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(54) **AIR CONDITIONER AND OPERATION METHOD THEREOF**

(57) Disclosed are an air conditioner and an operation method thereof. The air conditioner includes an indoor unit, an indoor temperature sensor configured to detect an indoor temperature in an indoor space in which the indoor unit is disposed, and a controller configured to monitor the indoor temperature using the indoor tem-

perature sensor. If the indoor temperature changes by a first reference temperature or more, the controller commences power-saving operation, and if the indoor temperature changes by a second reference temperature or more while the power-saving operation is performed, the controller stops the power-saving operation.

EP 4 563 905 A1

Description

[0001] This application claims the priority benefit of Korean Patent Application No. 10-2023-0169996, filed on November 29, 2023 in the Korean Intellectual Property Office.

BACKGROUND OF THE INVENTION

Field of the invention

[0002] The present disclosure relates to an air conditioner and an operation method thereof, and more particularly, to an air conditioner that performs operation taking into consideration the state of an indoor space.

Description of the Related Art

[0003] An air conditioner is installed to provide a pleasant indoor environment to persons by discharging cold or warm air to an indoor space to adjust indoor temperature and by purifying indoor air. An air conditioner generally includes an indoor unit, which includes a heat exchanger and is installed in an indoor space, and an outdoor unit, which includes a compressor and a heat exchanger and supplies refrigerant to the indoor unit.

[0004] The air conditioner is driven in a cooling mode and a heating mode depending on the flow of refrigerant. In the cooling mode, high-temperature and high-pressure liquid refrigerant is supplied to the indoor unit from the compressor of the outdoor unit through the heat exchanger of the outdoor unit. As the refrigerant expands and is vaporized in the heat exchanger of the indoor unit, ambient temperature is lowered, and as a fan of the indoor unit operates, cold air is discharged to the indoor space. In the heating mode, high-temperature and high-pressure gaseous refrigerant is supplied to the indoor unit from the compressor of the outdoor unit, and air heated by energy, which is released as the high-temperature and high-pressure gaseous refrigerant is liquefied in the heat exchanger of the indoor unit, is discharged to the indoor space according to operation of the fan of the indoor unit.

[0005] As various new functions related to operation of air conditioners have been developed and used, concepts such as so-called smart air conditioners or intelligent air conditioners are emerging. In general, as disclosed in Related Art Document 1 (Korean Patent Publication No. 10-2018-0085101, an air conditioner includes a sensor configured to detect indoor temperature and performs operation according to the indoor temperature detected by the sensor. For example, the air conditioner may control the operating frequency of the compressor so that the indoor temperature detected by the sensor reaches a target value.

[0006] When the indoor space, which is an object to be cooled or heated, communicates with another space, for example, when a door or a window provided on a wall

defining the indoor space is opened for ventilation, convection of air may occur between the indoor space and the other space. In this case, although air having undergone heat exchange for cooling or heating in the indoor unit is discharged to the indoor space, it is difficult for the indoor temperature to reach a target value due to convection of air. Further, if the air conditioner continues to operate in order to bring the indoor temperature to the target value in the situation in which it is difficult to cool or heat the indoor space due to communication between the indoor space and the other space, power is unnecessarily consumed.

SUMMARY OF THE INVENTION

[0007] It is an object of the present disclosure to solve at least one of the above or other problem(s).

[0008] It is another object of the present disclosure to provide an air conditioner capable of discharging air having undergone heat exchange so that the air flows along a ceiling defining an indoor space and an operation method thereof.

[0009] It is still another object of the present disclosure to provide an air conditioner capable of discharging air having undergone heat exchange so that the air flows toward a specific area in an indoor space and an operation method thereof.

[0010] It is still another object of the present disclosure to provide an air conditioner capable of determining whether an indoor space is in communication with another space and an operation method thereof.

[0011] It is still another object of the present disclosure to provide an air conditioner capable of performing power-saving operation while an indoor space is in communication with another space and an operation method thereof.

[0012] It is still another object of the present disclosure to provide an air conditioner capable of performing normal operation when communication between an indoor space and another space is blocked and an operation method thereof.

[0013] It is still another object of the present disclosure to provide an air conditioner capable of performing power-saving operation in various manners depending on whether a main discharge port is opened or closed by a main vane and an operation method thereof.

[0014] One or more objects are solved by the invention defined by the subject-matter of the independent claim(s).

[0015] According to an aspect of the present disclosure, an indoor temperature in an indoor space in which an indoor unit is disposed may be detected by an indoor temperature sensor, and it may be possible to determine, based on a change in the indoor temperature detected by the indoor temperature sensor, whether the indoor space is in communication with another space.

[0016] According to another aspect an air conditioner is provided including a controller configured to monitor

the indoor temperature using the indoor temperature sensor, wherein, if the indoor temperature changes by a first reference temperature or more, the controller commences power-saving operation, and if the indoor temperature changes by a second reference temperature or more while the power-saving operation is performed, the controller stops the power-saving operation.

[0017] According to yet another aspect an air conditioner is provided comprising: an indoor unit; an indoor temperature sensor configured to detect an indoor temperature in an indoor space in which the indoor unit is disposed; and a controller configured to monitor the indoor temperature using the indoor temperature sensor, wherein the controller is configured to: based on the indoor temperature changing by a first reference temperature or more, commencing power-saving operation, and based on the indoor temperature changing by a second reference temperature or more while the power-saving operation is performed, stopping the power-saving operation.

[0018] According to another aspect an operation method of an air conditioner is provided that includes commencing power-saving operation when the indoor temperature in the indoor space in which the indoor unit is disposed, detected by the indoor temperature sensor, changes by a first reference temperature or more and stopping the power-saving operation when the indoor temperature changes by a second reference temperature or more while performing the power-saving operation.

[0019] One or more of the above-mentioned aspects may be combined with each other. One or more of the above-mentioned aspects or a combination thereof can include one or more or all of the following.

[0020] Based on the indoor temperature increasing by a first temperature or more within a predetermined period of time during cooling operation or decreasing by a second temperature or more within the predetermined period of time during heating operation, the controller may be configured to determine that the indoor temperature changes by the first reference temperature or more.

[0021] The first temperature may be less than the second temperature.

[0022] While performing the power-saving operation, based on the indoor temperature decreasing by a third temperature or more during cooling operation or increasing by a fourth temperature or more during heating operation, the controller may be configured to determine that the indoor temperature changes by the second reference temperature or more.

[0023] The third temperature may be less than the fourth temperature.

[0024] The air conditioner may comprise a compressor configured to compress refrigerant.

[0025] While performing the power-saving operation, the controller may be configured to: based on power consumption of the air conditioner exceeding first power consumption, reducing an operating frequency of the

compressor, and/or based on the power consumption of the air conditioner being less than second power consumption, increasing the operating frequency of the compressor.

5 **[0026]** The first power consumption may be less than rated power consumption of the air conditioner and/or may exceed the second power consumption.

[0027] The indoor unit may be a wall-mounted type indoor unit.

10 **[0028]** The indoor unit may comprise a case configured to be mounted on a wall.

[0029] The wall-mounted type indoor unit may comprise a main discharge port formed to be open in a lower side of the case.

15 **[0030]** The wall-mounted type indoor unit may comprise a sub-discharge port formed to be open in a front side of the case.

[0031] The wall-mounted type indoor unit may comprise a main vane configured to open and close the main discharge port.

20 **[0032]** The controller may be configured to: based on an operation mode being set to a first mode not using the main discharge port, determining a rotational angle of the main vane to be a minimum angle to close the main discharge port so that air is discharged through the sub-discharge port, and/or based on the operation mode being set to a second mode using the main discharge port, determining the rotational angle of the main vane to be an angle corresponding to a predetermined airstream direction so that the air is discharged through the main discharge port and the sub-discharge port.

25 **[0033]** The controller may be configured to: when performing the power-saving operation with the operation mode set to the first mode, adjusting a first target temperature for temperature of air discharged from the indoor unit, and/or when performing the power-saving operation with the operation mode set to the second mode, adjusting a second target temperature for the indoor temperature.

30 **[0034]** The controller may be configured to: based on the operation mode being set to the first mode, changing the first target temperature by a fifth temperature according to a predetermined period, and/or based on the operation mode being set to the second mode, changing the second target temperature by a sixth temperature higher than the fifth temperature according to the predetermined period.

35 **[0035]** A maximum value of the first target temperature set in the power-saving operation may be different from a maximum value of the second target temperature set in the power-saving operation.

40 **[0036]** The commencing power-saving operation may comprise determining that the indoor temperature changes by the first reference temperature or more when the indoor temperature increases by a first temperature or more within a predetermined period of time during cooling operation or decreases by a second temperature or more within the predetermined period of time during

heating operation.

[0037] The stopping the power-saving operation may comprise determining that the indoor temperature changes by the second reference temperature or more when the indoor temperature decreases by a third temperature or more during cooling operation or increases by a fourth temperature or more during heating operation while performing the power-saving operation.

[0038] The first temperature may be less than the second temperature.

[0039] The third temperature may be less than the fourth temperature.

[0040] The operation method may comprise performing the power-saving operation. The performing the power-saving operation may comprises: reducing an operating frequency of a compressor when power consumption of the air conditioner exceeds first power consumption; and/or increasing the operating frequency of the compressor when the power consumption of the air conditioner is less than second power consumption.

[0041] The first power consumption may be less than rated power consumption of the air conditioner and/or may exceed the second power consumption.

[0042] The operation method may comprise performing the power-saving operation. The indoor unit may be a wall-mounted type indoor unit comprising a case configured to be mounted on a wall. The wall-mounted type indoor unit may comprise one or more of: a main discharge port formed to be open in a lower side of the case; a sub-discharge port formed to be open in a front side of the case; and a main vane configured to open and close the main discharge port. The performing the power-saving operation may comprise: adjusting a first target temperature for temperature of air discharged from the indoor unit when performing the power-saving operation with an operation mode set to a first mode not using the main discharge port; and/or adjusting a second target temperature for the indoor temperature when performing the power-saving operation with the operation mode set to a second mode using the main discharge port.

[0043] The air conditioner and/or the operation method according to the present disclosure may have one or more of the following effects.

[0044] According to at least one embodiment of the present disclosure, because air having undergone heat exchange is discharged so as to flow along a ceiling defining an indoor space, the entirety of the indoor space may be uniformly cooled or heated.

[0045] According to at least one embodiment of the present disclosure, because air having undergone heat exchange is discharged so as to flow toward a specific area in an indoor space, the entirety of the indoor space may be gradually cooled or heated from the specific area in the indoor space.

[0046] According to at least one embodiment of the present disclosure, it may be possible to accurately determine, based on a change in indoor temperature, whether an indoor space is in communication with an-

other space.

[0047] According to at least one embodiment of the present disclosure, because power-saving operation is performed while an indoor space is in communication with another space, unnecessary power consumption may be reduced.

[0048] According to at least one embodiment of the present disclosure, because normal operation is performed when communication between an indoor space and another space is blocked, operation requested by a user may be performed.

[0049] According to at least one embodiment of the present disclosure, because power-saving operation is performed in various manners depending on whether a main discharge port is opened or closed by a main vane, power-saving operation optimized for a preset operation mode may be performed.

[0050] The additional range of applicability of the present disclosure will become apparent from the following detailed description. However, because various changes and modifications will be clearly understood by those skilled in the art within the scope of the present disclosure, it should be understood that the detailed description and specific embodiments such as preferred embodiments of the present disclosure are merely given by way of example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] The above and other objects, features, and other advantages of the present disclosure will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an air conditioner according to an embodiment of the present disclosure;

FIG. 2 is a front view of the air conditioner according to the embodiment of the present disclosure;

FIG. 3 is a rear view of the air conditioner according to the embodiment of the present disclosure;

FIG. 4 is an exploded view of the air conditioner according to the embodiment of the present disclosure;

FIG. 5 is a side cross-sectional view of the air conditioner according to the embodiment of the present disclosure;

FIGS. 6 and 7 are views for explaining positioning of a movable vane and the flow of air according to an embodiment of the present disclosure;

FIG. 8 is a block diagram of the air conditioner according to the embodiment of the present disclosure;

FIGS. 9 and 10 are views for explaining a mode in which a main discharge port is closed according to an embodiment of the present disclosure;

FIGS. 11 and 12 are views for explaining a mode in

which the main discharge port is opened according to an embodiment of the present disclosure; FIGs. 13 and 14 are flowcharts showing an operation method of an air conditioner according to an embodiment of the present disclosure; and FIGs. 15 to 18 are diagrams for explaining operations of the air conditioner according to various embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0052] Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. In the drawings, illustration of parts unrelated to the description is omitted to clearly and briefly describe the present disclosure, and the same or extremely similar components are denoted by the same reference numerals throughout the specification.

[0053] As used herein, the terms with which the names of components are suffixed, "module" and "unit", are assigned to facilitate preparation of this specification, and are not intended to suggest unique meanings or functions. Accordingly, the terms "module" and "unit" may be used interchangeably.

[0054] It will be further understood that the terms "comprises", "comprising", "includes", and/or "including", when used herein, specify the presence of stated features, integers, steps, operations, elements, components, or combinations thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, or combinations thereof.

[0055] It will be understood that although the terms "first", "second", etc., may be used herein to describe various components, these components should not be limited by these terms. These terms are only used to distinguish one component from another component.

[0056] In the embodiments illustrated in the drawings, representations of directions, such as up (U), down (D), left (Le), right (Ri), front (F), and rear (R), are merely for convenience of explanation, and are not intended to limit the technical features disclosed in this specification.

[0057] The configuration of an air conditioner of the present disclosure will be described with reference to FIG. 1.

[0058] The air conditioner of the present disclosure includes a case 101 defining the external appearance thereof. The case 101 includes a suction port 12 formed in the upper side thereof. Air above the case 101 may be introduced into the case 101 through the suction port 12.

[0059] The case 101 defines therein a space in which a fan 50 (see FIG. 4) and a heat exchanger 70 (see FIG. 4), which will be described later, are disposed. The case 101 includes a first discharge port 36 formed in the front side thereof. The air conditioner may include a discharge cover 30, which is disposed on the front side of the case

101 and in which the first discharge port 36 is formed. The air conditioner may include a fixed vane 40 disposed on one side of the discharge cover 30 to guide the direction of air discharged through the first discharge port 36.

5 **[0060]** A display 170 may be disposed on the front surface of the case 101.

[0061] A suction grill 20 may be disposed on the upper side of the case 101. The suction grill 20 is detachably disposed on the case 101.

10 **[0062]** The suction grill 20 may be disposed on the upper side of the case 101 in which the suction port 12 is formed. The suction grill 20 may include a plurality of ribs 22 extending in the leftward-rightward direction or the forward-backward direction.

15 **[0063]** A mesh 24 may be disposed on the suction grill 20 in order to remove foreign substances from air entering the suction port 12. The mesh 24 may be disposed between the plurality of ribs 22.

[0064] The structure of the air conditioner will be described with reference to FIG. 2.

[0065] The display 170 may be disposed on the front surface of the case 101. The display 170 may display information such as the operation state of the air conditioner or the temperature of the indoor space.

25 **[0066]** The suction grill 20 may have a shape protruding upwardly. Thus, when the case 101 is viewed from the front, one side of the suction grill 20 may be exposed.

[0067] The first discharge port 36 is disposed at the lower portion of the front surface of the case 101. The fixed vane 40 is disposed in the first discharge port 36. The fixed vane 40 is fixedly disposed on one side of the case 101. Thus, the fixed vane 40 may guide air flowing through the first discharge port 36 in one direction.

30 **[0068]** The discharge cover 30, in which the first discharge port 36 is formed, may be disposed on the case 101. The discharge cover 30 may be disposed on a portion of the case 101 that forms the front surface. The discharge cover 30 may have a structure that is disposed in the case 101. The discharge cover 30 may form the first discharge port 36 so that the first discharge port 36 extends in the leftward-rightward direction. The fixed vane 40 may be disposed on the discharge cover 30.

35 **[0069]** The configuration of the lower part of the air conditioner will be described with reference to FIG. 3.

[0070] The air conditioner may include a lower cover 46. The lower cover 46 is disposed on an open lower side of the case 101. A second discharge port 48 may be defined between the lower cover 46 and the case 101. A first movable vane 120 is disposed between the lower cover 46 and the case 101 in order to open and close the second discharge port 48.

[0071] The second discharge port 48 may be formed in the front side of the lower cover 46.

50 **[0072]** The second discharge port 48 may be opened or closed depending on the position of the first movable vane 120.

[0073] The overall configuration of the air conditioner

will be schematically described with reference to FIG. 4.

[0074] The air conditioner of the present disclosure includes the case 101 defining the external appearance thereof. The case 101 may have a structure in which the front surface and both side surfaces thereof are closed. The case 101 may have a structure in which the lower side thereof is open.

[0075] The case 101 may have a structure in which the upper side thereof is open. The case 101 may include the suction port 12 formed in the upper surface thereof. The case 101 may include an upper rib 14 disposed on the upper surface thereof. The upper rib 14 may maintain positioning of the suction grill 20.

[0076] The case 101 may include the first discharge port 36 formed in the front side thereof. The discharge cover 30 in which the first discharge port 36 is formed may be disposed on the front side of the case 101. The discharge cover 30 may be integrally formed with the case 101.

[0077] The case 101 may have a shape in which the rear side thereof is open. The case 101 may define therein a space in which the fan 50 and the heat exchanger 70 are disposed.

[0078] The air conditioner of the present disclosure includes a suction grill 20 disposed in the suction port 12 in the case 101. The suction grill 20 includes the plurality of ribs 22 extending in the leftward-rightward direction or the forward-backward direction. The mesh 24 may be disposed between the plurality of ribs 22.

[0079] The suction grill 20 may be disposed on the upper rib 14 formed in the case 101.

[0080] The air conditioner of the present disclosure includes the discharge cover 30 in which the first discharge port 36 is formed. The discharge cover 30 is fixedly disposed on the front surface of the case 101. The first discharge port 36 is formed in the discharge cover 30 so as to be elongated in the leftward-rightward direction.

[0081] The discharge cover 30 includes a plurality of front ribs 38 extending in the upward-downward direction and spaced apart from each other in the leftward-rightward direction. The front ribs 38 may be connected to the fixed vane 40. The front ribs 38 may maintain positioning of the fixed vane 40.

[0082] The air conditioner of the present disclosure includes the fixed vane 40 to guide the direction of air discharged through the first discharge port 36. The fixed vane 40 may be fixedly disposed on the discharge cover 30. The fixed vane 40 may be fixedly disposed on the case 101.

[0083] The fixed vane 40 may have a structure that is connected to each of the plurality of front ribs 38 of the discharge cover 30. The fixed vane 40 may guide air flowing through the first discharge port 36 to move in a direction parallel to the floor or to move upwardly with respect to the direction parallel to the floor.

[0084] The air conditioner of the present disclosure includes the lower cover 46 disposed on the lower sur-

face of the case 101. The lower cover 46 may be disposed so as to cover a portion of the open lower side of the case 101. The second discharge port 48 may be formed in the lower cover 46.

[0085] The lower cover 46 is detachably disposed on the case 101. The lower cover 46 may be fixedly disposed on the case 101 or an inner body 80 to be described later. The lower cover 46 may be formed in a plate shape having a substantially U-shape. The second discharge port 48 may be defined between the case 101 and the lower cover 46.

[0086] The air conditioner of the present disclosure includes a stabilizer 100. The stabilizer 100 may guide the flow of air discharged by the fan 50. The stabilizer 100 may guide air flowing forwardly and downwardly from the fan 50 in the upward direction. The stabilizer 100 may support one side of the heat exchanger 70.

[0087] Movable vanes 120 and 130 may be disposed on the stabilizer 100. The movable vanes 120 and 130 may be disposed on the stabilizer 100 so that positioning thereof is changeable.

[0088] A vane motor 108 may be disposed on the stabilizer 100 in order to change positioning of the movable vanes 120 and 130.

[0089] The air conditioner of the present disclosure includes the first movable vane 120 to open and close the second discharge port 48. The movable vanes 120 and 130 may guide the direction of air discharged through the second discharge port 48. The movable vanes 120 and 130 may guide air flowing through the fan 50 to the first discharge port 36.

[0090] The air conditioner of the present disclosure includes the inner body 80 disposed in the case 101 to rotatably support the fan 50. The fan 50 may be disposed on the inner body 80. A fan motor 52 may be disposed on the inner body 80 in order to rotate the fan 50.

[0091] The inner body 80 is fixedly disposed in the case 101. The inner body 80 may guide air flowing backwardly or downwardly due to the fan 50. A louver 90 may be disposed on the inner body 80 in order to adjust the flow direction of air to the left and right. The louver 90 may guide air flowing to the first discharge port 36 or the second discharge port 48 in the leftward-rightward direction.

[0092] The air conditioner of the present disclosure includes the fan 50 to send air from the suction port 12 to the first discharge port 36 or the second discharge port 48. The fan 50 is rotatably disposed in the case 101. The fan 50 may be implemented as a cross-flow fan, which suctions air into one side thereof in the radial direction with respect to the rotation axis thereof and discharges air through another side thereof in the radial direction.

[0093] The fan 50 may suction air from the suction port 12 located above the fan 50. The fan 50 may discharge air to the first discharge port 36 or the second discharge port 48 located below the fan 50.

[0094] The air conditioner of the present disclosure includes the fan motor 52 to rotate the fan 50. The fan

motor 52 is disposed on one side of the inner body 80.

[0095] The air conditioner of the present disclosure includes a motor cover 54 to cover one side of the fan motor 52. The motor cover 54 may be mounted to the inner body 80. The motor cover 54 may be mounted to one side of the inner body 80 or one side of a control box 60 to be described later.

[0096] The air conditioner of the present disclosure includes the heat exchanger 70 to perform heat exchange on air flowing through the case 101. The heat exchanger 70 may cause heat exchange between refrigerant and air. The heat exchanger 70 may perform heat exchange on air to be discharged to the indoor space. The heat exchanger 70 may perform heat exchange on air flowing to the first discharge port 36 or the second discharge port 48.

[0097] The heat exchanger 70 may have a shape including at least one bent portion. The heat exchanger 70 is disposed above the fan 50. The heat exchanger 70 may perform heat exchange on air flowing to the fan 50.

[0098] The air conditioner of the present disclosure includes the control box 60 in which electronic components are disposed in order to control operation of the air conditioner. The control box 60 may be mounted to one side of the inner body 80. The control box 60 may be disposed on one side of the fan motor 52. The fan motor 52 may be disposed between the control box 60 and the fan 50.

[0099] The air conditioner of the present disclosure includes the display 170 to display temperature or the operational state of the air conditioner. The display 170 may be disposed on one side of the control box 60. The display 170 is disposed in the case 101. The display 170 is disposed behind the front wall of the case 101. The display 170 may output the operational state to the front wall of the case 101.

[0100] The air conditioner of the present disclosure includes a rear cover 190 disposed behind the case 101. The air conditioner may be mounted to a wall defining the indoor space by means of the rear cover 190. The rear cover 190 may have a structure that is coupled to the case 101 or the inner body 80.

[0101] The air conditioner of the present disclosure may include a heat exchanger holder 180 disposed on one side of the inner body 80 to maintain positioning of the heat exchanger 70. The heat exchanger holder 180 is fixedly disposed on the inner body 80. The fan 50 is rotatably disposed in an area in which the heat exchanger holder 180 is coupled to the inner body 80.

[0102] The heat exchanger holder 180 is disposed so as to be coupled to the inner body 80 at a position opposite the fan motor 52.

[0103] The air conditioner of the present disclosure includes an upper cover 61 to cover the upper side of the control box 60 or the fan motor 52. The upper cover 61 may cover the upper side of the fan motor 52 in the open top area of the case 101.

[0104] The positioning of the components of the air

conditioner will be described with reference to FIG. 5 showing the cross-section of the air conditioner.

[0105] The suction port 12 is formed in the upper side of the case 101. The suction port 12 is formed at a position above the fan 50.

[0106] The heat exchanger 70 is disposed above the fan 50. The heat exchanger 70 may have a structure including at least one bent region. The heat exchanger 70 of the present disclosure may include two bent regions.

[0107] The heat exchanger 70 includes a first heat exchanger 70a disposed in front of the fan 50, a second heat exchanger 70b bent and extending upwardly and backwardly from the first heat exchanger 70a, and a third heat exchanger 70c bent and extending downwardly and backwardly from the second heat exchanger 70b.

[0108] One end of the heat exchanger 70 is disposed above the stabilizer 100. The other end of the heat exchanger 70 is disposed above the inner body 80.

[0109] The fan 50 is disposed between the inner body 80 and the stabilizer 100. The fan 50 rotates to suction air through the front and upper sides thereof. The fan 50 rotates to discharge air through the rear and lower sides thereof.

[0110] The air moved by the fan 50 may flow to a discharge passage 18 defined by the inner body 80 and the stabilizer 100.

[0111] The inner body 80 is disposed behind and below the fan 50.

[0112] The inner body 80 includes a support body 82 disposed behind the fan 50 to support one side of the heat exchanger 70 and a guide body 84 configured to guide air flowing due to rotation of the fan 50 in the forward and downward directions.

[0113] The guide body 84 includes an inflow guide body 85 protruding to an area above the fan 50 to guide air entering the fan 50. The guide body 84 includes a first guide 86 to guide air flowing due to rotation of the fan 50 in the forward and downward directions.

[0114] The first guide 86 may be disposed such that a distance from the fan 50 gradually increases in the downward direction. The first guide 86 may include an upper guide 86a disposed near the periphery of the fan 50 and formed in a curved shape and a lower guide 86b extending from the lower end of the upper guide 86a in the forward and downward directions.

[0115] The louver 90 may be disposed on one side of the first guide 86 in order to adjust the direction of air flowing downwardly due to rotation of the fan 50 in the leftward-rightward direction. A separate louver motor (not shown) may be provided in order to change positioning of the louver 90 in the leftward-rightward direction.

[0116] A sterilizing lamp 92 may be disposed on one side of the first guide 86 in order to radiate ultraviolet light toward the fan 50. The sterilizing lamp 92 may be disposed on the side of the first guide 86 on which the louver 90 is disposed.

[0117] The stabilizer 100 is disposed so as to be spaced upward from the first guide 86 of the inner body

80.

[0118] The stabilizer 100 includes a second guide 102 disposed so as to be spaced upward from the first guide 86, an end guide 104 bent and extending upwardly from the upper end of the second guide 102, and a plurality of upper protrusions 106 formed on the upper surface of the second guide 102 so as to be spaced apart from each other in the forward-backward direction and to extend upwardly.

[0119] The second guide 102 includes at least two walls having different inclined surfaces. The second guide 102 and the first guide 86 may define the discharge passage 18 therebetween.

[0120] The movable vanes 120 and 130 may be disposed on the stabilizer 100. The movable vanes 120 and 130 may be disposed in the case 101 in order to adjust the direction of air discharged through the second discharge port 48. The movable vanes 120 and 130 include a first movable vane 120 configured to open and close the second discharge port 48 and a second movable vane 130 disposed on the discharge passage 18.

[0121] The first movable vane 120 and the second movable vane 130 may be connected to the vane motor 108 via a plurality of links. The air conditioner may include a driving link 140 connected to the vane motor 108, a first link 142 connecting the driving link 140 to the first movable vane 120, and a second link 144 connecting the driving link 140 to the second movable vane 130. The air conditioner may include an auxiliary link 146 connecting the stabilizer 100 to the first movable vane 120.

[0122] The first movable vane 120 may open and close the second discharge port 48. The second movable vane 130 may be disposed above the first movable vane 120. The length of the first movable vane 120 in the forward-backward direction may be formed to be greater than the length of the second movable vane 130 in the forward-backward direction.

[0123] A blocking screen 160 may be disposed on the stabilizer 100. The blocking screen 160 may prevent a part of the body of the user or the like from approaching the fan 50 through the discharge passage 18.

[0124] The second discharge port 48 is located in the lower surface of case 101. The first discharge port 36 is located in the front surface of the case 101. When the first movable vane 120 is positioned to close the second discharge port 48, the first movable vane 120 may guide air flowing due to the fan 50 to the first discharge port 36.

[0125] The discharge cover 30 may be disposed on one side of the case 101 that is open forward. The first discharge port 36 is formed in the discharge cover 30. The discharge cover 30 includes a lower discharge cover 34 connected to the lower end of the case 101 and an upper discharge cover 32 spaced upward from the lower discharge cover 34.

[0126] The fixed vane 40 is disposed on the discharge cover 30 in order to guide air discharged through the first discharge port 36.

[0127] The case 101 includes a corner wall 16 formed

at the lower end portion of the front surface thereof so as to be connected to the lower discharge cover 34.

[0128] Hereinafter, content related to the configuration in which air discharged by the fan 50 flows in the state in which the first movable vane 120 closes the second discharge port 48 will be described in detail with reference to FIG. 6.

[0129] The first guide 86 of the inner body 80 and the second guide 102 of the stabilizer 100 define the discharge passage 18. The first guide 86 of the inner body 80 and the second guide 102 and the first movable vane 120 of the stabilizer 100 may define the discharge passage 18.

[0130] An inclination angle θ_1 formed between the first guide 86 and a virtual horizontal line HL parallel to the floor may be formed to be greater than an inclination angle θ_2 formed between the second guide 102 and the virtual horizontal line HL.

[0131] That is, the cross-sectional width of the discharge passage 18 defined between the first guide 86 of the inner body 80 and the second guide 102 of the stabilizer 100 may gradually increase in a direction away from the fan 50.

[0132] The second guide 102 includes a rear guide 102a, a middle guide 102b extending forwardly from the rear guide 102a, and a front guide 102c extending forwardly from the middle guide 102b.

[0133] The rear guide 102a may be disposed so as to extend forwardly and downwardly in a direction away from the fan 50. The rear guide 102a may have a shape that is inclined forwardly and downwardly.

[0134] The rear guide 102a may define the discharge passage 18 with the lower guide 86b of the first guide 86. The inclination angle θ_2 formed between the rear guide 102a and the virtual horizontal line HL may be formed to be less than the inclination angle θ_1 formed between the first guide 86 and the virtual horizontal line HL.

[0135] A portion of the rear guide 102a is disposed above the first guide 86. Another portion of the rear guide 102a is disposed above the second discharge port 48. Still another portion of the rear guide 102a is disposed above the first movable vane 120.

[0136] The length 102aL of the rear guide 102a in the forward-backward direction may be formed to be greater than the length 102bL of the middle guide 102b in the forward-backward direction. The length 102aL of the rear guide 102a in the forward-backward direction may be formed to be less than the length 86bL of the lower guide 86b of the first guide 86 in the forward-backward direction.

[0137] The middle guide 102b may be disposed substantially parallel to the floor. The middle guide 102b is disposed above the second discharge port 48. The middle guide 102b may be disposed above the first movable vane 120. The middle guide 102b is disposed substantially parallel to the first movable vane 120 positioned to close the second discharge port 48.

[0138] The length 102bL of the middle guide 102b in

the forward-backward direction may be formed to be less than the length 102L of the first movable vane 120 in the forward-backward direction. The length 102aL of the rear guide 102a in the forward-backward direction may be formed to be 1.5 times to 3 times the length 102bL of the middle guide 102b in the forward-backward direction.

[0139] An angle θ_3 formed between the middle guide 102b and the rear guide 102a may be formed to be greater than an angle θ_4 formed between the first guide 86 and the first movable vane 120 positioned to close the second discharge port 48.

[0140] The length 102bL of the middle guide 102b in the forward-backward direction may be formed to be greater than the length 102cL of the front guide 102c in the forward-backward direction. The length 102bL of the middle guide 102b in the forward-backward direction may be formed to be 2 times to 4 times the length 102cL of the front guide 102c in the forward-backward direction.

[0141] The front guide 102c may extend forwardly and downwardly from the middle guide 102b. The front guide 102c is connected to the upper discharge cover 32 of the discharge cover 30.

[0142] The front guide 102c is disposed above the second discharge port 48. The front guide 102c is disposed above the first movable vane 120.

[0143] The first guide 86 includes the upper guide 86a disposed near the periphery of the fan 50 and formed in a curved shape. The upper guide 86a may be formed such that a distance from the fan 50 gradually increases in the downward direction.

[0144] The upper guide 86a may be disposed at a higher position than the second guide 102 in the upward-downward direction. The upper guide 86a may guide air discharged backwardly by rotation of the fan 50 in the downward direction.

[0145] The first guide 86 includes the lower guide 86b to guide air flowing downwardly due to rotation of the fan 50 in the forward direction. The lower guide 86b may have a structure that extends forwardly and downwardly.

[0146] The first guide 86 may guide air flowing due to rotation of the fan 50 to the second discharge port 48. The lower guide 86b of the first guide 86 has a structure that extends toward the second discharge port 48.

[0147] The first movable vane 120 may be positioned to close the second discharge port 48. The first movable vane 120 includes a vane upper surface 121, with which air flowing due to rotation of the fan 50 comes into contact. The first movable vane 120 includes a vane lower surface 122 disposed opposite the vane upper surface 121.

[0148] Referring to the drawings, the vane upper surface 121 and the vane lower surface 122 may be formed as different plates. However, unlike what is illustrated in the drawings, the vane upper surface 121 and the vane lower surface 122 may be formed as a single plate.

[0149] The vane upper surface 121 may be disposed substantially parallel to the middle guide 102b of the second guide 102. Air flowing along the discharge passage 18 may come into contact with the vane upper

surface 121. The vane upper surface 121 may guide air flowing along the discharge passage 18.

[0150] As shown in FIG. 6, in the state in which the second discharge port 48 is closed by the first movable vane 120, air flowing through the discharge passage 18 may move along the vane upper surface 121 of the first movable vane 120 and may then reach the first discharge port 36.

[0151] As shown in FIG. 6, the state in which the first movable vane 120 closes the second discharge port 48 may be set to a first position P1 of the movable vane. That is, at the first position P1 of the movable vane, the first movable vane 120 may be positioned to close the second discharge port 48.

[0152] The first movable vane 120 may include a plurality of protrusions 121c formed on the vane upper surface 121 so as to protrude upwardly and to be spaced apart from each other in the forward-backward direction. The plurality of protrusions 121c may prevent formation of dew on the first movable vane 120.

[0153] The vane upper surface 121 may include a rear end portion 121b, which forms an inclined surface extending backwardly and downwardly. The vane upper surface 121 may include a front end portion 121a, which forms an inclined surface extending forwardly and downwardly.

[0154] The length 121bL of the rear end portion 121b in the forward-backward direction may be formed to be 0.1 times to 0.2 times the length 120L of the first movable vane 120 in the forward-backward direction. The length 121aL of the front end portion 121a in the forward-backward direction may be formed to be 0.1 times to 0.2 times the length 120L of the first movable vane 120 in the forward-backward direction.

[0155] A thermally insulating member may be disposed inside the first movable vane 120.

[0156] The second movable vane 130 may be disposed above the first movable vane 120. In the state in which the first movable vane 120 closes the second discharge port 48, the second movable vane 130 may be positioned to send air forwardly.

[0157] At the first position P1 of the movable vane, the second movable vane 130 sends air flowing forwardly and downwardly through the discharge passage 18 to the first discharge port 36. At the first position P1 of the movable vane, the second movable vane 130 may be positioned in a downwardly convex shape.

[0158] At the first position P1 of the movable vane, the rear end portion 121b of the first movable vane 120 may be positioned so as to be oriented backward and upward. At the first position P1 of the movable vane, the front end portion 121a of the first movable vane 120 may be positioned so as to be oriented forward or to be oriented forward and upward.

[0159] The length 130L of the second movable vane 130 in the forward-backward direction may be formed to be half or less of the length 120L of the first movable vane 120 in the forward-backward direction.

[0160] The discharge cover 30 is disposed on the front side of the case 101. The discharge cover 30 may be disposed inside the case 101. A first discharge port passage 30a may be formed inside the discharge cover 30 in order to guide air flowing through the discharge passage 18 to the first discharge port 36.

[0161] The first discharge port passage 30a may be defined between the upper discharge cover 32 and the lower discharge cover 34. The first discharge port 36 may be formed in the front end portion of the first discharge port passage 30a.

[0162] The lower discharge cover 34 may include an inclined guide wall 34a forming an inclined surface extending forwardly and upwardly and a vane-corresponding wall 34b disposed so as to oppose the first movable vane 120.

[0163] The inclined guide wall 34a guides air flowing along the vane upper surface 121 of the first movable vane 120 to flow forwardly and upwardly. The inclined guide wall 34a may guide air flowing along the vane upper surface 121 of the first movable vane 120 to the first discharge port 36.

[0164] The inclined guide wall 34a may be disposed so as to be inclined upwardly at a greater angle than the surface formed by the vane upper surface 121 of the first movable vane 120. That is, the inclined guide wall 34a may guide air passing through the discharge passage 18 and then flowing along the upper surface of the first movable vane 120 to flow upwardly. Accordingly, the air flowing through the first discharge port 36 may be discharged forwardly in the horizontal direction or may be discharged forwardly and upwardly with respect to the horizontal direction. As a result, the air discharged forwardly through the first discharge port 36 may travel a long distance.

[0165] The front end portion of the inclined guide wall 34a may be connected to the corner wall 16 of the case 101. The front end portion of the inclined guide wall 34a connected to the corner wall 16 of the case 101 may be disposed substantially horizontally.

[0166] The vane-corresponding wall 34b is disposed so as to oppose the front end portion 121a of the first movable vane 120 positioned at the first position P1.

[0167] The upper discharge cover 32 may form a substantially horizontal surface. The upper discharge cover 32 may have a structure that extends from the second guide 102.

[0168] The fixed vane 40 is disposed between the lower discharge cover 34 and the upper discharge cover 32. The fixed vane 40 may extend in the forward-backward direction to guide the flow of air discharged through the first discharge port 36. The fixed vane 40 may have a structure that extends forwardly and upwardly.

[0169] An inclination angle θ_5 formed between the fixed vane 40 and the virtual horizontal line HL may be formed to be less than an inclination angle θ_6 formed between the lower discharge cover 34 and the virtual horizontal line HL. The inclination angle θ_5 formed be-

tween the fixed vane 40 and the virtual horizontal line HL may be formed to be less than the inclination angle θ_6 formed between the inclined guide wall 34a of the lower discharge cover 34 and the virtual horizontal line HL.

[0170] The inclination angle θ_5 formed between the fixed vane 40 and the virtual horizontal line HL may be formed to be greater than an inclination angle θ_7 formed between the vane upper surface 121 of the first movable vane 120 and the virtual horizontal line HL. The inclination angle θ_5 formed between the fixed vane 40 and the virtual horizontal line HL may be formed to be greater than an inclination angle θ_8 formed between the upper discharge cover 32 and the virtual horizontal line HL.

[0171] The first discharge port passage 30a may be formed such that the cross-sectional size thereof gradually decreases in the forward direction. The first discharge port passage 30a may be formed such that the length thereof in the upward-downward direction gradually decreases in the forward direction.

[0172] The area of the first discharge port 36 may be formed to be less than the area of the second discharge port 48. Referring to FIG. 6, the length 36h of the first discharge port 36 in the upward-downward direction may be formed to be less than the length 48w of the second discharge port 48 in the forward-backward direction.

[0173] The air flowing due to rotation of the fan 50 flows forwardly and downwardly along the discharge passage 18. The air flowing between the first movable vane 120 and the second guide 102 may be discharged through the first discharge port 36 via the first discharge port passage 30a. The air discharged through the first discharge port 36 via the first discharge port passage 30a may flow forwardly and upwardly.

[0174] Thus, at the first position P1 of the movable vane, air may be discharged through the first discharge port 36. Due to operation of the fan 50, air may be discharged forwardly from the case 101 through the first discharge port 36. In this case, the air discharged through the first discharge port 36 may travel forward a long distance.

[0175] The positioning of the movable vane and the flow of air at a second position P2 of the movable vane will be described with reference to FIG. 7.

[0176] The state in which the second discharge port 48 is opened may be set to a second position P2 of the movable vane. Thus, at the second position P2 of the movable vane, the first movable vane 120 may be positioned below the second discharge port 48. At the second position P2 of the movable vane, the first movable vane 120 may be positioned at a position spaced downward from the second discharge port 48. At the second position P2 of the movable vane, the first movable vane 120 may guide air flowing through the second discharge port 48 to flow forwardly and downwardly or to flow downwardly.

[0177] Unlike what is illustrated in the drawings, at the second position P2 of the movable vane, a portion of the second movable vane 120 may be positioned above the second discharge port 48.

[0178] During transition from the first position P1 of the movable vane to the second position P2 of the movable vane, the second movable vane 130 may move downwardly. During transition from the first position P1 of the movable vane to the second position P2 of the movable vane, the second movable vane 130 may be positioned so as to be inclined downwardly.

[0179] At the second position P2 of the movable vane, the first movable vane 120 may guide the direction of air flowing through the second discharge port 48. At the second position P2 of the movable vane, the air discharged through the second discharge port 48 may flow forwardly and downwardly along the first movable vane 120.

[0180] At the second position P2 of the movable vane, both the first discharge port 36 and the second discharge port 48 are opened. In this case, the air flowing through the discharge passage 18 may mainly flow to the second discharge port 48 opened in the forward and downward directions or in the downward direction. A portion of the air may be discharged through the first discharge port 36. However, most of the air may be discharged through the second discharge port 48, and may flow forwardly and downwardly or flow downwardly along the first movable vane 120 positioned to open the second discharge port 48.

[0181] At the second position P2 of the movable vane, the air flowing to the second discharge port 48 and/or the first discharge port 36 may flow forwardly and downwardly. Because the main air stream flows through the second discharge port 48, the air may be discharged forwardly and downwardly.

[0182] The air conditioner described hereinabove is for exemplary purposes only, and it may be noted that the present invention can be implemented in an air conditioner having a different structure, constituent components or arrangement of constituent components. For example, the position/orientation of the discharge ports may be different than the position/orientation described hereinabove. Also, the flow of air to the discharge ports and/or out of the discharge ports may be achieved differently than described hereinabove.

[0183] FIG. 8 is a block diagram of an air conditioner according to an embodiment of the present disclosure.

[0184] Referring to FIG. 8, the air conditioner 1 may include a communication unit 310, a sensor unit 320, a memory 330, a fan driving unit 340 configured to drive a fan 341, a compressor driving unit 350 configured to drive a compressor 351, a vane 360, and/or a controller 370.

[0185] The communication unit 310 may include at least one communication module. For example, the communication unit 310 may be provided in each of the outdoor unit and the indoor unit 10, and the outdoor unit and the indoor unit 10 may transmit and receive data to and from each other.

[0186] A method for communication between the outdoor unit and the indoor unit 10 may employ, for example, wireless communication, such as Wi-Fi, Bluetooth, Bea-

con, or ZigBee, as well as communication using a power line, serial communication (e.g., RS-485 communication), and wired communication through a refrigerant pipe.

[0187] The communication unit 310 may transmit and receive data to and from an external device. For example, the communication unit 310 may access a server connected to an external network to transmit and receive data.

[0188] The sensor unit 320 may include at least one sensor, and may transmit data related to a value detected by the sensor to the controller 370.

[0189] The sensor unit 320 may include a heat exchanger temperature sensor (not shown). For example, the heat exchanger temperature sensor may be disposed on the indoor heat exchanger 70 to detect the temperature of the indoor heat exchanger 70.

[0190] The sensor unit 320 may include a pipe temperature sensor (not shown). The pipe temperature sensor may detect the temperature of refrigerant flowing through each pipe of the air conditioner 1. For example, the pipe temperature sensor may be disposed on an inlet pipe of the indoor unit 10 and/or an outlet pipe of the indoor unit 10 to detect the temperature of refrigerant flowing through the pipe. For example, the pipe temperature sensor may be disposed on a pipe connected to the compressor 351 of the outdoor unit to detect the temperature of refrigerant entering the compressor 351 (hereinafter referred to as refrigerant suction temperature) and/or the temperature of refrigerant discharged from the compressor 351 (hereinafter referred to as refrigerant discharge temperature).

[0191] The sensor unit 310 may include a pressure sensor (not shown). The pressure sensor (not shown) may detect the pressure of gaseous refrigerant flowing through each pipe of the air conditioner 1. For example, the pressure sensor may be disposed on a pipe connected to the compressor 351 to detect the pressure of refrigerant entering the compressor 351 (hereinafter referred to as suction pressure) and/or the pressure of refrigerant discharged from the compressor 351 (hereinafter referred to as discharge pressure).

[0192] The sensor unit 320 may include an indoor temperature sensor (not shown) to detect or sense indoor temperature (i.e. the temperature of the indoor space) and/or an outdoor temperature sensor (not shown) to detect outdoor temperature (i.e. the temperature of the outdoor space). Alternatively or additionally, the indoor temperature and/or the temperature may be measured/sensed/determined by some external sensors or apparatuses and may be communicated/transmitted (through wired or wireless techniques) to the air conditioner.

[0193] The sensor unit 320 may include an indoor humidity sensor (not shown) to detect indoor humidity and/or an outdoor humidity sensor (not shown) to detect outdoor humidity.

[0194] The memory 330 may store data on a reference value related to operation of each component provided in

the air conditioner 1.

[0195] The memory 330 may store programs for processing and controlling each signal in the controller 370, and may store processed data and/or data to be processed. For example, the memory 330 may store application programs designed for the purpose of performing various tasks processable by the controller 370, and may selectively provide some of the stored application programs in response to a request by the controller 370.

[0196] For example, the memory 330 may include at least one of volatile memory (e.g., DRAM, SRAM, or SDRAM) or non-volatile memory (e.g., flash memory, hard disk drive (HDD), or solidstate drive (SSD)).

[0197] The fan driving unit 340 may drive the fan 341 provided in the air conditioner 1. For example, the fan 341 may include an outdoor fan and/or an indoor fan 50. The indoor fan 50 may be referred to as a blower 50.

[0198] The fan driving unit 340 may include a rectifier (not shown) configured to rectify alternating current (AC) power into direct current (DC) power and output the DC power, a DC terminal capacitor (not shown) configured to store a ripple voltage from the rectifier, an inverter (not shown) provided with a plurality of switching elements to convert smoothed DC power into three-phase AC power of a certain frequency and output the three-phase AC power, and/or at least one motor configured to drive the fan 341 according to the three-phase AC power output from the inverter.

[0199] The fan driving unit 340 may include components separately provided to drive the outdoor fan and the indoor fan 50. For example, the air conditioner 1 may include a first fan driving unit configured to drive the outdoor fan and a second fan driving unit configured to drive the indoor fan 50.

[0200] The compressor driving unit 350 may drive the compressor 351. The compressor driving unit 350 may include a rectifier (not shown) configured to rectify AC power into DC power and output the DC power, a DC terminal capacitor (not shown) configured to store a ripple voltage from the rectifier, an inverter (not shown) provided with a plurality of switching elements to convert smoothed DC power into three-phase AC power of a certain frequency and output the three-phase AC power, and/or a compressor motor configured to drive the compressor 351 according to the three-phase AC power output from the inverter.

[0201] The vane 360 may be disposed in a discharge port of the indoor unit 10, through which air flowing through the indoor unit 10 due to the indoor fan 50 is discharged. The vane 360 may include a fixed vane 40 disposed in the first discharge port 36 and a first movable vane 120 disposed in the second discharge port 48. Hereinafter, the first discharge port 36 may be referred to as a sub-discharge port, and the second discharge port 48 may be referred to as a main discharge port. The fixed vane 40 may be referred to as a sub-vane, and the first movable vane 120 may be referred to as a main vane.

[0202] The air conditioner 1 may include a vane motor

configured to drive the vane 360 and a link connected between the vane 360 and the vane motor. For example, when the link rotates along with rotation of the vane motor, the direction in which the vane 360 is oriented may change according to rotation of the link. In this case, as the direction in which the vane 360 is oriented changes, the direction in which air is discharged through the discharge port of the indoor unit 10 (hereinafter referred to as an airstream direction) may change. The vane motor may be implemented as a step motor. However, the disclosure is not limited thereto.

[0203] The controller 370 may control overall operation of the air conditioner 1. The controller 370 may be connected to each component provided in the air conditioner 1, and may transmit and/or receive signals to/from each component to control overall operation of each component.

[0204] The controller 370 may control operation of the fan driving unit 340 to change the number of revolutions of the fan 341. For example, the fan driving unit 340 may change the frequency of three-phase AC power output to the outdoor fan motor under the control of the controller 370 to change the number of revolutions of the outdoor fan. For example, the fan driving unit 340 may change the frequency of three-phase AC power output to the indoor fan motor under the control of the controller 370 to change the number of revolutions of the indoor fan 50.

[0205] The controller 370 may control operation of the compressor driving unit 350 to change the operating frequency of the compressor 351. For example, the compressor driving unit 350 may change the frequency of three-phase AC power output to the compressor motor under the control of the controller 370 to change the operating frequency of the compressor 351.

[0206] The controller 370 may be provided not only in the outdoor unit but also in the indoor unit 10 or a central controller (not shown) configured to control operation of the outdoor unit and/or the indoor unit 10.

[0207] The controller 370 may include at least one processor, and may control overall operation of the air conditioner 1 using the processor included therein. Here, the processor may be a general processor such as a central processing unit (CPU). Alternatively, the processor may be a dedicated device, such as an ASIC, or other hardware-based processor.

[0208] The controller 370 may obtain data related to each component provided in the air conditioner 1. In this case, the controller 370 may obtain data related to each component provided in the air conditioner 1 at regular time intervals according to a certain period taking into consideration computational load.

[0209] The controller 370 may perform various calculations based on the obtained data, and may control overall operation of each component provided in the air conditioner 1 based on calculation results.

[0210] The data related to each component provided in the air conditioner 1 may include, for example, the operating frequency of the compressor 351, the refrigerant

suction temperature of the compressor 351, the refrigerant discharge temperature of the compressor 351, the suction pressure of the compressor 351, the discharge pressure of the compressor 351, the temperature of the inlet pipe of the indoor unit 10, the temperature of the outlet pipe of the indoor unit 10, the indoor temperature, the outdoor temperature, and the degree of opening of an electronic expansion valve (EEV).

[0211] The air conditioner 1 may include an input device configured to receive a user input. For example, upon receiving a user input through the input device (e.g., a touch panel or a key), the air conditioner 1 may perform operation corresponding to the user input. The input device may receive user input for implementing one or more settings, e.g. an indoor target temperature (described hereinbelow) or a discharge target temperature (described hereinbelow).

[0212] The air conditioner 1 may include an output device configured to output a message indicating the operational state of the air conditioner 1. For example, the output device may include a display device, such as a display 170 or a light-emitting diode (LED), and/or an audio device, such as a speaker or a buzzer.

[0213] The controller 370 may control the vane 360 according to an operation mode. The operation mode of the air conditioner 1 may be set to any one of a first mode in which the main discharge port 48 is closed to prevent air from being discharged through the main discharge port 48 and a second mode in which the main discharge port 48 is opened to allow air to be discharged through the main discharge port 48.

[0214] Referring to FIG. 9, when the operation mode of the air conditioner 1 is set to the first mode, the main discharge port 48 may be closed by the main vane 120. In this case, the air introduced into the indoor unit 10 through the suction port 12 of the indoor unit 10 may flow to the sub-discharge port 36 via the discharge passage 18 due to rotation of the indoor fan 50. The air flowing to the sub-discharge port 36 may be discharged to the indoor space in a first discharge direction AD1 corresponding to the sub-vane 40. For example, the first discharge direction AD1 corresponding to the sub-vane 40 may be a direction corresponding to the forward direction F. For example, the first discharge direction AD1 corresponding to the sub-vane 40 may be a direction tilted at a predetermined angle in the upward direction U with respect to the forward direction F.

[0215] The air conditioner may have a different structure from described hereinabove. Generally put, a first mode may be understood as a mode in which air is discharged from the air conditioner e.g. the indoor unit of the air conditioner in a first discharge direction or only in the first discharge direction. The first discharge direction may correspond to or be same as a direction ranging from a forward direction F or a direction tilted at a predetermined angle (e.g. from 0 degree to 90 degree) in the upward direction U with respect to the forward direction F, or may be a direction within the forward direction F and

the direction tilted at the predetermined angle (e.g. from 0 degree to 90 degree) in the upward direction U with respect to the forward direction F. The first discharge direction may be a fixed or may vary/swing between two limits/boundaries. The two limits/ boundaries defined by/falling within the forward direction F and the direction tilted at the predetermined angle (e.g. from 0 degree to 90 degree) in the upward direction U with respect to the forward direction F. The forward direction may be understood as a horizontal direction e.g. a direction perpendicular to a front side/surface and/or a rear side/surface of the indoor unit of the air conditioner and/or to a wall surface defining the indoor space. The first mode may structurally be implemented by the air conditioner structure/layout/design/architecture described herein with respect to other FIGs e.g. by using sub-vane and/or main vane or may be implemented by any other structure/layout/design/architecture (e.g. without using sub-vane and/or main vane).

[0216] Referring to FIG. 10, when the operation mode of the air conditioner 1 is set to the first mode, indoor temperature 1001, predicted mean vote (PMV) 1002, and predicted percentage of dissatisfied (PPD) 1003 for the indoor space may be checked. Here, PMV may be an index that predicts the mean value of the votes of a large group of people on the seven-point thermal sensation scale. A larger PMV value indicates that the simulated people feel colder, and a smaller PMV value indicates that the simulated people feel hotter. PPD may be an index that predicts the percentage of thermally dissatisfied people, and the unit thereof may be "%". PMV and PPD may be calculated based on metabolic rate, thermal resistance, air temperature, mean radiant temperature, relative air velocity, and partial water vapor pressure.

[0217] As the main discharge port 48 is closed by the main vane 120, the air having undergone heat exchange after entering the indoor unit 10 through the suction port 12 of the indoor unit 10 may be discharged in the first discharge direction AD1 through the sub-discharge port 36. The air discharged in the first discharge direction AD1 may flow along the ceiling defining the indoor space. In this case, the entirety of the indoor space may be uniformly cooled or heated by the air flowing along the ceiling.

[0218] According to an embodiment, when the operation mode is set to the first mode, the air conditioner 1 may control the compressor 351 based on the temperature of the indoor heat exchanger 70. For example, when the operation mode is set to the first mode, the user may set a target value for the temperature of the air discharged from the indoor unit 10 (hereinafter referred to as discharge target temperature) for example through a remote control. In this case, the air conditioner 1 may control the compressor 351 so that the temperature of the indoor heat exchanger 70 detected by the heat exchanger temperature sensor corresponds to the preset discharge target temperature. That is, in the case in which the entirety of the indoor space is cooled or heated from

the upper side of the indoor space e.g. from the ceiling as the air having undergone heat exchange flows along the upper side/ceiling, the user may directly adjust the temperature of the air discharged from the indoor unit 10. For example, during the cooling operation, the user may set the discharge target temperature in the temperature range of 16 °C to 20 °C.

[0219] Referring to FIG. 11, when the operation mode of the air conditioner 1 is set to the second mode, the main discharge port 48 may be opened as the main vane 120 rotates at a predetermined angle. In this case, a portion of the air introduced into the indoor unit 10 through the suction port 12 of the indoor unit 10 may flow to the main discharge port 48 via the discharge passage 18 due to rotation of the indoor fan 50. The air flowing to the main discharge port 48 may be discharged to the indoor space in a second discharge direction AD2 corresponding to the main vane 120. For example, the second discharge direction AD2 corresponding to the main vane 120 may be a direction tilted at a predetermined angle in the downward direction D with respect to the forward direction F.

[0220] The air conditioner may have a different structure from described hereinabove. Generally put, a second mode may be understood as a mode in which air is discharged from the air conditioner e.g. the indoor unit of the air conditioner in a second discharge direction or only in the second discharge direction or in the second discharge direction along with the first discharge direction. The amount of air discharged in the first discharge direction may be less than the amount of air discharged in the second discharge direction. The second discharge direction may correspond to or be same as a direction tilted downward from the forward direction F (e.g. from 5 degree to 90 degree) in the downward direction D with respect to the forward direction F. The second discharge direction may be a fixed or may vary/swing between two limits/boundaries. The two limits/ boundaries defined by/falling within the forward direction F and the direction tilted at the predetermined angle (e.g. up to 90 degree) in the downward direction D with respect to the forward direction F. The second mode may structurally be implemented by the air conditioner structure/layout/design/architecture described herein with respect to other FIGs e.g. by using sub-vane and/or main vane or may be implemented by any other structure/layout/design/architecture (e.g. without using sub-vane and/or main vane).

[0221] Referring to FIG. 12, when the operation mode of the air conditioner 1 is set to the second mode, indoor temperature 1201, PMV 1202, and PPD 1203 for the indoor space may be checked.

[0222] As the main discharge port 48 is opened by the main vane 120, a portion of the air having undergone heat exchange after entering the indoor unit 10 through the suction port 12 of the indoor unit 10 may be discharged in the first discharge direction AD1 through the sub-discharge port 36, and the remaining portion of the air may be discharged in the second discharge direction

AD2 through the main discharge port 48. In this case, the amount of air discharged in the first discharge direction AD1 may be less than the amount of air discharged in the second discharge direction AD2. The air discharged in the second discharge direction AD2 may flow toward a specific area in the indoor space corresponding to the second discharge direction AD2. In this case, the entirety of the indoor space may be gradually cooled or heated from the specific area in the indoor space by the air flowing toward the specific area in the indoor space.

[0223] According to an embodiment, when the operation mode is set to the second mode, the air conditioner 1 may control the compressor 351 based on the indoor temperature. For example, when the operation mode is set to the second mode, the user may set an indoor target temperature for the indoor space for example through the remote control. In this case, the air conditioner 1 may control the compressor 351 so that the indoor temperature detected by the indoor temperature sensor corresponds to the preset indoor target temperature i.e. a target temperature set by a user or user-set. That is, in the case in which the air having undergone heat exchange flows toward the floor and thus a specific area in the indoor space is intensively cooled or heated, the temperature of the indoor space may reach or be maintained at the indoor target temperature set by the user. During the cooling operation, the larger the temperature difference between the indoor temperature and the indoor target temperature, the lower the temperature of the air discharged from the indoor unit 10. In addition, the smaller the temperature difference, the higher the temperature of the air discharged from the indoor unit 10. For example, during the cooling operation, if the temperature difference between the indoor temperature and the indoor target temperature is 3 °C or more, the temperature of the air discharged from the indoor unit 10 may be 11 °C, and if the temperature difference is less than 0 °C, the temperature of the air discharged from the indoor unit 10 may be 17 °C. For heating operation, the above-described is vice versa, i.e. the larger the temperature difference between the indoor temperature and the indoor target temperature, the higher the temperature of the air discharged from the indoor unit 10. In addition, the smaller the temperature difference, the lower the temperature of the air discharged from the indoor unit 10.

[0224] According to an embodiment, alternatively or in addition to the compressor control as described above, the rotational speed of the indoor fan 50 corresponding to a preset air volume may be varied depending on the mode. In the case in which the air volume is set to a predetermined level, the rotational speed of the indoor fan 50 in the state in which the operation mode of the air conditioner 1 is set to the first mode may be less than the rotational speed of the indoor fan 50 in the state in which the operation mode of the air conditioner 1 is set to the second mode. Accordingly, it may be possible to reduce noise occurring due to rotation of the indoor fan 50 in the state in which the main discharge port 48 is closed by the

main vane 120.

[0225] FIGs. 13 and 14 are flowcharts showing an operation method of an air conditioner according to an embodiment of the present disclosure.

[0226] Referring to FIG. 13, the air conditioner 1 may monitor the indoor temperature for the indoor space using the indoor temperature sensor or any other external sensor (i.e. not part of the air conditioner) in operation S1310.

[0227] The air conditioner 1 may determine whether the indoor temperature changes by a preset first reference temperature or more in operation S1320. In this case, the first reference temperature may be different or may be set differently depending on whether the air conditioner 1 is performing the cooling operation or is performing the heating operation taking into consideration the cooling/heating capacity of the air conditioner 1 and/or the density of air according to temperature. For example, during the cooling operation, the air conditioner 1 may determine whether the indoor temperature increases by a predetermined value (i.e. the preset first reference temperature) e.g. 1.5 °C or more within a predetermined period of time, e.g., 5 minutes. For example, during the heating operation, the air conditioner 1 may determine whether the indoor temperature decreases by a predetermined value (i.e. the preset first reference temperature) e.g. 2.5 °C or more within a predetermined period of time, e.g., 5 minutes.

[0228] Upon determining that the indoor temperature changes by the preset first reference temperature or more, the air conditioner 1 may commence power-saving operation in operation S1330. Here, the power-saving operation may be operation that reduces the amount of power consumed by the air conditioner 1. For example, when performing the power-saving operation, the air conditioner 1 may drive the compressor 351 at an operating frequency that is lower than the operating frequency of the compressor 351 when the air conditioner 1 performs operation (hereinafter referred to as normal operation) before commencing the power-saving operation. For example, when performing the power-saving operation, the air conditioner 1 may drive the outdoor fan at a rotational speed that is lower than the rotational speed of the outdoor fan in the normal operation.

[0229] According to an embodiment, when performing the power-saving operation, the air conditioner 1 may determine a first power consumption less than the rated power consumption of the air conditioner 1 by a predetermined level and/or a second power consumption less than the first power consumption by a predetermined level. If the current power consumption of the air conditioner 1 exceeds the first power consumption, the air conditioner 1 may lower the operating frequency of the compressor 351. On the other hand, if the current power consumption of the air conditioner 1 is less than the second power consumption, which is less than the first power consumption by a predetermined level, the air conditioner 1 may increase the operating frequency of

the compressor 351. Accordingly, the air conditioner (1) may be possible to operate within a predetermined range of power consumption corresponding to the power-saving operation while performing the power-saving operation.

[0230] According to an embodiment, the air conditioner 1 may perform the power-saving operation depending on whether the operation mode is a mode using the main discharge port 48 i.e. the second mode. This will be described with reference to FIG. 14.

[0231] Referring to FIG. 14, the air conditioner 1 may determine whether operation for minimizing the amount of power consumed by the air conditioner 1 (hereinafter referred to as hibernate operation or minimum power operation or standby operation) is being performed in operation S1410. For example, if the operating frequency of the compressor 351 corresponds to a preset minimum frequency, the air conditioner 1 may determine that the hibernate operation is being performed. For example, if temperature set as the criterion for control of cooling/heating corresponds to the highest temperature during cooling or corresponds to the lowest temperature during heating, the air conditioner 1 may determine that the hibernate operation is being performed.

[0232] Upon determining that the hibernate operation is not being performed, the air conditioner 1 may determine whether the operation mode is a mode using the main discharge port 48 in operation S1420. For example, the user may input/transmit a command to set the operation mode of the air conditioner 1 into/to the air conditioner 1 for example through a remote control. In this case, the air conditioner 1 may set or select the operation mode (e.g. the first mode or the second mode) based on the control command received from the user for example via the remote control.

[0233] Upon determining that the operation mode is set to the first mode, the air conditioner 1 may change the preset discharge target temperature by a first temperature in operation S1430. For example, during the cooling operation, the air conditioner 1 may increase the preset discharge target temperature by 0.5 °C. For example, during the heating operation, the air conditioner 1 may reduce the preset discharge target temperature by 0.5 °C. This further facilitates gradual (or at a slower rate than normal) cooling/heating of the indoor space.

[0234] Upon determining that the operation mode is set to the second mode, the air conditioner 1 may change the preset indoor target temperature by a second temperature in operation S1440. For example, during the cooling operation, the air conditioner 1 may increase the preset indoor target temperature by 1 °C. For example, during the heating operation, the air conditioner 1 may reduce the preset indoor target temperature by 1 °C. This further facilitates faster (or at a quicker rate than normal) cooling/heating of the indoor space.

[0235] That is, in the case of the first mode in which the discharge target temperature for the temperature of the air discharged from the indoor unit 10 is directly set, the

temperature set as the criterion for control may be adjusted more precisely than the second mode in which the indoor target temperature for the indoor temperature is set.

[0236] In addition, the air conditioner (1) may be possible to gradually reduce power consumption by adjusting the discharge target temperature or indoor target temperature until the hibernate operation is performed.

[0237] According to an embodiment, the maximum value of the discharge target temperature may be different from the maximum value of the indoor target temperature. For example, during the cooling operation, the maximum value of the discharge target temperature may be 20 °C, and the maximum value of the indoor target temperature may be 30 °C.

[0238] Referring again to FIG. 13, the air conditioner 1 may determine whether the indoor temperature changes by a preset second reference temperature or more in operation S1340. In this case, the second reference temperature may be different or may be set differently depending on whether the air conditioner 1 is performing the cooling operation or is performing the heating operation taking into consideration the cooling/heating capacity of the air conditioner 1 and/or the density of air according to temperature. For example, during the cooling operation, the air conditioner 1 may determine whether the indoor temperature decreases by a predetermined value (i.e. the preset second reference temperature) e.g. 1 °C or more. For example, during the heating operation, the air conditioner 1 may determine whether the indoor temperature increases by a predetermined value (i.e. the preset second reference temperature) e.g. 2 °C or more. This may be because the difference between the indoor and outdoor temperatures during the cooling operation is smaller than the difference between the indoor and outdoor temperatures during the heating operation.

[0239] Upon determining that the indoor temperature changes by the preset second reference temperature or more, the air conditioner 1 may stop the power-saving operation, and may perform the normal operation in operation S1350.

[0240] Referring to FIG. 15, a door 1505 may be disposed on a surface/wall surface defining an indoor space 1500 in which the indoor unit 10 is disposed. In the state in which the door 1505 is closed, the indoor space 1500 may be cooled or heated by air discharged from the indoor unit 10 after undergoing heat exchange therein. This operation may be the normal operation.

[0241] Generally, the normal operation may be understood as intended/rated operation or an operation whose parameters are preset e.g. by the manufacturer. For example, the intended/rated operation for cooling an indoor space from a current indoor temperature to a target indoor temperature (set by user) may have parameters such as operation frequency for the compressor and/or rotational speed of the fan, etc. The operational parameters for normal operation may be stored in a

memory of the air conditioner for example in form of a look-up table. During normal operation, the controller may operate the air conditioner based on the preset parameters.

[0242] If/when the door 1505 is opened, the indoor space 1500 and another space 1510 may communicate with each other. For example, the other space 1510 may be an outdoor space or another indoor space (e.g. outside of the indoor space 1500 or from which the indoor space 1500 may be closed off). In this case (i.e. when the door is open), heat exchange may occur between the indoor space 1500 and the other space 1500 e.g. convection of air occurs between the indoor space 1500 and the other space 1510 due to a difference in temperature between the indoor space 1500 and the other space 1510, the temperature in the indoor space 1500 may change for example by the first reference temperature or more in spite of operation of the air conditioner 1.

[0243] On the other hand, if/when the door 1505 is closed again i.e. closed after being opened once, communication between the indoor space 1500 and the other space 1510 may be blocked. In this case, as the air having undergone heat exchange is discharged to the indoor space 1500 by operation of the air conditioner 1, the temperature in the indoor space 1500 may change for example by the second reference temperature or more.

[0244] Referring to FIG. 16, if/when the door 1505 is opened at a time point while the air conditioner 1 is performing the cooling operation, the indoor temperature in the indoor space 1500 may increase by a first temperature $\Delta T1$, e.g., 1.5 °C, or more within a predetermined period of time e.g. 5 minutes in spite of the normal operation of the air conditioner 1. In this case, the air conditioner or its controller may compare the first temperature change $\Delta T1$ to the first reference temperature and if the first temperature change $\Delta T1$ is equal to or greater than the first reference temperature, the air conditioner 1 (i.e. the controller of the air conditioner) may determine that the door 1505 is open or has been opened, and may perform power-saving operation i.e. switch/change from the normal operation to the power-saving operation.

[0245] On the other hand, if/when the door 1505 is closed at a subsequent time point t_c , the temperature in the indoor space 1500 may decrease by a third temperature $\Delta T3$, e.g., 1 °C, or more due to the power-saving operation of the air conditioner 1. In this case, the air conditioner or its controller may compare the third temperature change $\Delta T3$ to the second reference temperature and if the third temperature change $\Delta T3$ is equal to or greater than the second reference temperature, the air conditioner 1 (i.e. the controller of the air conditioner) may determine that the door 1505 is/has been closed, and may perform the normal operation i.e. switch/change from the power-saving operation to normal operation.

[0246] Referring to FIG. 17, if the door 1505 is opened at a time point while the air conditioner 1 is performing the heating operation, the indoor temperature in the indoor

space 1500 may decrease by a second temperature ΔT_2 , e.g., 2.5 °C, or more within a predetermined period of time e.g. 5 minutes in spite of the normal operation of the air conditioner 1. In this case, the air conditioner or its controller may compare the second temperature change ΔT_2 to the first reference temperature and if the second temperature change ΔT_2 is equal to or greater than the first reference temperature, the air conditioner 1 may determine that the door 1505 is open or has been opened, and may perform power-saving operation i.e. switch/change from the normal operation to the power-saving operation.

[0247] On the other hand, if/when the door 1505 is closed at a subsequent time point t_c , the temperature in the indoor space 1500 may increase by a fourth temperature ΔT_4 , e.g., 2 °C, or more due to the power-saving operation of the air conditioner 1. In this case, the air conditioner or its controller may compare the fourth temperature change ΔT_4 to the second reference temperature and if the fourth temperature change ΔT_4 is equal to or greater than the second reference temperature, the air conditioner 1 may determine that the door 1505 is/has been closed, and may perform the normal operation i.e. switch/change from the power-saving operation to normal operation.

[0248] Referring to FIG. 18, when the air conditioner 1 performs the power-saving operation, the air conditioner 1 may determine a first power consumption P_1 less than the rated power consumption of the air conditioner 1 and/or a second power consumption P_2 less than the first power consumption P_1 by a predetermined level.

[0249] If the current power consumption of the air conditioner 1 is equal to or less than the first power consumption P_1 and is equal to or greater than the second power consumption P_2 (1810), the air conditioner 1 may maintain the operating frequency of the compressor 351. If the current power consumption of the air conditioner 1 exceeds the first power consumption P_1 (1820), the air conditioner 1 may lower the operating frequency of the compressor 351. If the current power consumption of the air conditioner 1 is less than the second power consumption P_2 (1830), the air conditioner 1 may increase the operating frequency of the compressor 351. Accordingly, the air conditioner (1) may be possible to operate within a predetermined range of power consumption corresponding to the power-saving operation while performing the power-saving operation.

[0250] Referring to FIGs. 1 to 18, an air conditioner 1 in accordance with one aspect of the present disclosure may include an indoor unit 10, an indoor temperature sensor configured to detect an indoor temperature in an indoor space 1500 in which the indoor unit 10 is disposed, and a controller 370 configured to monitor the indoor temperature using the indoor temperature sensor. If the indoor temperature changes by a first reference temperature or more, the controller 370 may commence power-saving operation, and if the indoor temperature changes by a second reference temperature or more

while the power-saving operation is performed, the controller may stop the power-saving operation.

[0251] In addition, in accordance with one aspect of the present disclosure, if the indoor temperature increases by a first temperature or more within a predetermined period of time during cooling operation or decreases by a second temperature or more within the predetermined period of time during heating operation, the controller 370 may determine that the indoor temperature changes by the first reference temperature or more.

[0252] In addition, in accordance with one aspect of the present disclosure, the first temperature may be less than the second temperature.

[0253] In addition, in accordance with one aspect of the present disclosure, while performing the power-saving operation, if the indoor temperature decreases by a third temperature or more during cooling operation or increases by a fourth temperature or more during heating operation, the controller 370 may determine that the indoor temperature changes by the second reference temperature or more.

[0254] In addition, in accordance with one aspect of the present disclosure, the third temperature may be less than the fourth temperature.

[0255] In addition, in accordance with one aspect of the present disclosure, the air conditioner may include a compressor 351 configured to compress refrigerant. While performing the power-saving operation, if power consumption of the air conditioner 1 exceeds first power consumption, the controller 370 may reduce the operating frequency of the compressor 351, and if the power consumption of the air conditioner 1 is less than second power consumption, the controller 370 may increase the operating frequency of the compressor 351. The first power consumption may be less than the rated power consumption of the air conditioner 1 and may exceed the second power consumption.

[0256] In addition, in accordance with one aspect of the present disclosure, the indoor unit 10 may be a wall-mounted type indoor unit 10 including a case 101 configured to be mounted on a wall, and the wall-mounted type indoor unit 10 may include a main discharge port 48 formed to be open in a lower side of the case 101, a sub-discharge port 36 formed to be open in a front side of the case 101, and a main vane 120 configured to open and close the main discharge port 48. If an operation mode is set to a first mode not using the main discharge port 48, the controller 370 may determine the rotational angle of the main vane 120 to be a minimum angle to close the main discharge port 48 so that air is discharged through the sub-discharge port 36, and if the operation mode is set to a second mode using the main discharge port 48, the controller 370 may determine the rotational angle of the main vane 120 to be an angle corresponding to a predetermined airstream direction so that the air is discharged through the main discharge port 48 and the sub-discharge port 36.

[0257] In addition, in accordance with one aspect of the

present disclosure, when performing the power-saving operation with the operation mode set to the first mode, the controller 370 may adjust a first target temperature for the temperature of air discharged from the indoor unit 10, and when performing the power-saving operation with the operation mode set to the second mode, the controller 370 may adjust a second target temperature for the indoor temperature.

[0258] In addition, in accordance with one aspect of the present disclosure, if the operation mode is set to the first mode, the controller 370 may change the first target temperature by a fifth temperature according to a predetermined period, and if the operation mode is set to the second mode, the controller 370 may change the second target temperature by a sixth temperature higher than the fifth temperature according to the predetermined period.

[0259] In addition, in accordance with one aspect of the present disclosure, the maximum value of the first target temperature set in the power-saving operation may be different from the maximum value of the second target temperature set in the power-saving operation.

[0260] An operation method of an air conditioner 1 in accordance with one aspect of the present disclosure may include commencing power-saving operation when an indoor temperature in an indoor space 1500 in which an indoor unit 10 is disposed, detected by an indoor temperature sensor, changes by a first reference temperature or more and stopping the power-saving operation when the indoor temperature changes by a second reference temperature or more while performing the power-saving operation.

[0261] In addition, in accordance with one aspect of the present disclosure, the commencing power-saving operation may include determining that the indoor temperature changes by the first reference temperature or more when the indoor temperature increases by a first temperature or more within a predetermined period of time during cooling operation or decreases by a second temperature or more within the predetermined period of time during heating operation, and the stopping the power-saving operation may include determining that the indoor temperature changes by the second reference temperature or more when the indoor temperature decreases by a third temperature or more during cooling operation or increases by a fourth temperature or more during heating operation while performing the power-saving operation.

[0262] In addition, in accordance with one aspect of the present disclosure, the first temperature may be less than the second temperature, and the third temperature may be less than the fourth temperature.

[0263] In addition, in accordance with one aspect of the present disclosure, the operation method may further include performing the power-saving operation, and the performing the power-saving operation may include reducing the operating frequency of a compressor 351 when power consumption of the air conditioner 1 exceeds first power consumption and increasing the operating frequency of the compressor 351 when the power

consumption of the air conditioner 1 is less than second power consumption. The first power consumption may be less than the rated power consumption of the air conditioner 1 and may exceed the second power consumption.

[0264] In addition, in accordance with one aspect of the present disclosure, the operation method may further include performing the power-saving operation, and the indoor unit 10 may be a wall-mounted type indoor unit 10 including a case 101 configured to be mounted on a wall. The wall-mounted type indoor unit 10 may include a main discharge port 48 formed to be open in a lower side of the case 101, a sub-discharge port 36 formed to be open in a front side of the case 101, and a main vane 120 configured to open and close the main discharge port 48.

The performing the power-saving operation may include adjusting a first target temperature for the temperature of air discharged from the indoor unit 10 when performing the power-saving operation with an operation mode set to a first mode not using the main discharge port 48 and adjusting a second target temperature for the indoor temperature when performing the power-saving operation with the operation mode set to a second mode using the main discharge port 48.

[0265] As is apparent from the above description, an air conditioner and an operation method thereof according to the present disclosure have the following effects.

[0266] According to at least one embodiment of the present disclosure, because air having undergone heat exchange is discharged so as to flow along a ceiling defining an indoor space, the entirety of the indoor space may be uniformly cooled or heated.

[0267] According to at least one embodiment of the present disclosure, because air having undergone heat exchange is discharged so as to flow toward a specific area in an indoor space, the entirety of the indoor space may be gradually cooled or heated from the specific area in the indoor space.

[0268] According to at least one embodiment of the present disclosure, it may be possible to accurately determine, based on a change in indoor temperature, whether an indoor space is in communication with another space.

[0269] According to at least one embodiment of the present disclosure, because power-saving operation is performed while an indoor space is in communication with another space, unnecessary power consumption may be reduced.

[0270] According to at least one embodiment of the present disclosure, because normal operation is performed when communication between an indoor space and another space is blocked, operation requested by a user may be performed.

[0271] According to at least one embodiment of the present disclosure, because power-saving operation is performed in various manners depending on whether a main discharge port is opened or closed by a main vane, power-saving operation optimized for a preset operation mode may be performed.

[0272] The accompanying drawings are used to assist in easy understanding of various technical features and it should be understood that the embodiments presented herein are not limited by the accompanying drawings.

[0273] The operation method of the present disclosure may be implemented as processor-readable code stored on a processor-readable recording medium. The processor-readable recording medium may be any type of recording device in which data is stored in a processor-readable manner. Examples of the processor-readable recording medium include ROM, RAM, a CD-ROM, a magnetic tape, a floppy disk, an optical data storage, a carrier wave such as transmission via the Internet, etc. The processor-readable recording medium can also be distributed over network coupled computer systems so that the processor-readable code is stored and executed in a distributed fashion.

[0274] Although the present disclosure has been described with reference to specific embodiments shown in the drawings, it is apparent to those skilled in the art that the present disclosure is not limited to those exemplary embodiments and is embodied in many forms without departing from the scope of the present disclosure, which is described in the following claims.

Claims

1. An air conditioner (1) comprising:

an indoor unit (10) disposed in an indoor space (1500);
an indoor temperature sensor configured to detect an indoor temperature of the indoor space (1500); and
a controller (370) configured to monitor the indoor temperature using the indoor temperature sensor,
wherein the controller (370) is configured to:

based on the indoor temperature changing by a first reference temperature or more, commencing power-saving operation, and based on the indoor temperature changing by a second reference temperature or more while the power-saving operation is performed, stopping the power-saving operation.

2. The air conditioner (1) according to claim 1,

wherein the air conditioner (1) is configured to cool the indoor space, and wherein the commencing power-saving operation includes the controller (370) being configured to: switch from a normal operation to the power-saving operation if the indoor temperature increases by the first reference temperature or more in a prede-

termined period of time, and wherein the stopping the power-saving operation includes the controller (370) being configured to: switch from the power-saving operation to the normal operation if the indoor temperature decreases by the second reference temperature or more while the power-saving operation is being performed; and/or

wherein the air conditioner (1) is configured to heat the indoor space, and wherein the stopping the power-saving operation includes the controller (370) being configured to: switch from a normal operation to the power-saving operation if the indoor temperature decreases by the first reference temperature or more in a predetermined period of time, and wherein the stopping the power-saving operation includes the controller (370) being configured to: switch from the power-saving operation to the normal operation if the indoor temperature increases by a second reference temperature or more while the power-saving operation is being performed.

3. The air conditioner (1) according to claim 1 or 2,

wherein, based on the indoor temperature increasing by a first temperature or more within the predetermined period of time during cooling operation or decreasing by a second temperature or more within the predetermined period of time during heating operation, the controller (370) is configured to determine that the indoor temperature changes by the first reference temperature or more; or
wherein, based on the indoor temperature increasing by a first temperature or more within the predetermined period of time during cooling operation or decreasing by a second temperature or more within the predetermined period of time during heating operation, the controller (370) is configured to determine that the indoor temperature changes by the first reference temperature or more, and wherein the first temperature is less than the second temperature.

4. The air conditioner (1) according to any one of the preceding claims,

wherein, while performing the power-saving operation, based on the indoor temperature decreasing by a third temperature or more during cooling operation or increasing by a fourth temperature or more during heating operation, the controller (370) is configured to determine that the indoor temperature changes by the second reference temperature or more; or
wherein, while performing the power-saving operation, based on the indoor temperature de-

creasing by a third temperature or more during cooling operation or increasing by a fourth temperature or more during heating operation, the controller (370) is configured to determine that the indoor temperature changes by the second reference temperature or more, and wherein the third temperature is less than the fourth temperature.

5. The air conditioner (1) according to any one of the preceding claims, further comprising a compressor (351) configured to compress a refrigerant, wherein, while performing the power-saving operation, the controller (370) is configured to:

based on a power consumption of the air conditioner (1) exceeding a first power consumption, reducing an operating frequency of the compressor (351), and
based on the power consumption of the air conditioner (1) being less than a second power consumption, increasing the operating frequency of the compressor (351), and
wherein the first power consumption is less than a rated power consumption of the air conditioner (1) and exceeds the second power consumption.

6. The air conditioner (1) according to any one of the preceding claims, wherein the indoor unit (10) is a wall-mounted type indoor unit comprising a case (101) configured to be mounted on a wall defining the indoor space, wherein the wall-mounted type indoor unit comprises:

a sub-discharge port (36) open at a front side of the case (101) and configured to discharge air in a first discharge direction;
a main discharge port (48) open at a lower side of the case (101) and configured to discharge air in a second discharge direction; and
a main vane (120) configured to open and close the main discharge port (48),
wherein the controller (370) is configured to:

based on an operation mode being set to a first mode, close the main discharge port (48) by the main vane (120) so that air is discharged through the sub-discharge port (36), and
based on the operation mode being set to a second mode, open the main discharge port (48) so that the air is discharged through the main discharge port (48) and the sub-discharge port (36).

7. The air conditioner (1) according to claim 6,

wherein the first discharge direction (AD1) corresponds to a direction ranging from a forward direction (F) to a direction tilted at a predetermined angle in an upward direction (U) with respect to the forward direction (F), and
wherein the second discharge direction (AD2) corresponds to a direction tilted downward (D) from the forward direction (F).

8. The air conditioner (1) according to claim 6 or 7, wherein the controller (370) is configured to:

when performing the power-saving operation with the operation mode set to the first mode, adjust a discharge target temperature, wherein the discharge target temperature is a target value set by a user for temperature of air discharged from the indoor unit (10), and
when performing the power-saving operation with the operation mode set to the second mode, adjust a indoor target temperature, wherein the indoor target temperature is a target value set by a user for the indoor temperature of the indoor space.

9. The air conditioner (1) according to claim 8, wherein the controller (370) is configured to:

based on the operation mode being set to the first mode, change the discharge target temperature by a fifth temperature according to a predetermined period, and
based on the operation mode being set to the second mode, changing the indoor target temperature by a sixth temperature higher than the fifth temperature according to the predetermined period.

10. The air conditioner (1) according to claim 8 or 9, wherein a maximum value of the discharge target temperature set in the power-saving operation is different from a maximum value of the indoor target temperature set in the power-saving operation.

11. An operation method of an air conditioner (1) comprising an indoor unit (10) disposed in an indoor space (1500), the operation method comprising:

commencing a power-saving operation when an indoor temperature of the indoor space, detected by an indoor temperature sensor, changes by a first reference temperature or more; and
stopping the power-saving operation when the indoor temperature, detected by the indoor temperature sensor, changes by a second reference temperature or more while performing the power-saving operation.

12. The operation method according to claim 11,

wherein the air conditioner (1) is cooling the indoor space, and wherein the commencing power-saving operation includes: switching
 5 from a normal operation to the power-saving operation if the indoor temperature increases by the first reference temperature or more in a predetermined period of time, and the stopping
 10 the power-saving operation includes: switching from the power-saving operation to the normal operation or a standby operation if the indoor temperature decreases by the second reference temperature or more while the power-saving
 15 operation is being performed; and/or wherein the air conditioner (1) is heating the indoor space, and wherein the stopping the power-saving operation includes: switching
 20 from a normal operation to the power-saving operation if the indoor temperature decreases by the first reference temperature or more in a predetermined period of time, and the stopping
 25 the power-saving operation includes: switching from the power-saving operation to the normal operation or a standby operation if the indoor temperature increases by a second reference temperature or more while the power-saving
 operation is being performed.

13. The operation method according to claim 11 or 12,
 30 wherein the commencing power-saving operation comprises determining that the indoor temperature changes by the first reference temperature or more when the indoor temperature increases by a first temperature or more within the predetermined period
 35 of time during cooling operation or decreases by a second temperature or more within the predetermined period of time during heating operation, preferably the first temperature is less than the second temperature; and
 40 wherein the stopping the power-saving operation comprises determining that the indoor temperature changes by the second reference temperature or more when the indoor temperature decreases by a third temperature or more during cooling operation or
 45 increases by a fourth temperature or more during heating operation while performing the power-saving operation, preferably the third temperature is less than the fourth temperature.

14. The operation method according to any one of claims 11 to 13,
 wherein the performing the power-saving operation comprises:

reducing an operating frequency of a compressor (351) of the air conditioner when power consumption of the air conditioner (1) exceeds

a first power consumption; and increasing the operating frequency of the compressor (351) when the power consumption of the air conditioner (1) is less than a second power consumption, and
 wherein the first power consumption is less than a rated power consumption of the air conditioner (1) and exceeds the second power consumption.

15. The operation method according to any one of claims 11 to 14,

wherein the air conditioner (1) is according to any one of claims 1 to 10; or
 wherein the air conditioner (1) comprises:

a sub-discharge port (36) open at a front side of a case (101) of the indoor unit and configured to discharge air in a first discharge direction (AD1) corresponding to a direction ranging from a forward direction (F) to a direction tilted at a predetermined angle in an upward direction (U) with respect to the forward direction (F);
 a main discharge port (48) open at a lower side of the case (101) and configured to discharge air in a second discharge direction (AD2) corresponding to a direction tilted downward (D) from the forward direction (F);
 a main vane (120) configured to open and close the main discharge port (48), and
 wherein the performing the power-saving operation comprises:

adjusting a discharge target temperature, the discharge target temperature being a target value set by a user for temperature of air discharged from the indoor unit (10), when performing the power-saving operation with an operation mode set to a first mode in which the main discharge port (48) is closed so that air is discharged through the sub-discharge port (36); and

adjusting an indoor target temperature, the indoor target temperature being a target value set by a user for the indoor temperature, when performing the power-saving operation with the operation mode set to a second mode in which the main discharge port (48) is open so that the air is discharged through the main discharge port (48) and the sub-discharge port (36).

FIG. 1

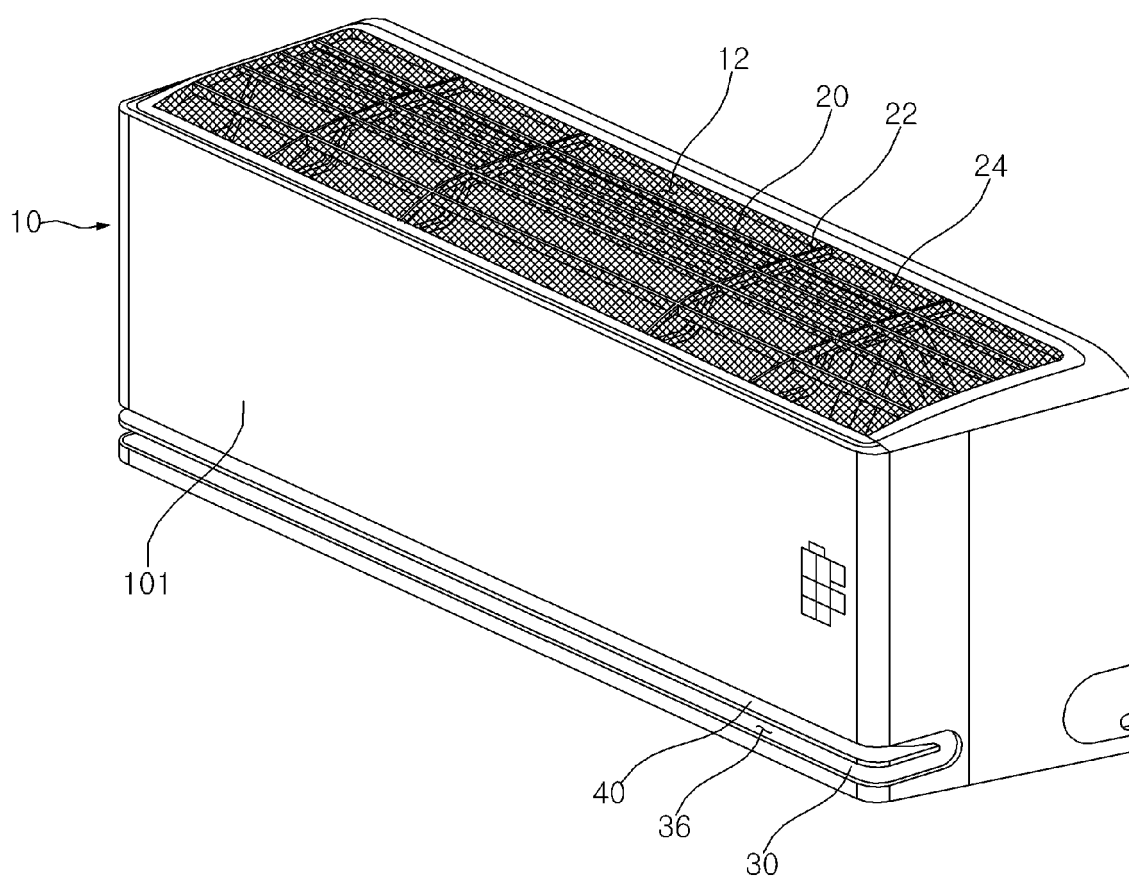


FIG. 2

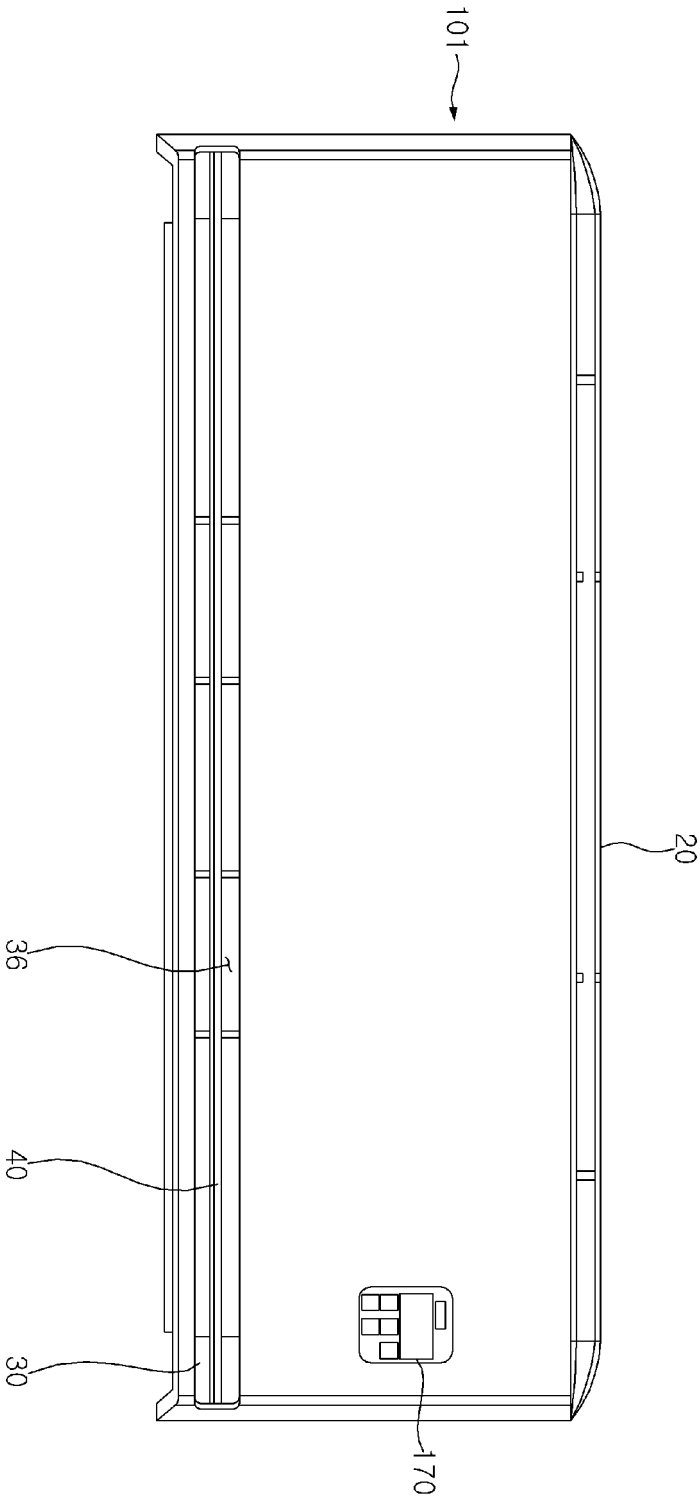


FIG. 3

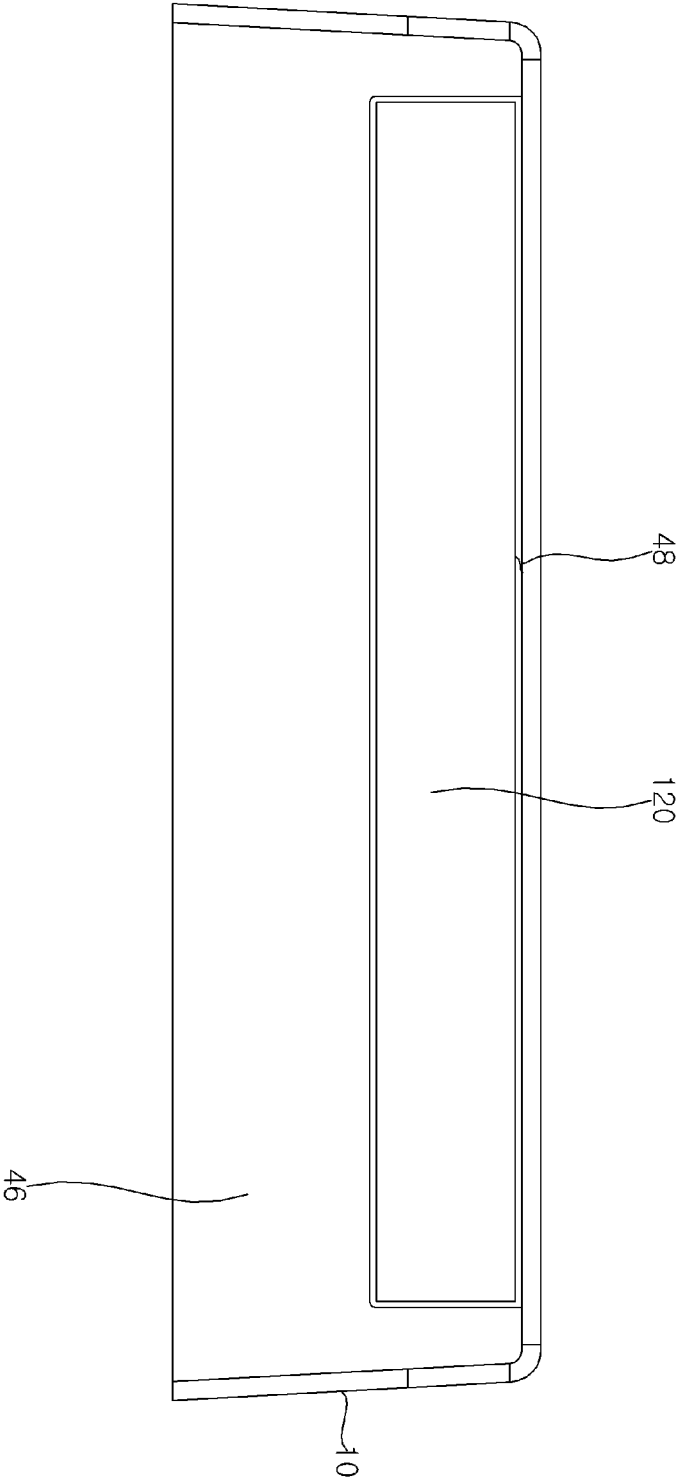


FIG. 4

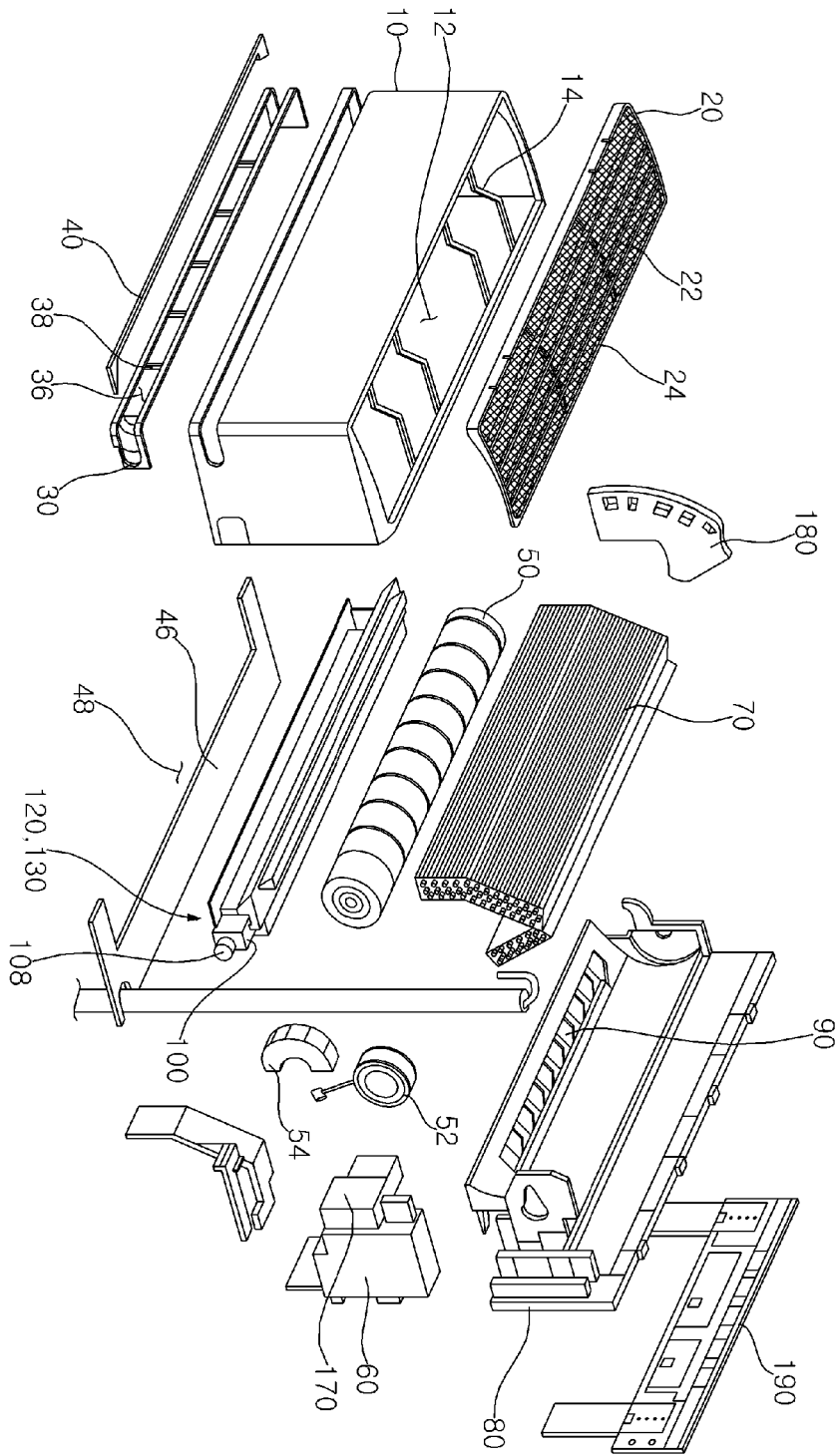


FIG. 5

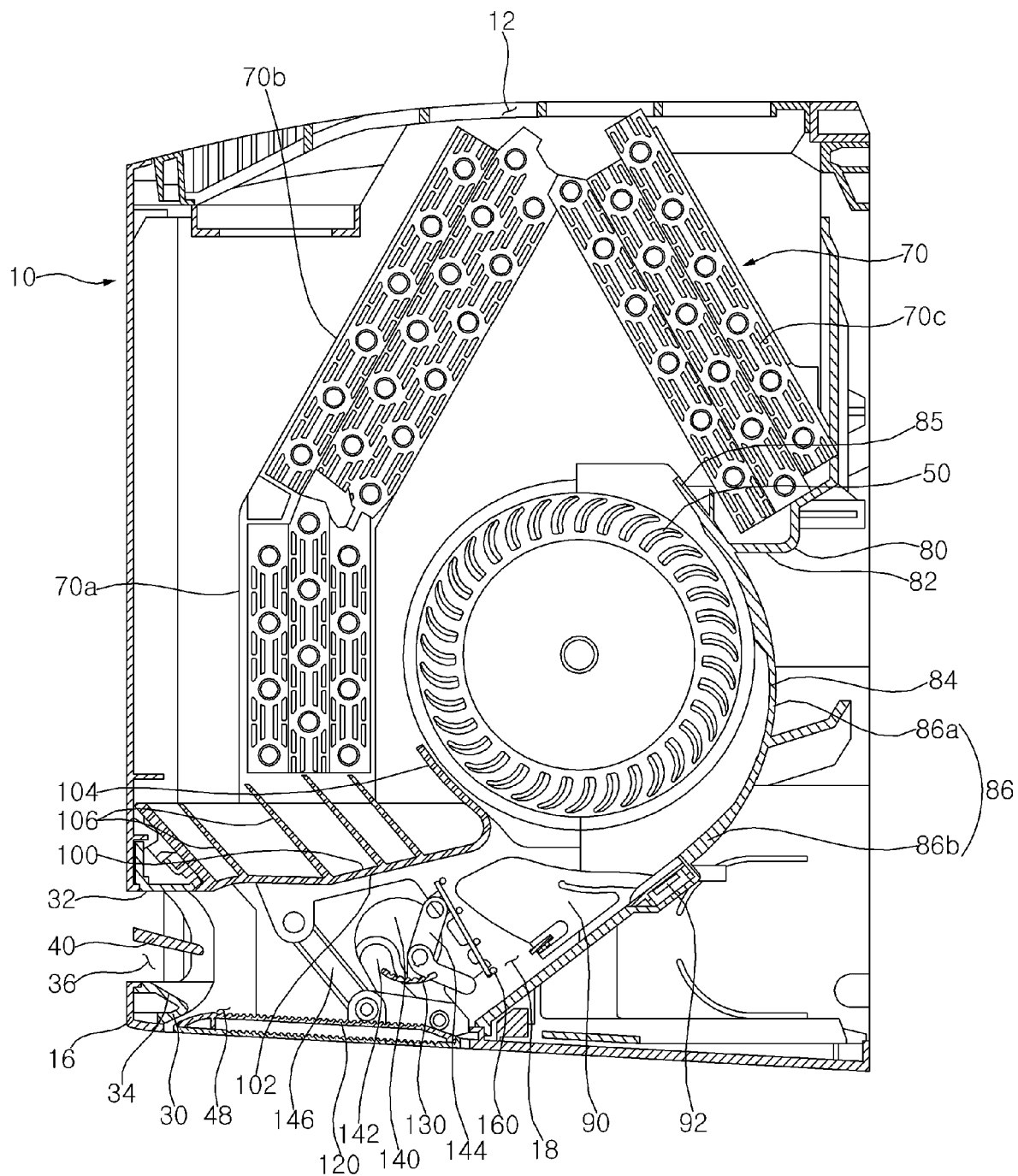


FIG. 6

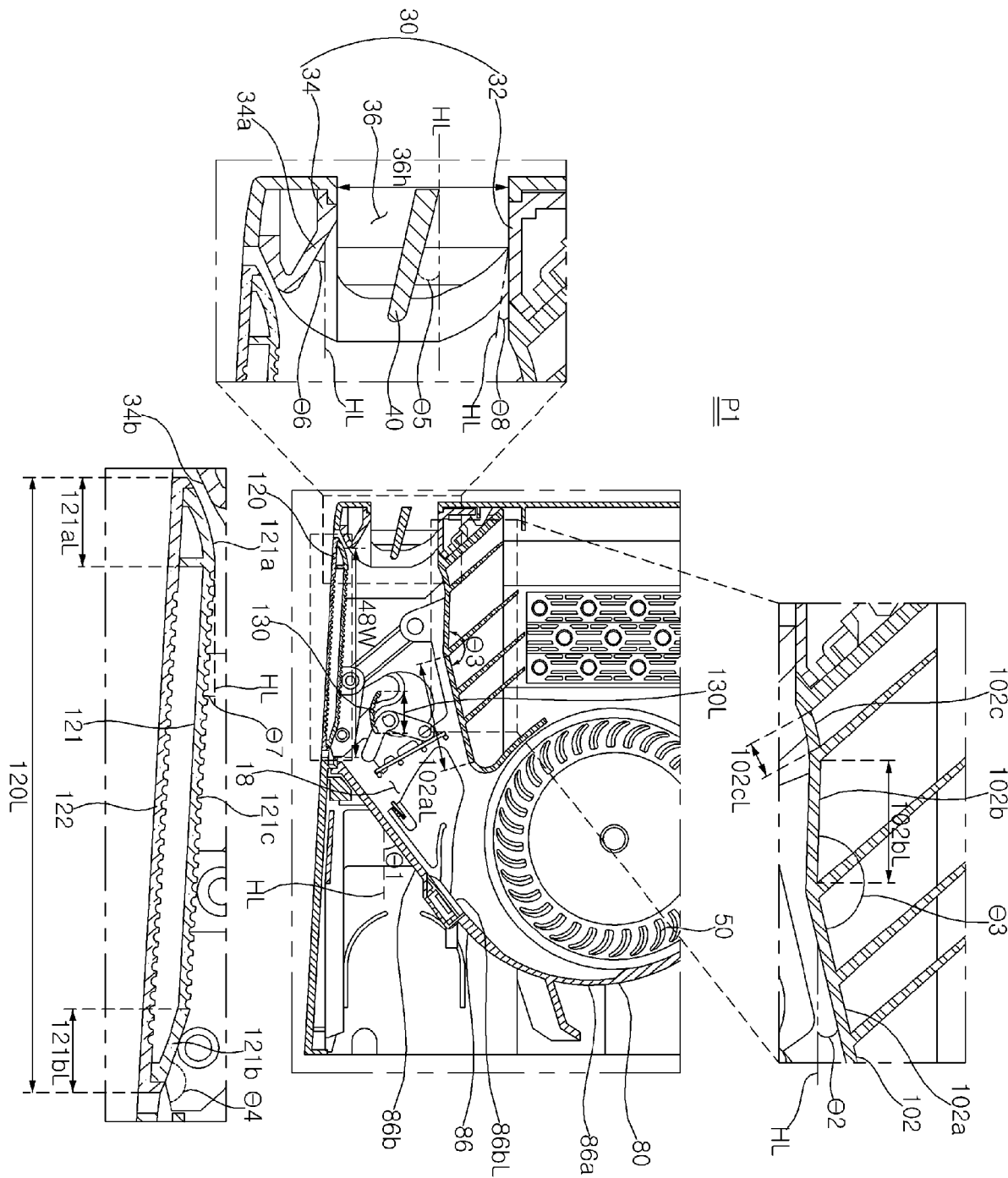


FIG. 7

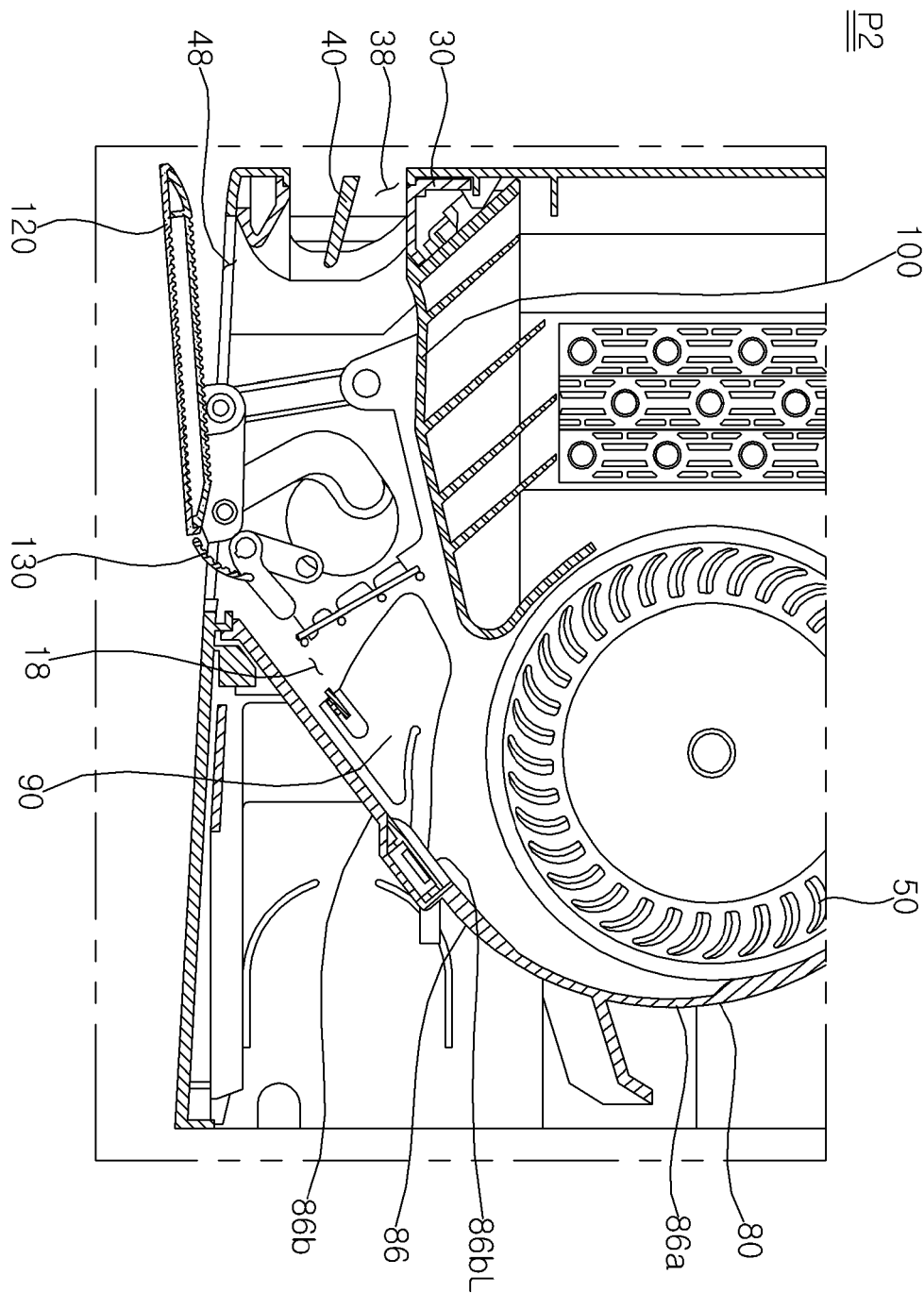


FIG. 8

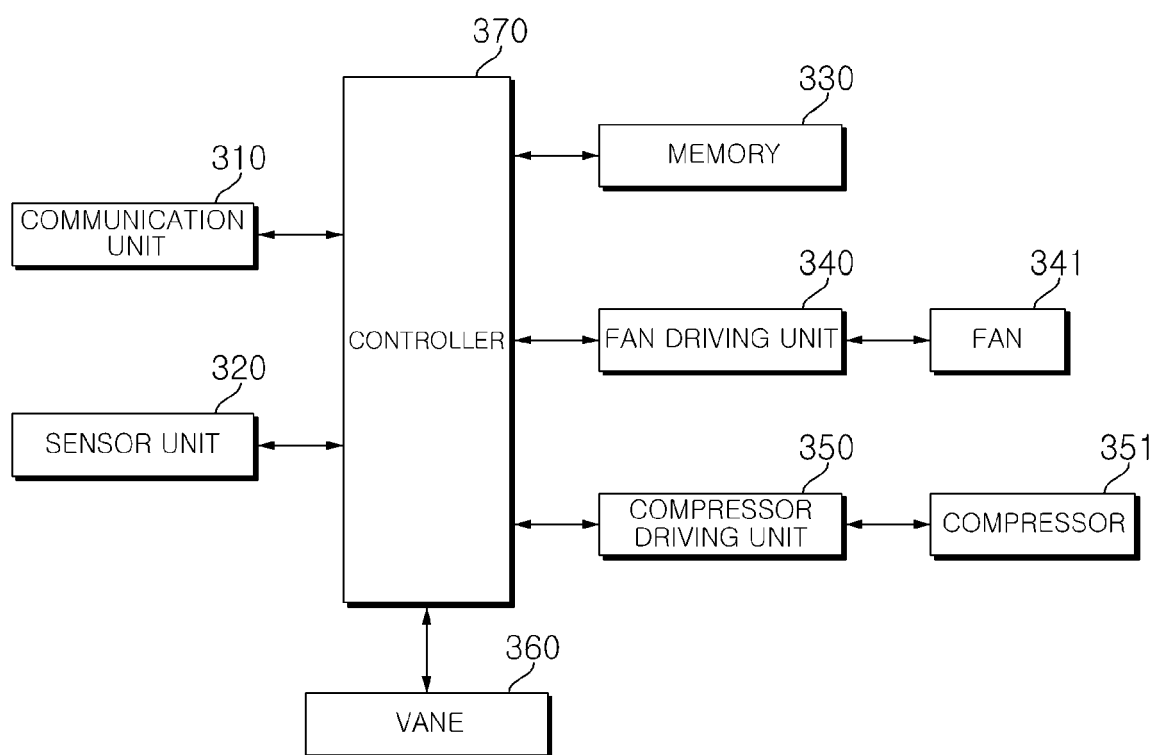


FIG. 9

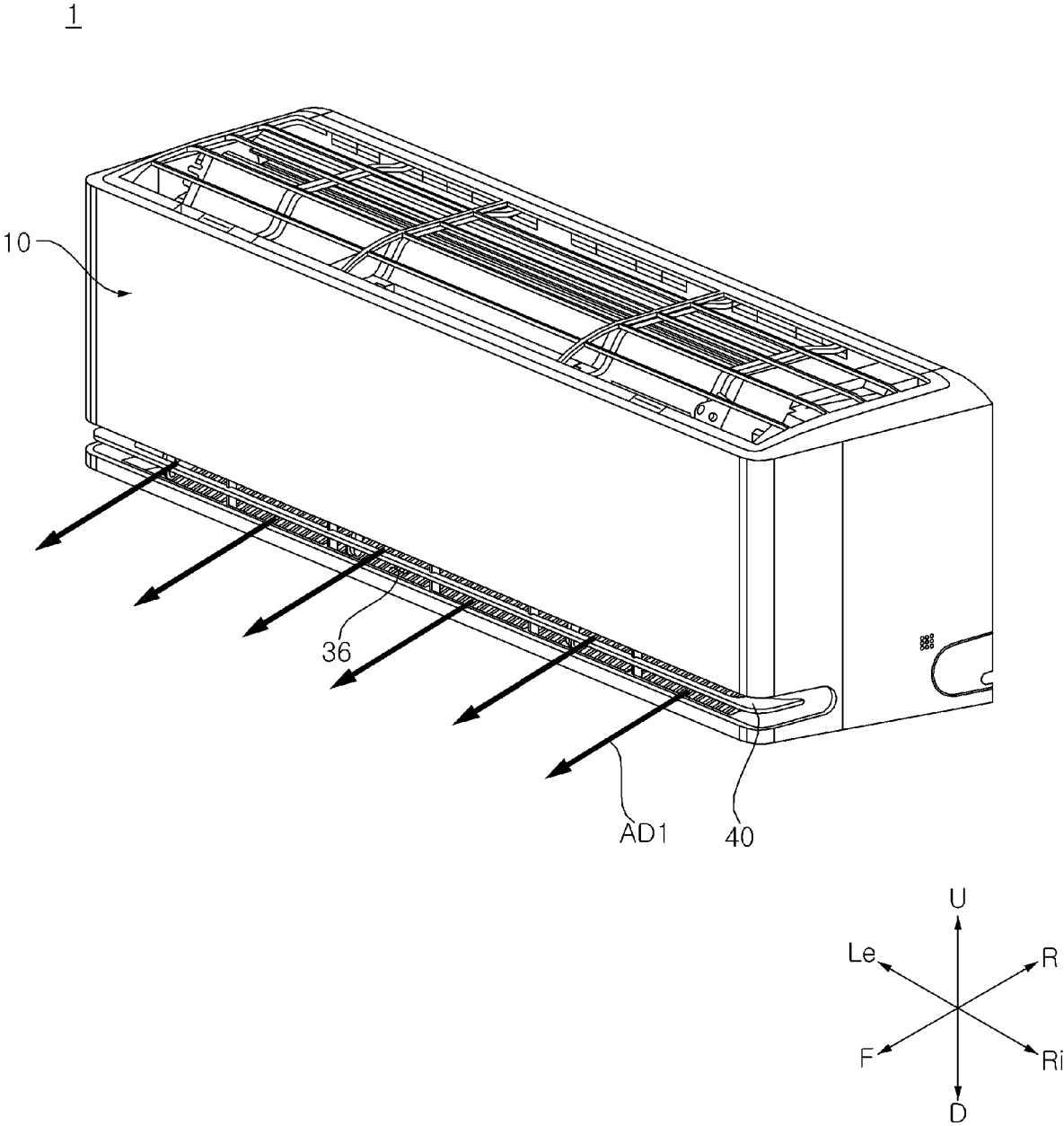


FIG. 10

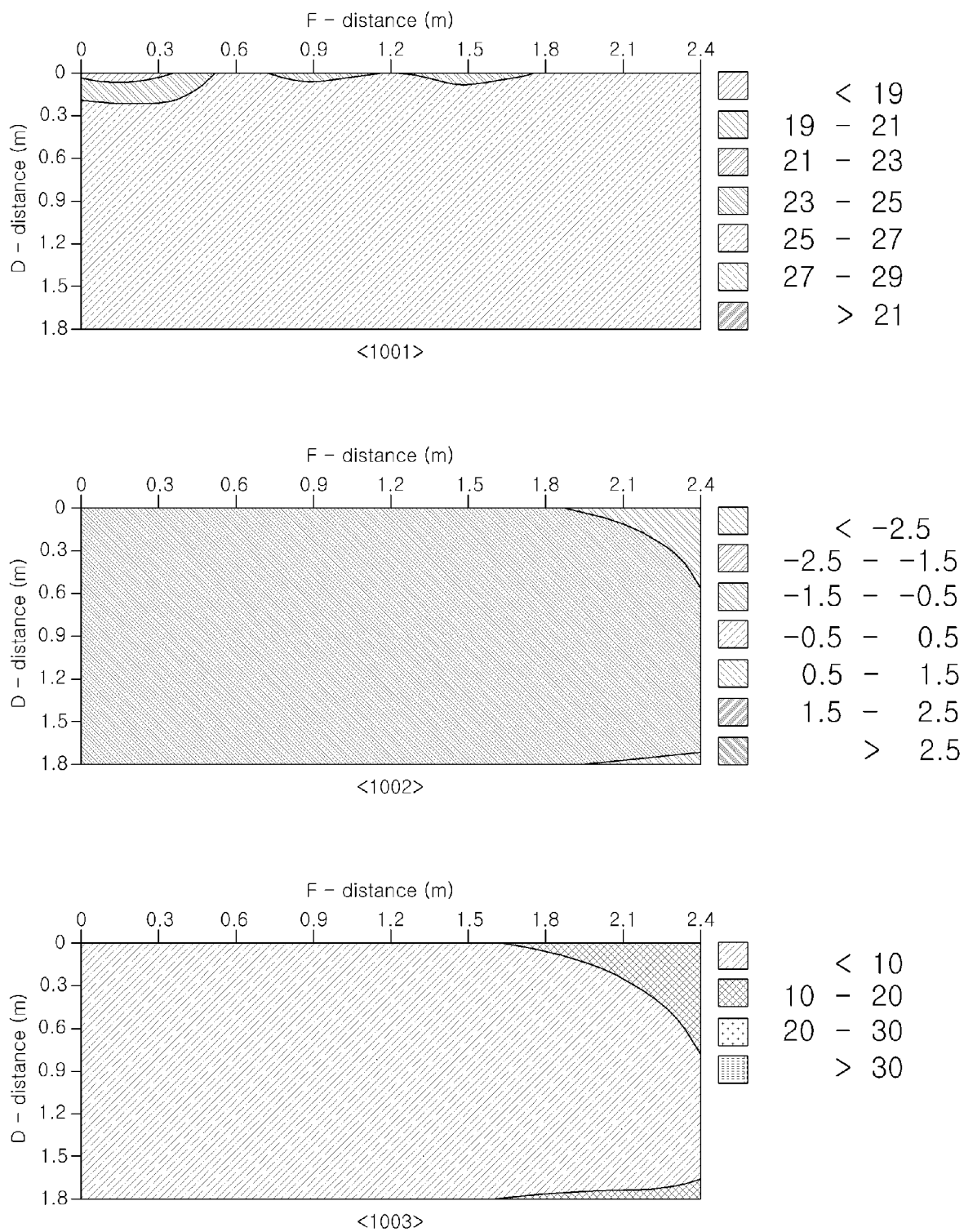


FIG. 11

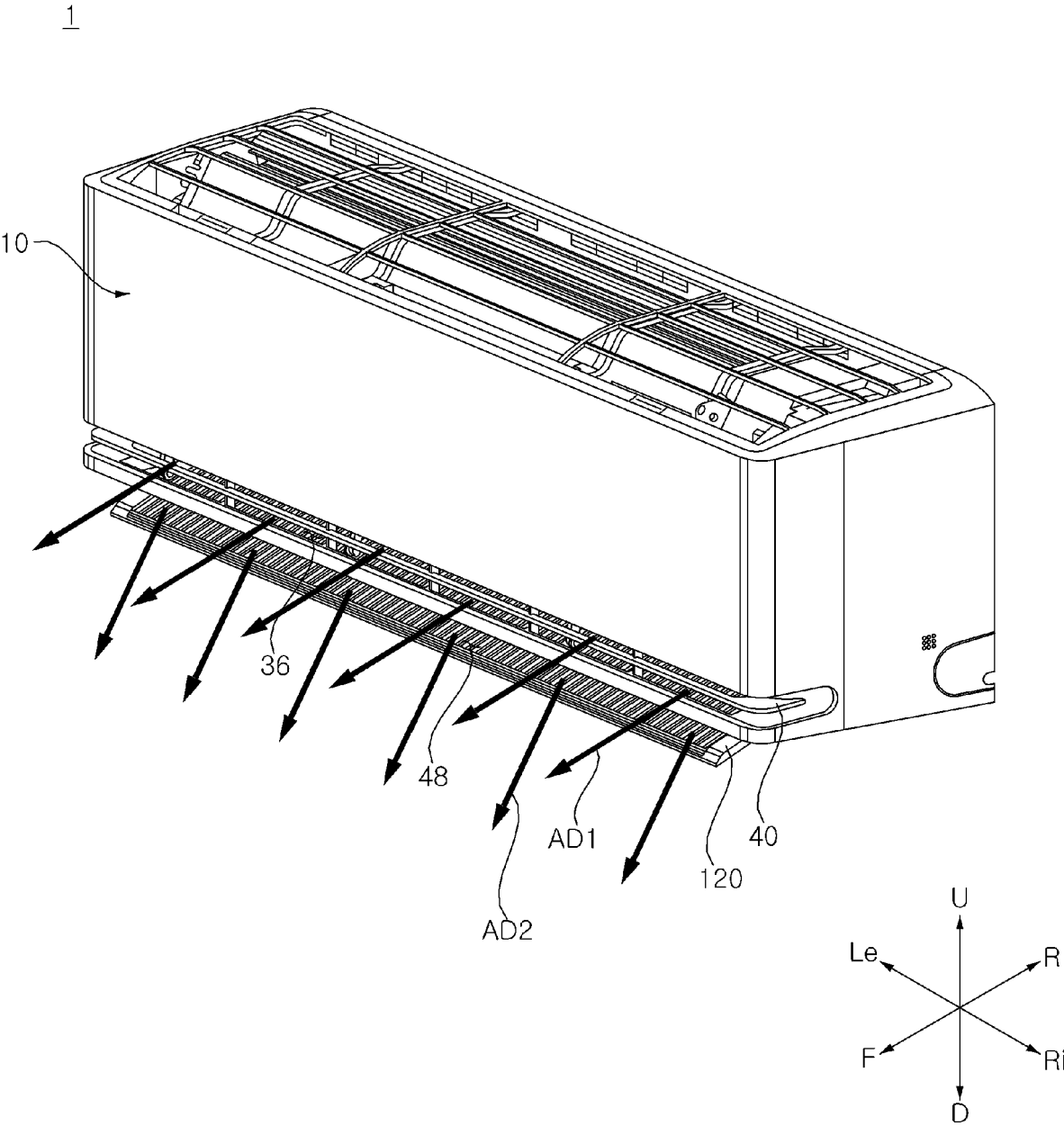


FIG. 12

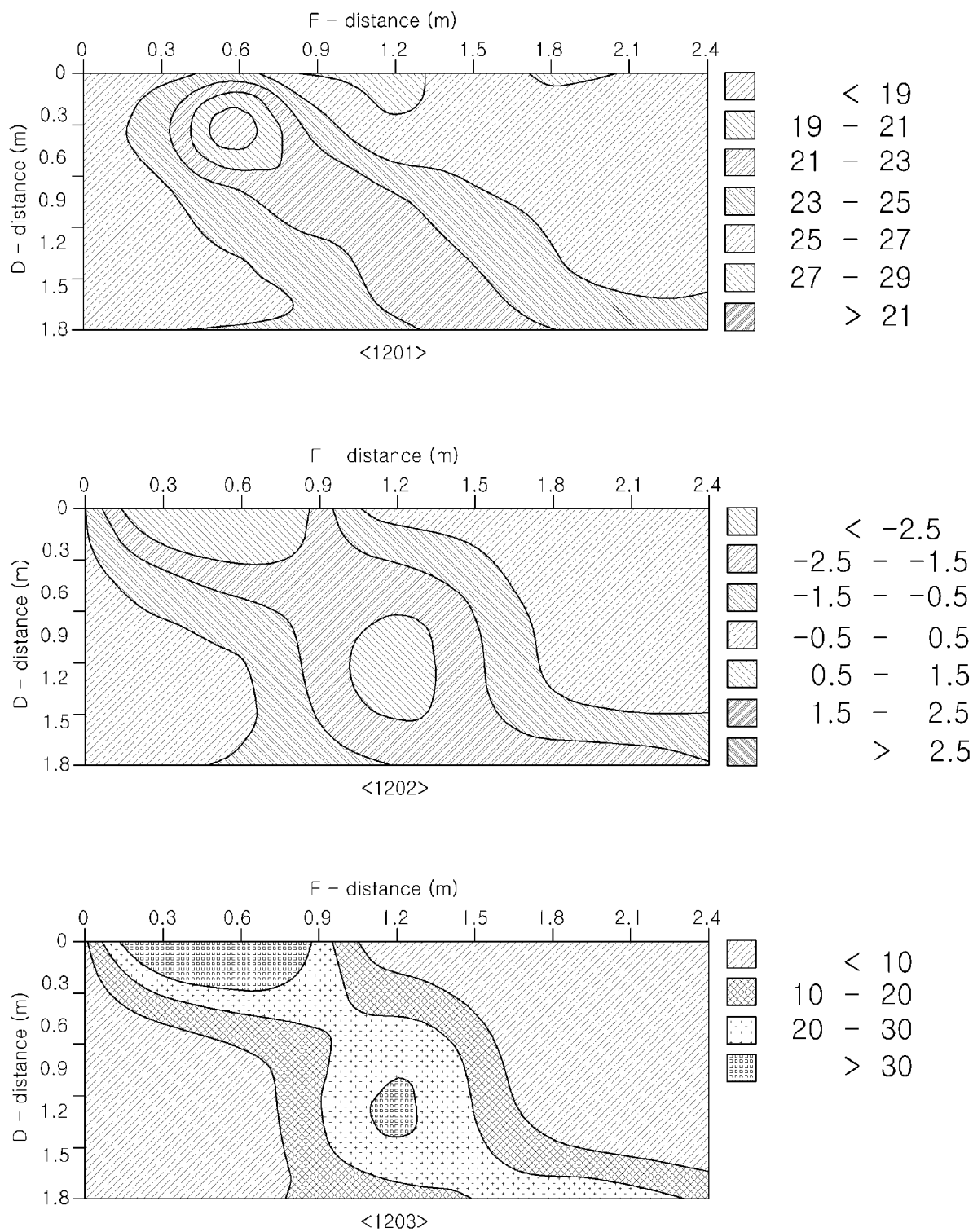


FIG. 13

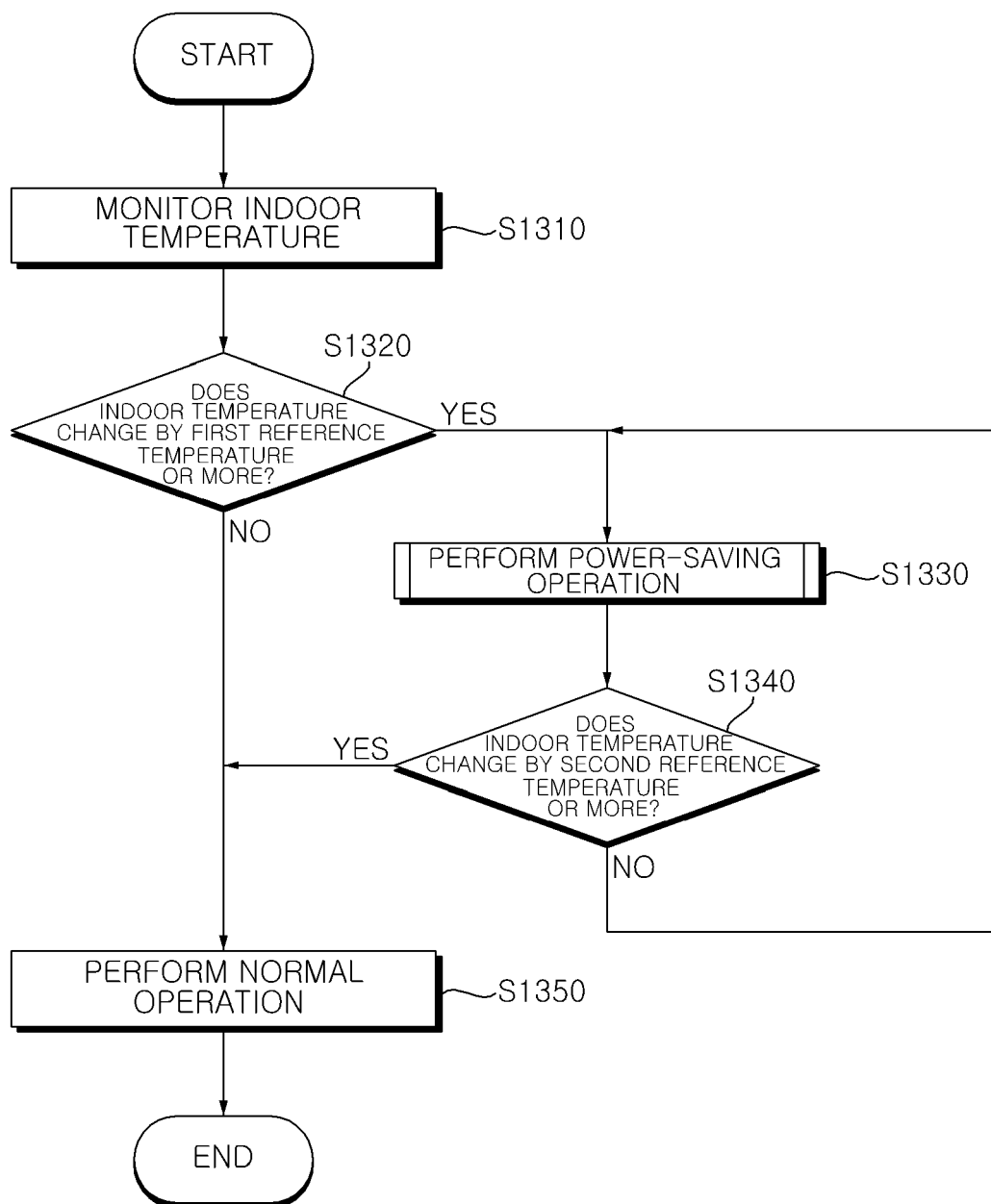


FIG. 14

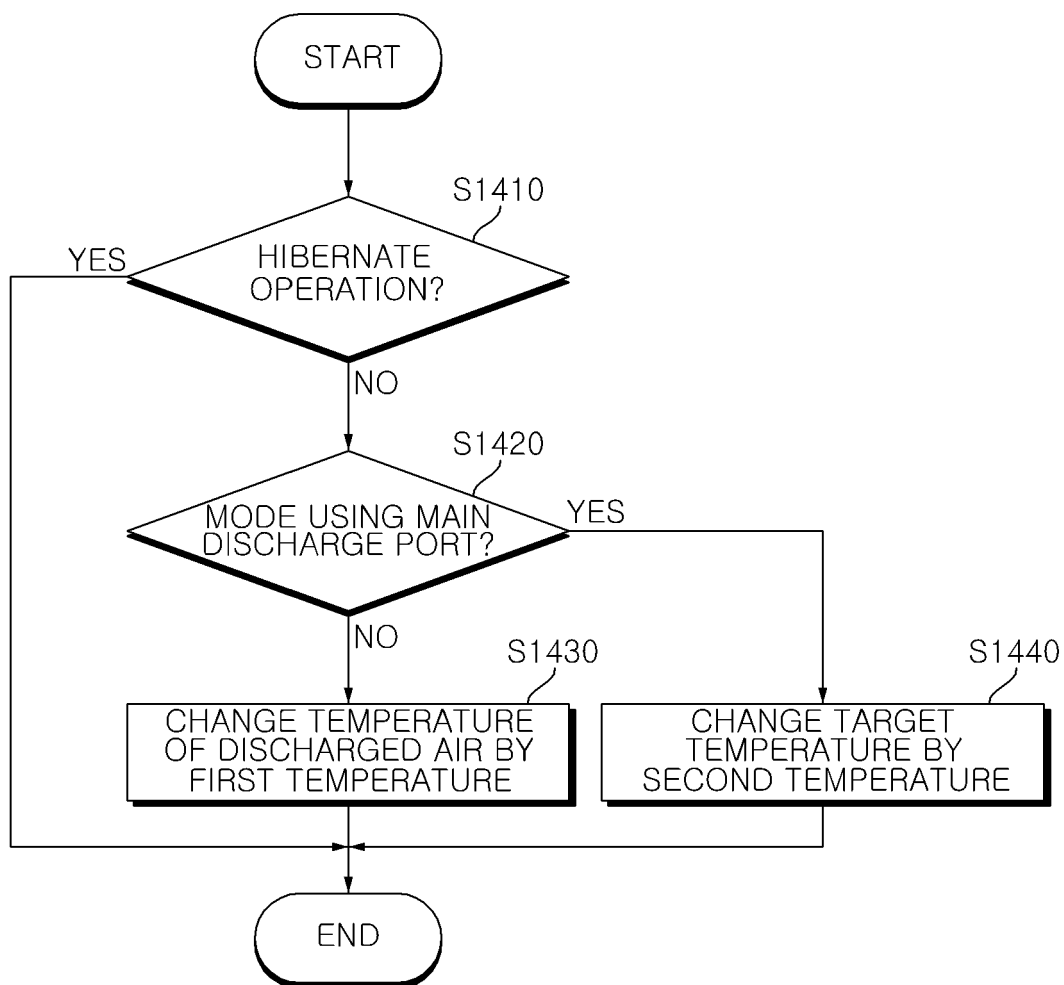
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FIG. 15

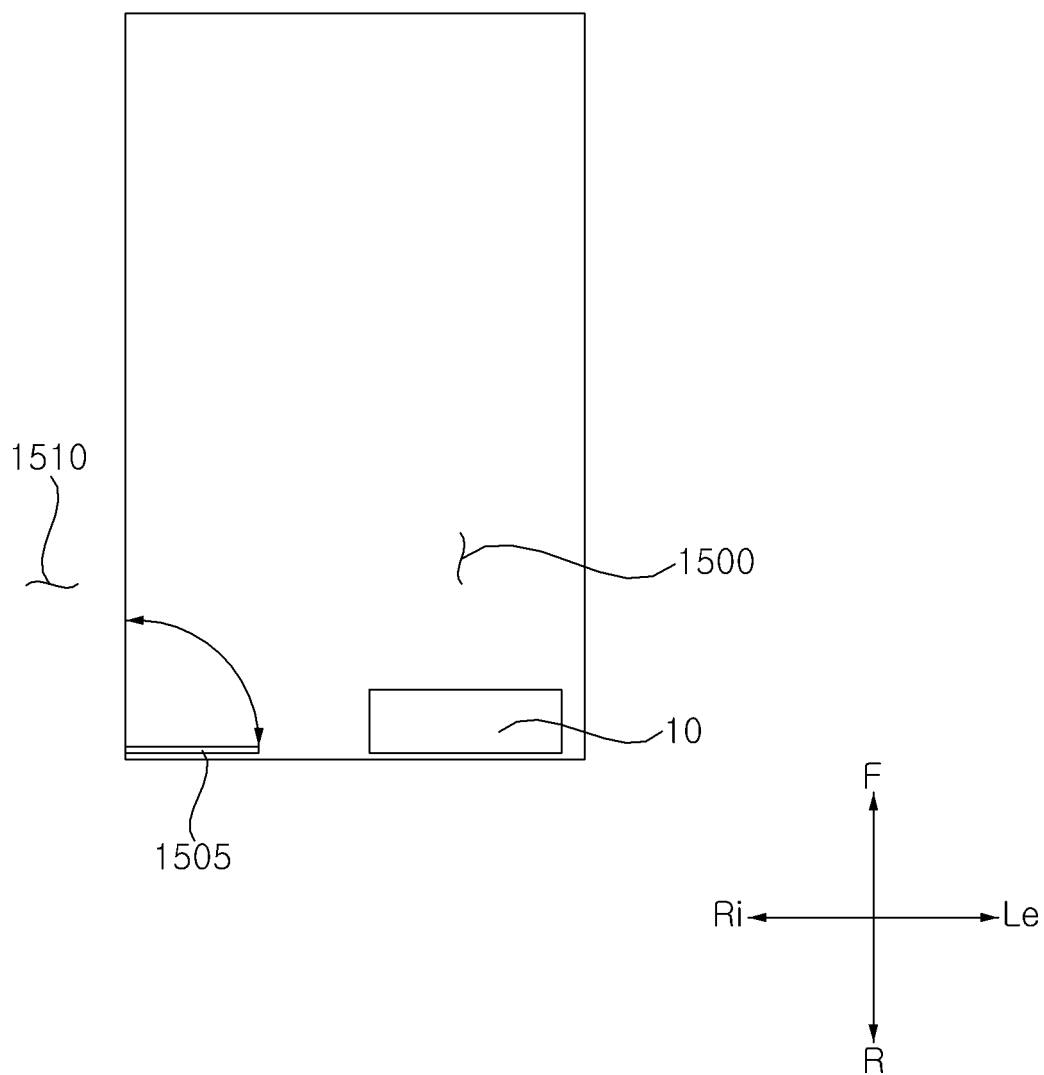


FIG. 16

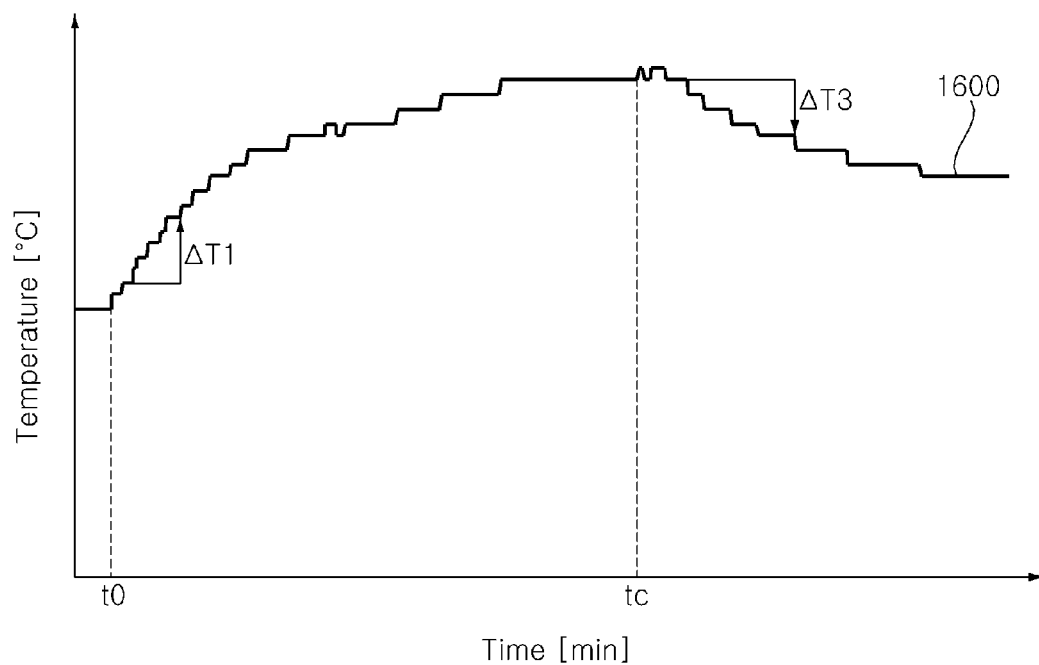


FIG. 17

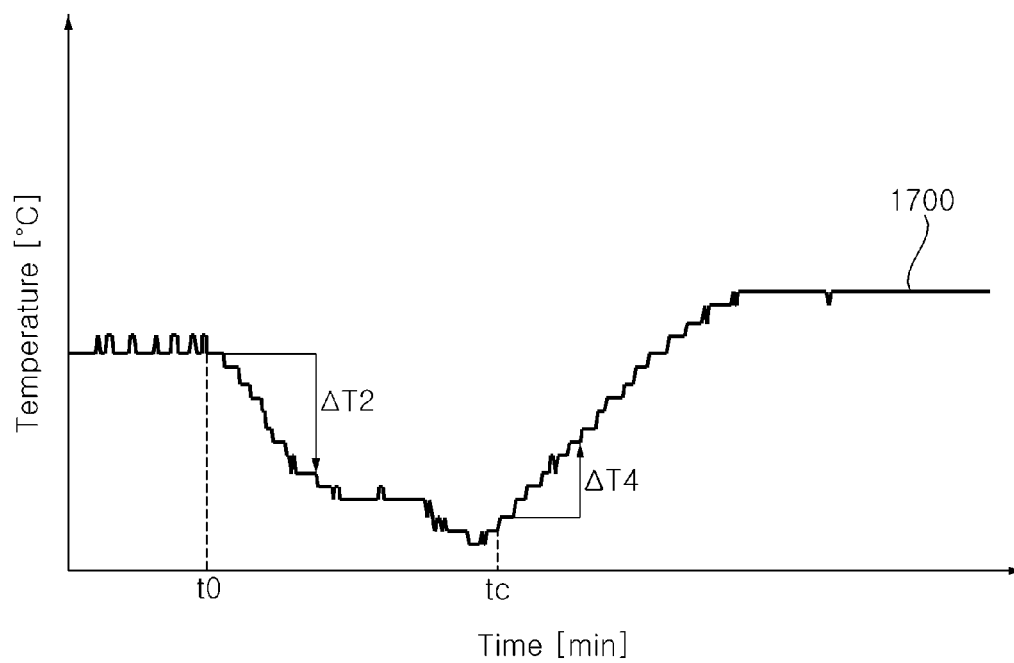
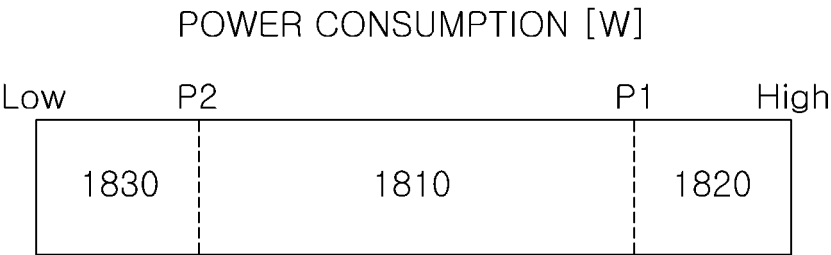


FIG. 18





EUROPEAN SEARCH REPORT

Application Number

EP 24 21 5652

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 113 819 607 A (QINGDAO HAIER AIR CONDITIONER ET AL.) 21 December 2021 (2021-12-21) * the whole document *	1-15	INV. F24F1/0057 F24F11/46 F24F11/61 F24F11/65 F24F11/86
Y	CN 206 207 662 U (DALITEK INTELLIGENT TECH INC) 31 May 2017 (2017-05-31) * pages 11-12 *	1-15	ADD. F24F110/10
Y	CN 216 897 718 U (GUANGDONG AKE TECH CO LTD) 5 July 2022 (2022-07-05) * pages 6-7 *	1-15	
Y	CN 109 442 670 A (GREE ELECTRIC APPLIANCES INC ZHUHAI) 8 March 2019 (2019-03-08) * paragraphs [0047] - [0056] *	1-15	
Y	KR 102 293 072 B1 (LG ELECTRONICS INC [KR]) 25 August 2021 (2021-08-25) * figures 30b, 31b *	6,7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
Place of search		Date of completion of the search	Examiner
Munich		18 March 2025	Blot, Pierre-Edouard
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EP 24 21 5652

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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18-03-2025

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 113819607 A	21-12-2021	NONE	
CN 206207662 U	31-05-2017	NONE	
CN 216897718 U	05-07-2022	NONE	
CN 109442670 A	08-03-2019	NONE	
KR 102293072 B1	25-08-2021	NONE	

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EPO FORM P0459

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Patent documents cited in the description

- KR 1020230169996 [0001]
- KR 1020180085101 [0005]