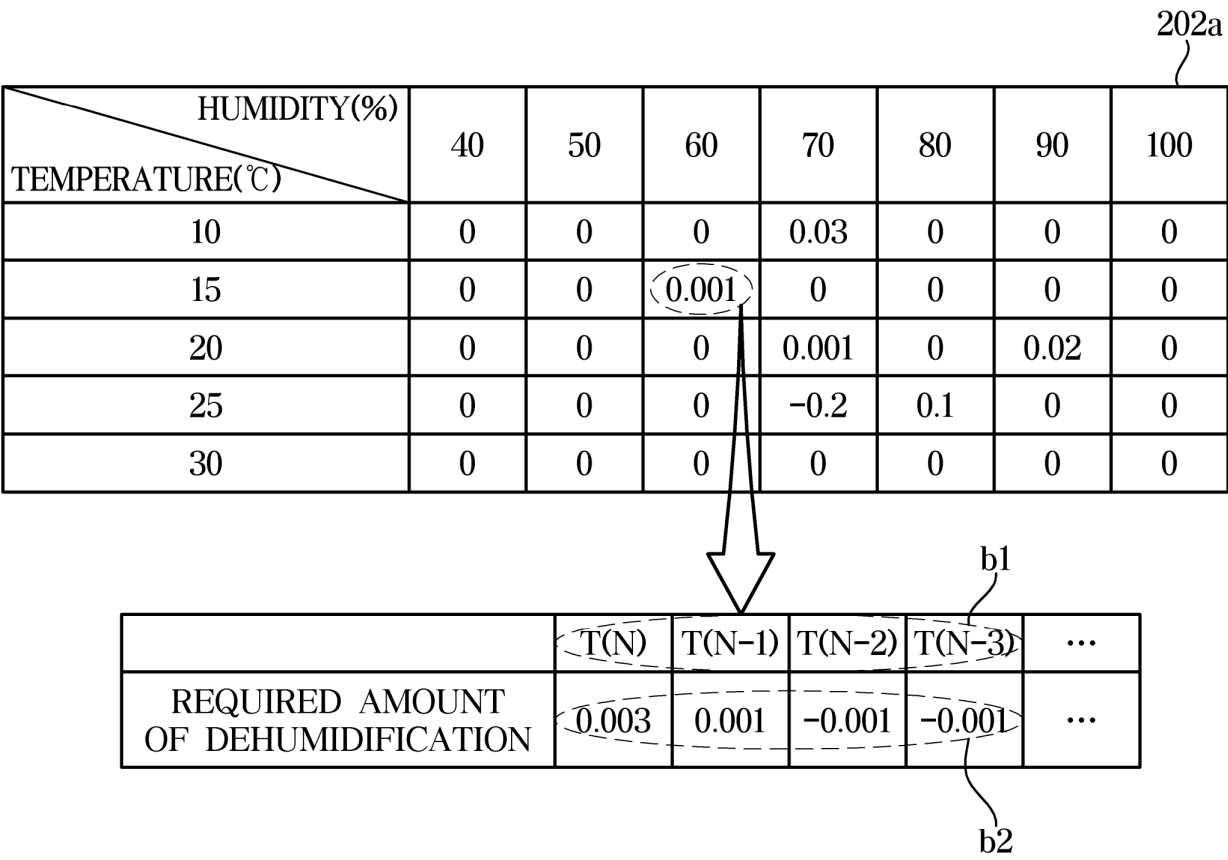


FIG. 12

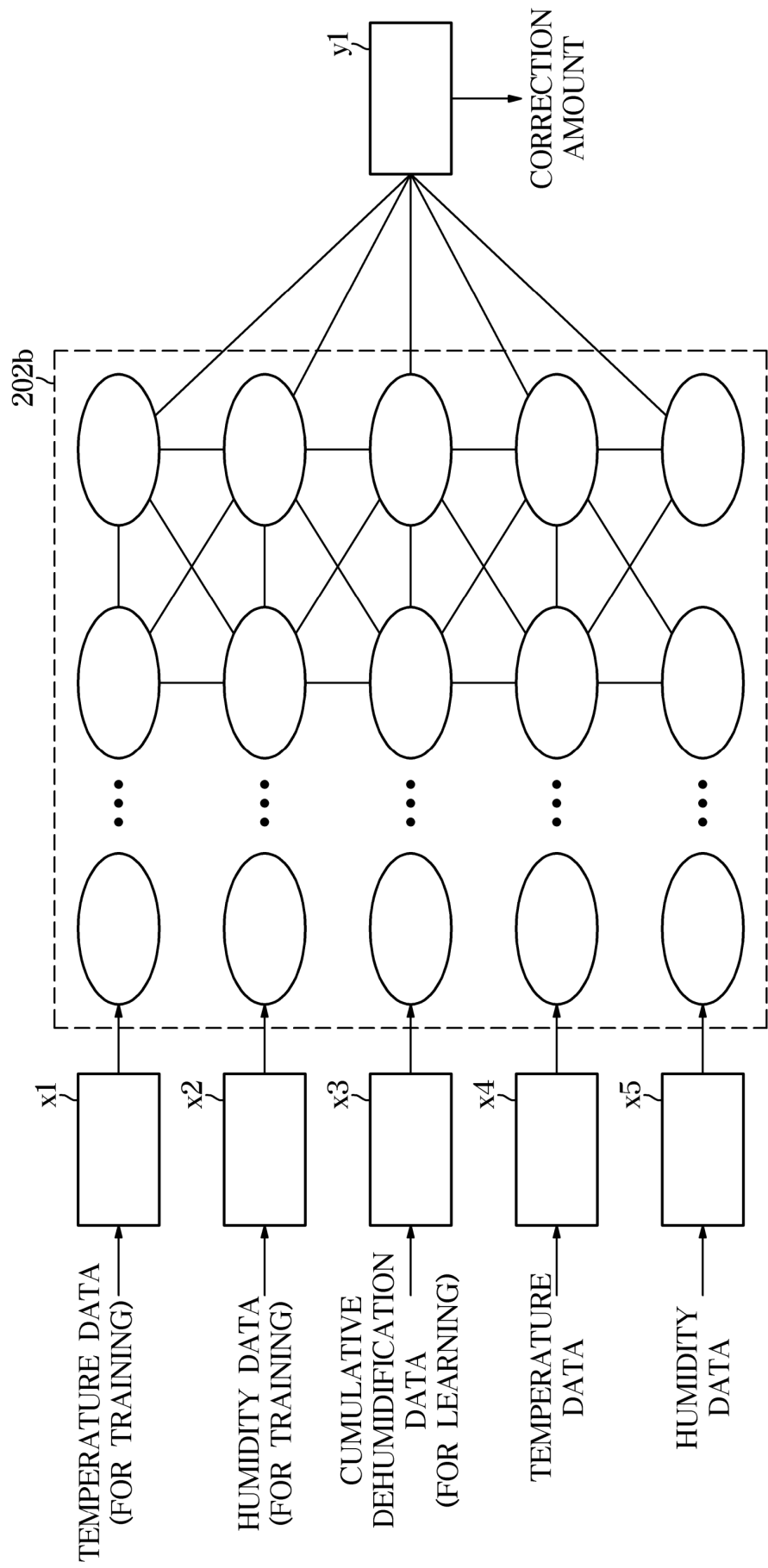


FIG. 13

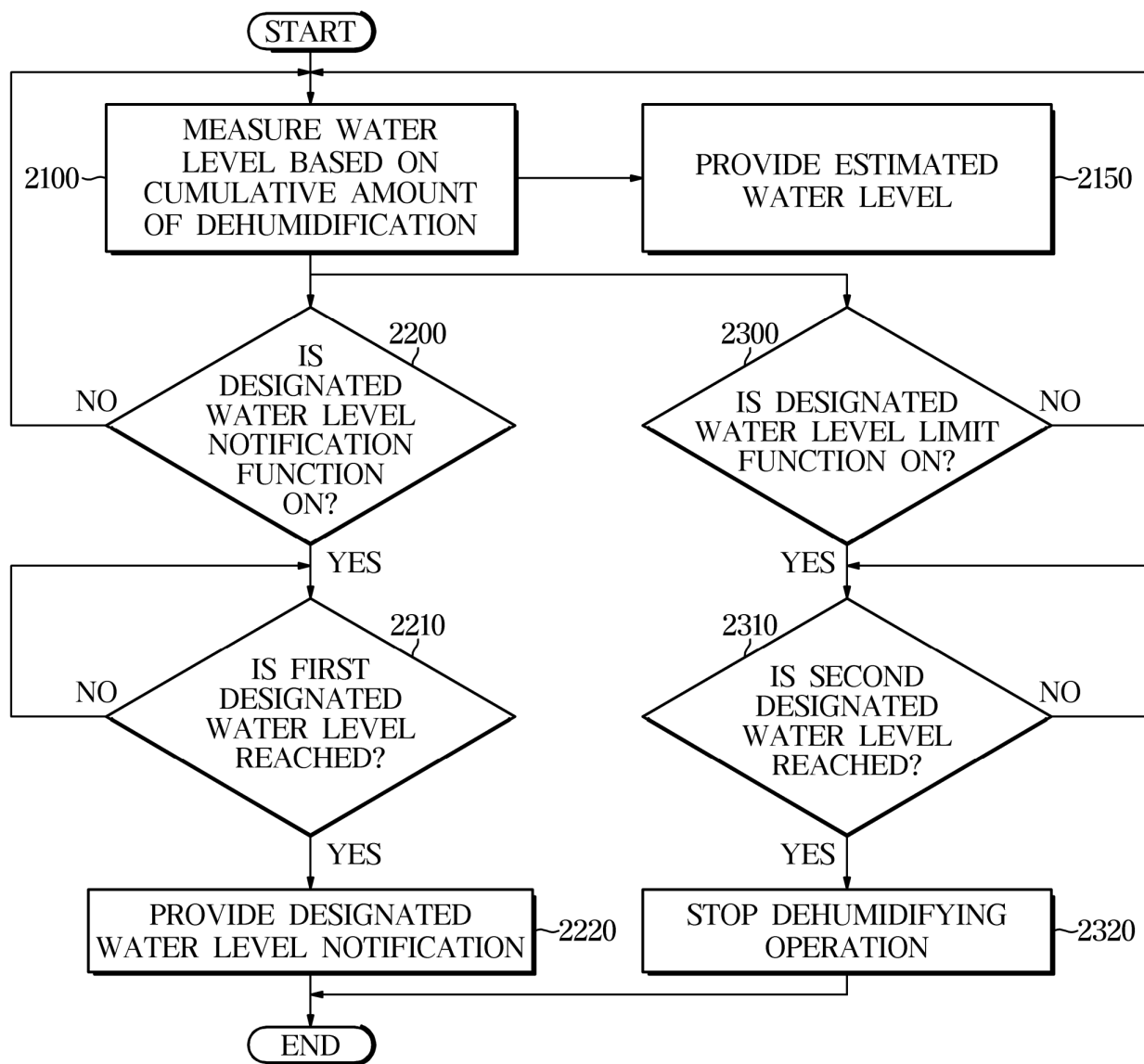


FIG. 14

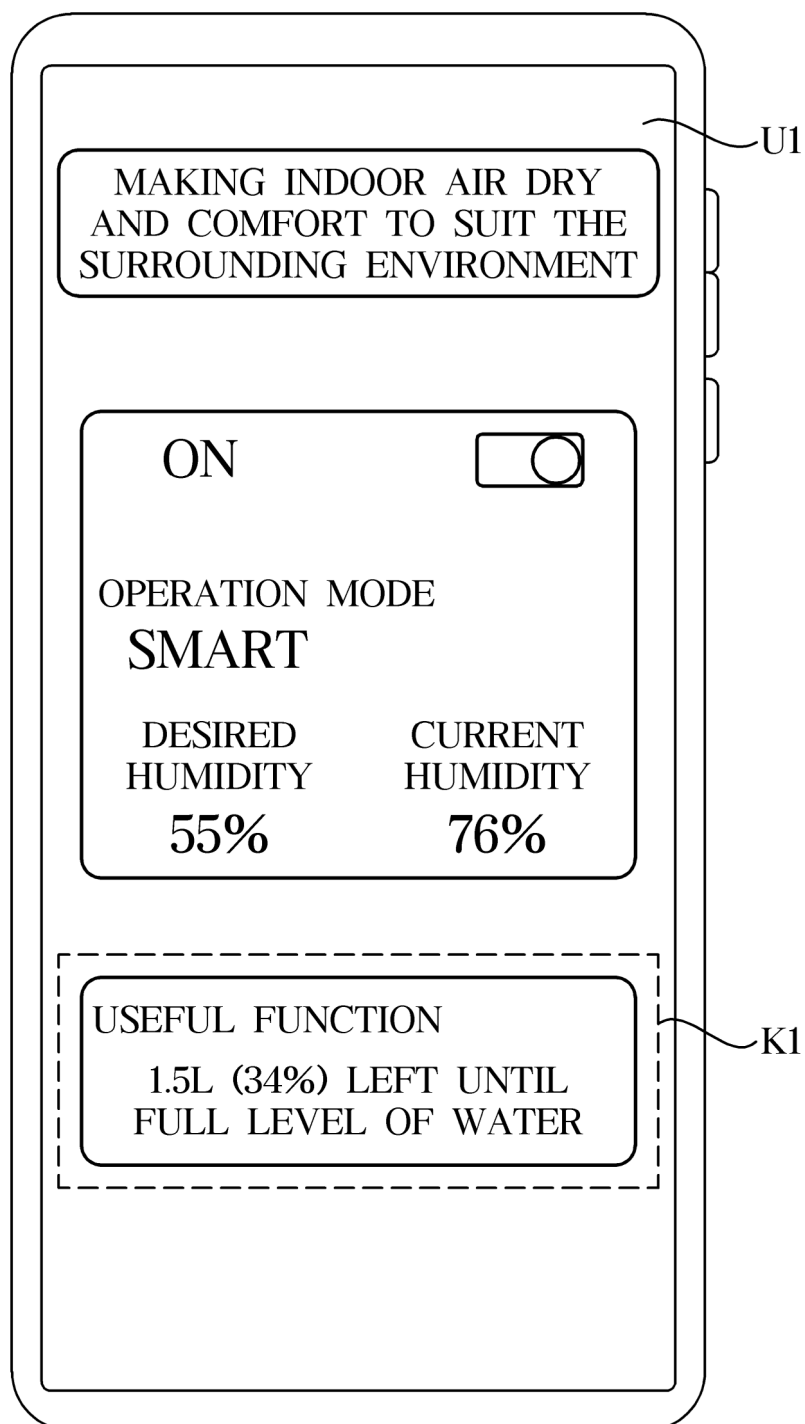


FIG. 15

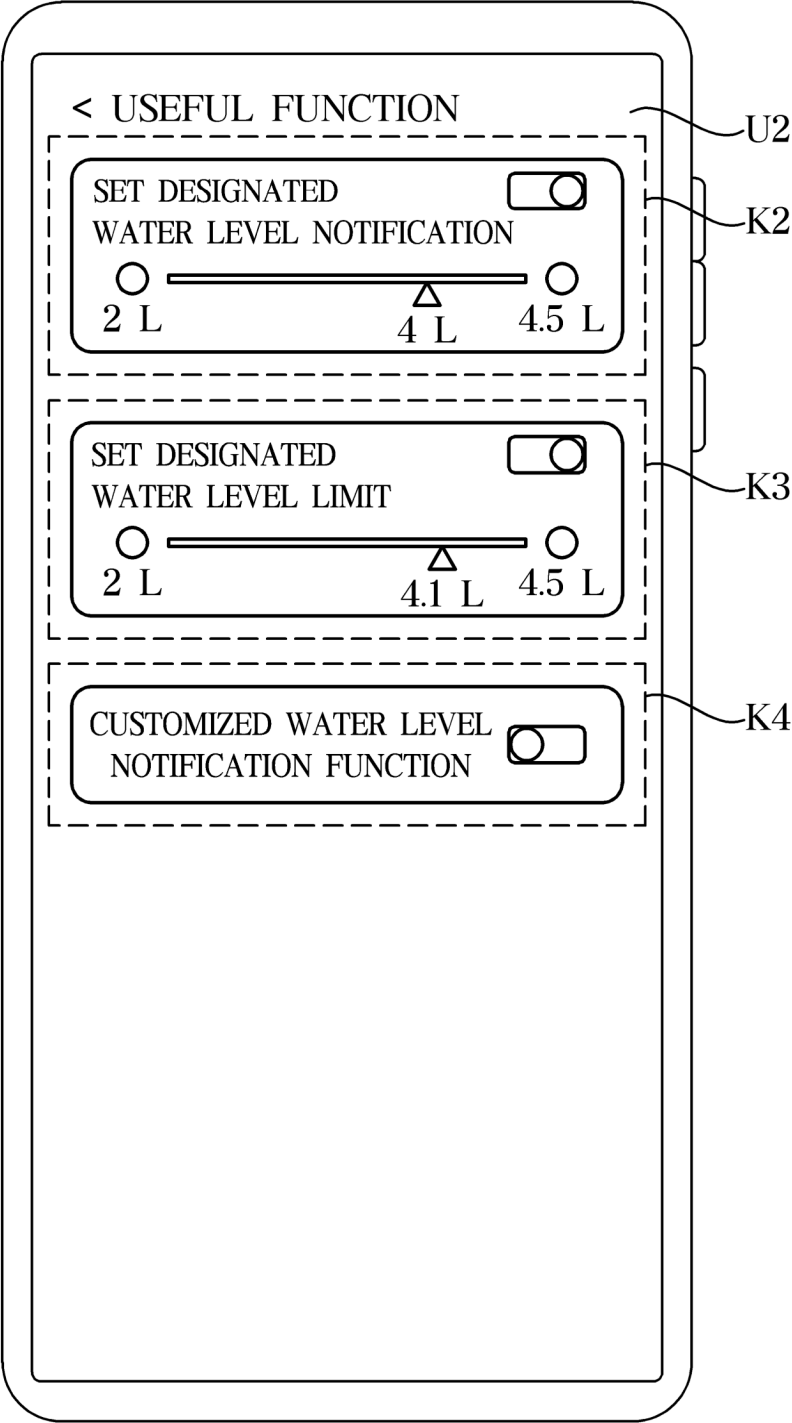
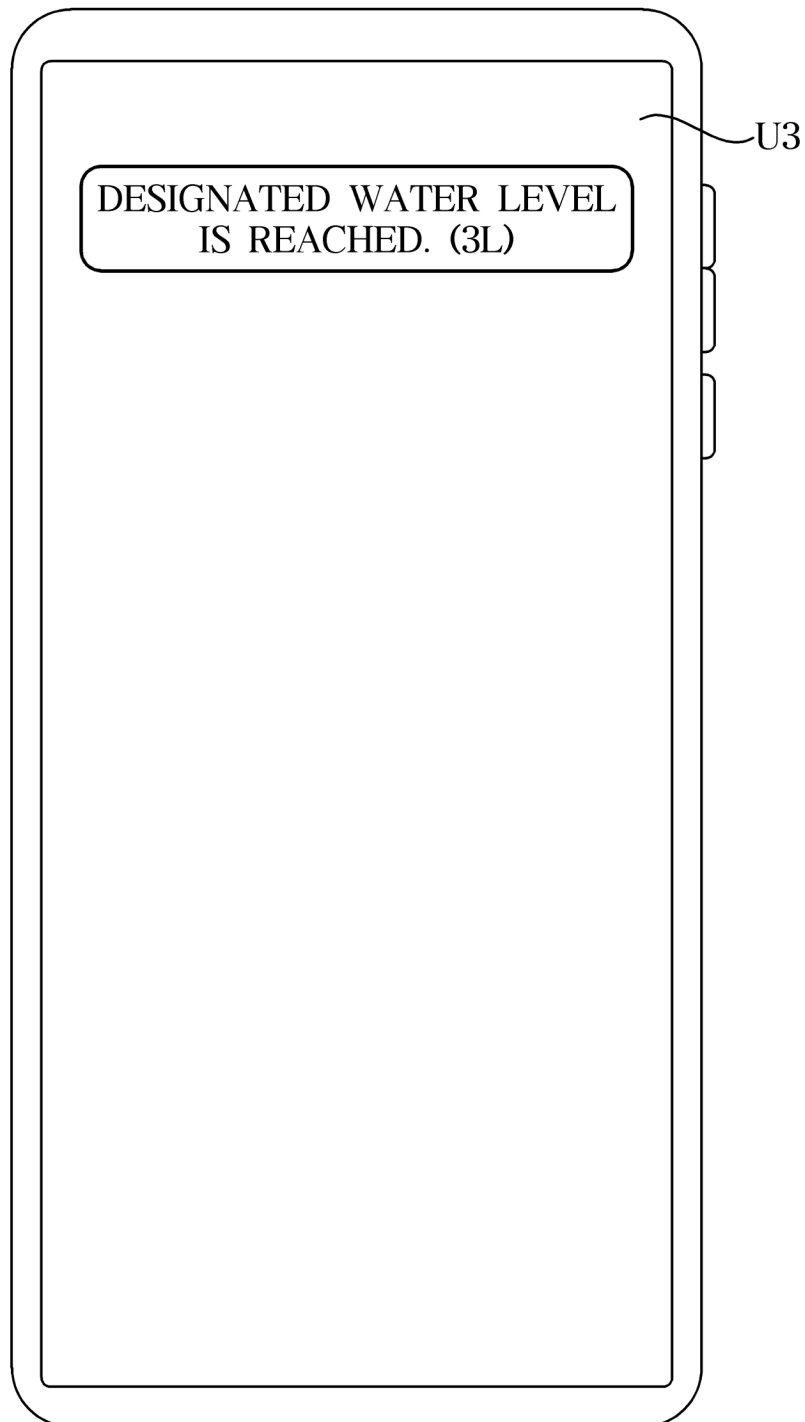


FIG. 16



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/015573

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/63(2018.01)i; **F24F 11/52**(2018.01)i; **F24F 3/14**(2006.01)i; **F24F 110/10**(2018.01)i; **F24F 110/20**(2018.01)i;
F24F 140/30(2018.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F 11/63(2018.01); B01D 53/26(2006.01); D06F 58/28(2006.01); F24F 1/02(2011.01); F24F 11/02(2006.01);
 F24F 11/49(2018.01); F24F 11/52(2018.01); G01F 23/62(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 제습기(dehumidifier), 환경 센서(environment sensor), 온도(temperature), 습도(humidity), 물통(water tank), 수위 센서(water level sensor), 제습량(dehumidification amount), 보정 데이터(correction data)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2012-161730 A (PANASONIC CORP.) 30 August 2012 (2012-08-30) See paragraphs [0004]-[0009] and [0022]-[0049] and figures 1 and 3-7.	1,4-6,10-13
Y		2-3,7-9,14-15
Y	JP 2020-011173 A (MITSUBISHI ELECTRIC CORP. et al.) 23 January 2020 (2020-01-23) See paragraph [0035] and figure 3.	2-3,14-15
Y	JP 2020-012592 A (MITSUBISHI ELECTRIC CORP. et al.) 23 January 2020 (2020-01-23) See paragraph [0099] and figures 4-5.	3,15
Y	JP 2007-237068 A (MATSUSHITA ELECTRIC IND. CO., LTD.) 20 September 2007 (2007-09-20) See paragraphs [0064], [0068] and [0073] and figures 5-9.	7-9
A	JP 2002-340389 A (SANYO ELECTRIC CO., LTD.) 27 November 2002 (2002-11-27) See paragraphs [0007]-[0027] and figures 1-8.	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search 10 February 2025	Date of mailing of the international search report 10 February 2025
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208 Facsimile No. +82-42-481-8578	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2024/015573

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
JP	2012-161730	A	30 August 2012	None			
JP	2020-011173	A	23 January 2020	JP	7091899	B2	28 June 2022
JP	2020-012592	A	23 January 2020	None			
JP	2007-237068	A	20 September 2007	JP	4876637	B2	15 February 2012
JP	2002-340389	A	27 November 2002	None			