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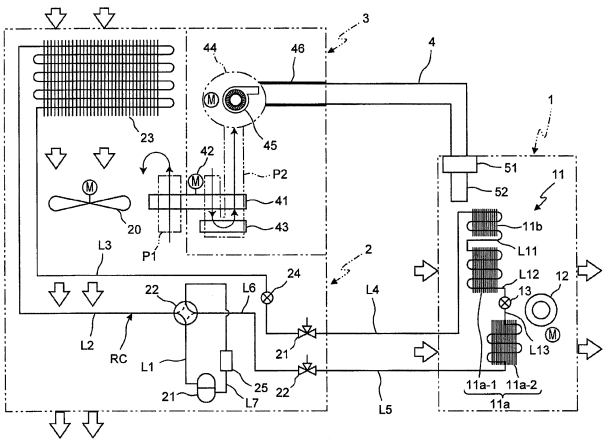
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(54) **AIR CONDITIONER**

(57) An air conditioner includes a refrigerant circuit (RC), an indoor unit (1) having a casing and an indoor fan (12), a humidified air supply device (3) that supplies humidified air into the casing, and a control device that performs cleaning operation of an indoor heat exchanger (11) by controlling the refrigerant circuit (RC) and the humidified air supply device (3) to supply humidified air from the humidified air supply device (3) into the casing and to cause the indoor heat exchanger (11) to function as an evaporator. The control device controls, during a first time period from when information related to start of the cleaning operation is received until a predetermined time elapses, the refrigerant circuit (RC) to restrict a flow rate of refrigerant to the indoor heat exchanger (11) more than during the cleaning operation or to set evaporation temperature (Te) of the indoor heat exchanger (11) higher than during the cleaning operation, and controls, after the first time period, the refrigerant circuit (RC) and the humidified air supply device (3) to perform the cleaning operation.

Fig.2



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to air conditioners.

BACKGROUND ART

[0002] There is a conventional air conditioner that condenses moisture on a surface of an indoor heat exchanger to perform cleaning operation of the surface of the indoor heat exchanger with condensed water droplets (refer to Patent Literature 1: Japanese Patent No. 6296633, for example). In the cleaning operation, the air conditioner causes the indoor heat exchanger to function as an evaporator to set evaporation temperature of refrigerant for the indoor heat exchanger to be equal to or lower than a dew-point temperature.

CITATIONS LIST

PATENT LITERATURE

[0003] Patent Literature 1: Japanese Patent No. 6296633

SUMMARY OF INVENTION

TECHNICAL PROBLEMS

[0004] There has been a problem with the air conditioner that a sufficient amount of water for cleaning the indoor heat exchanger cannot be obtained, because water droplets condensed in the indoor heat exchanger are formed from water vapor included in indoor air, and thus the quantity of water droplets that clean the surface of the indoor heat exchanger depends on the amount of moisture included in the indoor air.

[0005] Therefore, in order to solve such a problem, there has been proposed an air conditioner capable of obtaining a sufficient amount of water for cleaning an indoor heat exchanger by including a humidified air supply device that supplies humidified air into an indoor unit.

[0006] However, there has been a problem with the air conditioner including the humidified air supply device that excessive cooling of a casing causes dew condensation on the casing if the cleaning operation is started after heating operation or cooling operation ends and if the indoor heat exchanger is caused to function as an evaporator before humidified air is supplied from the humidified air supply device.

[0007] The present disclosure proposes an air conditioner capable of reducing or suppressing formation of dew condensation on a casing when cleaning an indoor heat exchanger.

SOLUTIONS TO PROBLEMS

[0008] An air conditioner according to an aspect of the present disclosure includes
a refrigerant circuit in which a compressor, an outdoor heat exchanger, an expansion mechanism, and an indoor heat exchanger are connected in a loop,
an indoor unit having a casing in which the indoor heat exchanger is disposed in an airflow pathway and an indoor fan disposed in the airflow pathway of the casing,
a humidified air supply device that supplies humidified air into the casing, and
a control device that performs cleaning operation of the indoor heat exchanger by controlling the refrigerant circuit and the humidified air supply device to supply humidified air from the humidified air supply device into the casing and to cause the indoor heat exchanger to function as an evaporator, in which
the control device controls, during a first time period from when information related to start of the cleaning operation is received until a predetermined time elapses, the refrigerant circuit to regulate a flow rate of refrigerant to the indoor heat exchanger more than during the cleaning operation or to set evaporation temperature of the indoor heat exchanger higher than during at a time of the cleaning operation, and
after the first time period, the control device controls the refrigerant circuit and the humidified air supply device to perform the cleaning operation.

[0009] According to the present disclosure, excessive cooling of a casing is prevented, because during the first time period from when information related to start of the cleaning operation (an end of heating operation, cooling operation, or the like) is received until the predetermined time elapses, the control device controls the refrigerant circuit to restrict a flow rate of refrigerant to the indoor heat exchanger more than during the cleaning operation or to set evaporation temperature of the indoor heat exchanger higher than during the cleaning operation, by which, during the first time period before starting the cleaning operation, the indoor heat exchanger is prevented from functioning as an evaporator or capability of the evaporator is reduced until after humidified air is supplied from the humidified air supply device. Therefore, formation of dew condensation on the casing can be reduced or suppressed when cleaning the indoor heat exchanger.

[0010] An air conditioner according to one embodiment of the present disclosure includes a flap attached to a blow-out port of the casing in a vertically tiltable manner, in which the control device controls tilting of the flap in a vertical direction to maintain the flap tilted upward from a horizontal during the first time period.

[0011] According to the present disclosure, blown-out air can be prevented from hitting a user in a room, because the control device controls tilting of the flap in the vertical direction to maintain the flap tilted upward from the horizontal during the first time period so that blown-out air is directed to a ceiling of the room.

[0012] In the air conditioner according to one embodiment of the present disclosure, the control device controls the indoor fan to drive the indoor fan at a predetermined number of rotations during the first time period.

[0013] According to the present disclosure, by the control device controlling the indoor fan to drive the indoor fan at a predetermined number of rotations during the first time period, it is possible to mask sound of a humidification fan or the like, which sound is transmitted from the humidified air supply device that has started operation in advance.

[0014] In the air conditioner according to one embodiment of the present disclosure, the control device controls, during the cleaning operation, the amount of refrigerant that flows to the indoor heat exchanger and the number of rotations of the indoor fan so that temperature of the indoor heat exchanger that functions as an evaporator is higher than 0°C and equal to or lower than a dew-point temperature.

[0015] According to the present disclosure, during the cleaning operation, water vapor included in humidified air from the humidified air supply device forms water droplets instead of freezing in the indoor heat exchanger by the control device controlling the amount of refrigerant that flows to the indoor heat exchanger and the number of rotations of the indoor fan so that the temperature of the indoor heat exchanger that functions as an evaporator is higher than 0°C and equal to or lower than a dew-point temperature.

[0016] In the air conditioner according to one embodiment of the present disclosure, the cleaning operation is performed without the first time period after humidifying operation in which the humidified air supply device supplies humidified air to the indoor unit, or after humidifying heating operation in which the humidified air supply device supplies humidified air to the indoor unit and the indoor heat exchanger is caused to function as a condenser.

[0017] According to the present disclosure, in cleaning operation after an end of humidifying operation in which the humidified air supply device supplies humidified air to the indoor unit, the humidified air supply device can immediately supply humidified air, and therefore, cleaning operation can be started without a first time period, and time can be saved as a result. Similarly, in cleaning operation after an end of the humidifying heating operation in which the humidified air supply device supplies humidified air to the indoor unit and the indoor heat exchanger is caused to function as a condenser, the humidified air supply device can immediately supply humidified air, and therefore, cleaning operation can be started without a first time period, and time can be saved as a result.

BRIEF DESCRIPTION OF DRAWINGS

[0018]

FIG. 1 is an external view of an air conditioner of a first embodiment of the present disclosure.

FIG. 2 is a circuit diagram of the air conditioner.

FIG. 3 is a schematic cross-sectional diagram of an indoor unit as viewed from line III-III in FIG. 1.

FIG. 4 is a control block diagram of the air conditioner.

FIG. 5 is a timing chart for describing cleaning operation of the air conditioner.

DESCRIPTION OF EMBODIMENTS

[0019] Hereinafter, embodiments will be described. Note that, in the drawings, identical reference signs represent identical or corresponding parts. In addition, dimensions on the drawings such as a length, a width, a thickness, and a depth have appropriately been changed from actual scales on the drawings for clarification and simplification, and do not represent actual relative dimensions.

[First embodiment]

[0020] FIG. 1 is an external view of an air conditioner of a first embodiment of the present disclosure.

[0021] As shown in FIG. 1, the air conditioner according to the first embodiment is a pair-type air conditioner including an indoor unit 1 and an outdoor unit 2 connected to the indoor unit 1 via refrigerant pipes L4 and L5. Furthermore, in the air conditioner, a humidification device 3 connected to the indoor unit 1 via a humidification hose 4 is provided on the outdoor unit 2. The humidification device 3 is an example of a humidified air supply device.

[0022] Furthermore, FIG. 2 is a circuit diagram of a refrigerant circuit RC included in the air conditioner.

<Configuration of indoor unit 1>

[0023] The indoor unit 1 of the air conditioner is, for example, a wall-mounted indoor unit attached to an indoor wall surface. The indoor unit 1 has a casing 10 (shown in FIG. 3), an indoor heat exchanger 11, and an indoor fan 12 that sends air to the indoor heat exchanger 11.

[0024] The indoor heat exchanger 11 is positioned on an upstream side of the indoor fan 12 with respect to air flow from the indoor fan 12. The indoor heat exchanger 11 has a main heat exchange unit 11a, an auxiliary heat exchange unit 11b, and an electromagnetic valve 13 in order to exchange heat between air from the indoor fan 12 and refrigerant.

[0025] Hereinafter, details of the main heat exchange unit 11a and the auxiliary heat exchange unit 11b will be described focusing on a refrigerant flow in a cooling cycle.

[0026] The main heat exchange unit 11a includes a front section 11a-1 positioned on an indoor side and a rear section 11a-2 positioned on a side opposite to the indoor side. Furthermore, the front section 11a-1 is fluidly

connected to the rear section 11a-2 via refrigerant pipes L12 and L13 and the electromagnetic valve 13. This allows refrigerant, which flows from an electric expansion valve 24 on a side of the outdoor unit 2 to the main heat exchange unit 11a, to flow into the rear section 11a-2 after flowing through the front section 11a-1.

[0027] The auxiliary heat exchange unit 11b is provided on a side opposite to the rear section 11a-2 of the main heat exchange unit 11a with respect to the front section 11a-1 of the main heat exchange unit 11a. That is, the auxiliary heat exchange unit 11b is positioned on an indoor side of the front section 11a-1 of the main heat exchange unit 11a. The auxiliary heat exchange unit 11b has a smaller capacity than a capacity of the main heat exchange unit 11a. Furthermore, the refrigerant pipe L4 is connected to one end of the auxiliary heat exchange unit 11b, and the front section 11a-1 of the main heat exchange unit 11a is connected to another end of the auxiliary heat exchange unit 11b via a refrigerant pipe L11. This allows refrigerant from a side of the electric expansion valve 24 on a side of the outdoor unit 2 to be supplied to the main heat exchange unit 11a via the auxiliary heat exchange unit 11b.

[0028] As the indoor fan 12, for example, a cross-flow fan is adopted. The cross-flow fan blows, to the inside of a room, air of which the temperature, or the like, is adjusted by the indoor heat exchanger 11.

[0029] The electromagnetic valve 13 is provided on a middle portion of a refrigerant path of the indoor heat exchanger 11. More specifically, the electromagnetic valve 13 is a valve for setting differential pressure between a side of the front section 11a-1 of the main heat exchange unit 11a and a side of the rear section 11a-2 of the main heat exchange unit 11a. The electromagnetic valve 13 is an on/off valve that can take only two positions, a large opening degree and a small opening degree, and is turned on when necessary (for example, during reheat dehumidifying operation described later) to be switched from the large opening degree position to the small opening degree position.

<Configuration of outdoor unit 2>

[0030] The outdoor unit 2 of the air conditioner has a compressor 21, a four-way switching valve 22, an outdoor heat exchanger 23, the electric expansion valve 24 as an example of an expansion mechanism, an accumulator 25, an outdoor fan 20 that sends air to the outdoor heat exchanger 23.

[0031] The outdoor heat exchanger 23 is positioned downstream of the outdoor fan 20 with respect to air flow from the outdoor fan 20. The refrigerant that flows through the outdoor heat exchanger 23 exchanges heat with air from the outdoor fan 20.

[0032] The expansion valve 24 is, for example, an electric valve that can be adjusted to three or more opening degrees different from one another, and the opening degree changes according to a signal from a control device 100 (shown in FIG. 4).

<Humidification device 3>

[0033] As shown in FIG. 2, the humidification device 3 has a disk-shaped humidifying rotor 41 provided with an adsorption area and a desorption area, a humidifying rotor drive motor 42, a heater 43, a damper 44, a humidification fan 45, and an outdoor unit-side humidification duct 46 to which the humidification hose 4 is connected.

[0034] In the humidifying rotor 41, an adsorbent such as silica gel, zeolite, or alumina is formed in a honeycomb shape or in a porous polygranular shape. The humidifying rotor 41 is provided so as to be rotatable by the humidifying rotor drive motor 42.

[0035] Furthermore, first and second air passages P1 and P2 for supplying humidified air are provided inside the humidification device 3.

[0036] The first air passage P1 is disposed so that air sucked inside the humidification device 3 by the outdoor fan 20 passes through the adsorption area of the humidifying rotor 41, and then discharged to outside. In the first air passage P1, moisture in the sucked air is adsorbed when the air passes through the adsorption area of the humidifying rotor 41, and the air is discharged in a dry state to outside.

[0037] The second air passage P2 is disposed so that air sucked inside the humidification device 3 by the humidification fan 45 is heated by the heater 43, passes through the desorption area of the humidifying rotor 41, and then supplied to the indoor unit 1 via the outdoor unit-side humidification duct 46. In the second air passage P2, the air sucked inside the humidification device 3 is moisturized by moisture adsorbed in the adsorption area when passing through the desorption area of the humidifying rotor 41, and then is supplied in a humidified state to the indoor unit 1.

<Configuration of refrigerant circuit RC>

[0038] The refrigerant circuit RC of the air conditioner includes the indoor heat exchanger 11, the compressor 21, the four-way switching valve 22, the outdoor heat exchanger 23, the electric expansion valve 24, the accumulator 25, and refrigerant pipes L1 to L7. More specifically, the indoor heat exchanger 11, the compressor 21, the four-way switching valve 22, the outdoor heat exchanger 23, the electric expansion valve 24, and the accumulator 25 are fluidly connected by the refrigerant pipes L1 to L7. This configures a looped refrigerant circuit RC. In such a refrigerant circuit RC, refrigerant circulates when the compressor 21 is driven.

[0039] Although not shown, the air conditioner includes a remote controller. The user can operate the remote controller to start or stop automatic air-conditioning operation, cooling operation, heating operation, dehumidifying operation, or the like.

[0040] FIG. 3 is a schematic cross-sectional diagram

of the indoor unit 1 as viewed from line III-III in FIG. 1.

[0041] As shown in FIG. 3, the indoor unit 1 includes the indoor heat exchanger 11 disposed in an airflow pathway Pw of the casing 10. In addition, the indoor fan 12 is disposed in the airflow pathway Pw of the casing 10 and on a downstream side of the indoor heat exchanger 11. Furthermore, a horizontal flap 31 capable of tilting in the vertical direction is provided at a blow-out port 1a of the airflow pathway Pw of the casing 10. The horizontal flap 31 is an example of a flap. The airflow pathway Pw of the casing 10 is a pathway of air flow indicated by a thick solid arrow shown in FIG. 3.

[0042] Furthermore, an indoor unit-side humidification duct 51 to which the humidification hose 4 (shown in FIG. 2) is connected and diffusion duct 52 are disposed in the airflow pathway Pw of the casing 10 and on an upstream side of the indoor heat exchanger 11. The diffusion duct 52 is connected to the indoor unit-side humidification duct 51 and extending in the casing 10 in a horizontal direction (refer to FIG. 1). On a back wall of the diffusion duct 52, a plurality of humidification blow-out ports (not shown) is formed side by side in the horizontal direction. Humidified air flowed from the indoor unit-side humidification duct 51 into the diffusion duct 52 is blown out from the plurality of humidification blow-out ports toward the indoor heat exchanger 11.

[0043] FIG. 4 is a control block diagram of the air conditioner.

[0044] As shown in FIG. 4, the indoor unit 1 is provided with an indoor heat exchanger temperature sensor T4 that detects temperature of the indoor heat exchanger 11, an indoor temperature sensor T5 that detects temperature of a room where the indoor unit 1 is installed, and a humidity sensor H that detects humidity of the room where the indoor unit 1 is installed.

[0045] As shown in FIG. 4, the outdoor unit 2 is provided with an outdoor heat exchanger temperature sensor T1 that detects temperature of the outdoor heat exchanger 23, an outside air temperature sensor T2 that detects outside air temperature, and an evaporation temperature sensor T3 that detects evaporation temperature of the electric expansion valve 24.

[0046] Furthermore, as shown in FIG. 4, the air conditioner has the control device 100 that controls the indoor unit 1 and outdoor unit 2, and a remote controller (not shown).

[0047] The control device 100 includes an indoor control unit (not shown) for the indoor unit 1 and an outdoor control unit (not shown)for the outdoor unit 2, each of which is provided with a central processing unit (CPU) that performs calculations, operations, or the like, a read only memory (ROM) that stores a program, data, or the like required for control of the indoor unit 1 and the outdoor unit 2, a random access memory (RAM), or the like. The control device 100 controls the compressor 21, the four-way switching valve 22, the electric expansion valve 24, the outdoor fan 20, the indoor fan 12, the electromagnetic valve 13, a display unit 30, a horizontal flap drive motor 32, the humidifying rotor drive motor 42, the heater 43, the damper 44, and the humidification fan 45 based on a signal or signals, or the like, from the remote controller or from one of the sensors (the outdoor heat exchanger temperature sensor T1, the outside air temperature sensor T2, the evaporation temperature sensor T3, the indoor heat exchanger temperature sensor T4, the indoor temperature sensor T5, and the humidity sensor H) of each of the indoor unit 1 and outdoor unit 2.

[0048] The remote controller can change content of control of the indoor unit 1 and outdoor unit 2 by the control device 100. For example, operation of the remote controller allows for selection of an operating mode of heating operation, cooling operation, or dehumidifying operation, performance of operation start, operation switching, or operation stop, setting or changing of indoor temperature or airflow volume, or starting or stopping of cleaning operation.

[0049] FIG. 5 is a timing chart for describing a cleaning operation. In this cleaning operation, an end of heating operation is used as information related to start of the cleaning operation, for example. Note that the control device 100 receives information related to start of cleaning operation when the remote controller is operated to have the cleaning operation started, or when air conditioning operation ends, after the user having operated the remote controller to set the air conditioner to execute cleaning operation after an end of the air conditioning operation such as heating operation or cooling operation.

[0050] In FIG. 5, it is assumed that execution of cleaning operation after an end of an air conditioning operation such as heating operation or cooling operation has been set by operation of the remote controller.

[0051] First, after the heating operation stops, during a preparation period (first time period) until a predetermined time T (20 minutes in this embodiment) elapses, the compressor 21 is stopped from operating, to prevent refrigerant from flowing to the refrigerant circuit RC, by which a flow rate of refrigerant to the indoor heat exchanger 11 is restricted.

[0052] In addition, operation of the humidification device 3 starts at a time of start of the preparation period. Specifically, the control device 100 controls the humidifying rotor drive motor 42, the heater 43, and the humidification fan 45 to rotate the humidifying rotor 41 of the humidification device 3 and turn on the heater 43 and the humidification fan 45 in order to prepare for supply of humidified air to the indoor unit 1 via the humidification hose 4.

[0053] Moreover, during the preparation period and during the cleaning operation, the indoor fan 12 is driven at a predetermined number of rotations. The predetermined number of rotations of the indoor fan 12 is a number of rotations capable of masking sound of the humidification fan transmitted from the humidification device 3.

[0054] Furthermore, during the preparation period and the cleaning operation, the horizontal flap 31 is opened

to a predetermined opening degree so that a direction of blown-out air from the horizontal flap 31 is upward from the horizontal.

[0055] Then, when the preparation period ends and the cleaning operation starts, operation of the compressor 21 is started, and the indoor heat exchanger 11 is caused to function as an evaporator in the cooling cycle. When temperature of the indoor heat exchanger 11 is higher than 0°C and equal to or lower than a dew-point temperature, water droplets start to adhere to the indoor heat exchanger 11.

[0056] In the air conditioner having the above configuration, the control device 100 controls the refrigerant circuit RC to restrict a flow rate of refrigerant to the indoor heat exchanger 11 during the preparation period (first time period) from when information related to start of the cleaning operation is received until the predetermined time T (20 minutes in this embodiment) elapses. In this preparation period, the control device 100 controls the humidifying rotor drive motor 42, the heater 43, and the humidification fan 45 to rotate the humidifying rotor 41 of the humidification device 3 and turn on the heater 43 and the humidification fan 45 in order to prepare for supply of humidified air to the indoor unit 1 via the humidification hose 4.

[0057] Note that, only adsorption operation may be performed during the preparation period, in which the humidifying rotor 41 of the humidification device 3 is rotated to cause the adsorption area of the humidifying rotor 41 to adsorb moisture, and the humidified air may actually be introduced to the indoor unit 1 from the humidification device 3 after the cleaning operation starts.

[0058] Thus, when cleaning operation is started after heating operation or cooling operation ends, the indoor heat exchanger 11 is prevented from functioning as an evaporator until humidified air is substantially supplied from the humidification device 3 (humidified air supply device), by which excessive cooling of the casing 10 is prevented. Therefore, formation of dew condensation on the casing 10 can be reduced or suppressed when cleaning the indoor heat exchanger 11.

[0059] In addition, blown-out air can be prevented from hitting a user in the room, because the control device 100 controls tilting of the horizontal flap 31 in the vertical direction to maintain the horizontal flap 31 tilted upward from the horizontal during the preparation period so that blown-out air is directed to a ceiling of the room.

[0060] Moreover, by the control device 100 controlling the indoor fan 12 to drive the indoor fan 12 at a predetermined number of rotations during the preparation period, it is possible to mask sound of a humidification fan, which is transmitted to the inside of the room via the humidification hose 4 and the indoor unit 1 from the humidification device 3 that has started operation in advance, or the like.

[0061] Furthermore, during the cleaning operation, water vapor included in humidified air from the humidification device 3 can form water droplets and form dew condensation in the indoor heat exchanger 11 while preventing the indoor heat exchanger 11 from freezing, by the control device 100 controlling the amount of refrigerant that flows to the indoor heat exchanger 11 and the number of rotations of the indoor fan 12 so that temperature of the indoor heat exchanger 11 that functions as an evaporator is higher than 0°C and equal to or lower than a dew-point temperature.

[Second embodiment]

[0062] An air conditioner according to a second embodiment of the present disclosure is identical in configuration to the air conditioner according to the first embodiment except for operation of a control device 100, and will therefore be described with reference to FIGS. 1 to 4.

[0063] In the air conditioner according to the second embodiment, the control device 100 executes cleaning operation without a preparation period. after executing humidifying operation in which a humidification device 3 (humidified air supply device) supplies humidified air to an indoor unit 1, or after executing humidifying heating operation in which the humidification device 3 supplies humidified air to the indoor unit 1, and an indoor heat exchanger 11 is caused to function as a condenser.

[0064] According to the air conditioner having the above configuration, in the cleaning operation after an end of the humidifying operation in which the humidification device 3 supplies humidified air to the indoor unit 1, the humidification device 3 can immediately supply humidified air, and therefore, the cleaning operation can be started without a preparation period, and time can be saved as a result.

[0065] Similarly, in the cleaning operation after an end of the humidifying heating operation in which the humidification device 3 supplies humidified air to the indoor unit 1 and the indoor heat exchanger 11 is caused to function as a condenser, the humidification device 3 can immediately supply humidified air, and therefore, the cleaning operation can be started without a preparation period, and time can be saved as a result.

[0066] The air conditioner according to the second embodiment has effects similar to effects of the air conditioner of the first embodiment.

[Third embodiment]

[0067] An air conditioner according to a third embodiment of the present disclosure is identical in configuration to the air conditioner according to the first embodiment except for operation of a control device 100, and will therefore be described with also reference to FIGS. 1 to 4.

[0068] In the air conditioner according to the first embodiment, after air conditioning operation such as heating operation or cooling operation stops, , the compressor 21 is stopped from operating during a preparation period (first time period), to prevent refrigerant from flowing to

the refrigerant circuit RC. Meanwhile, in the air conditioner according to the third embodiment, during the preparation period (first time period), the compressor 21 is operated, and an indoor heat exchanger 11 is caused to function as an evaporator in a cooling cycle. At this time, a smaller amount of refrigerant, as compared to the subsequent cleaning operation, is flowed to the indoor heat exchanger 11 to restrict a flow rate of the refrigerant to the indoor heat exchanger 11, by which evaporation temperature Te of the indoor heat exchanger 11 detected by the indoor heat exchanger temperature sensor T4 is made higher than at a time of cleaning operation.

[0069] In the preparation period (first time period) before starting the cleaning operation, the capability of the indoor heat exchanger 11 as an evaporator can be reduced until humidified air is supplied from a humidification device 3 (humidified air supply device), by which excessive cooling of the casing 10 is prevented. Therefore, formation of dew condensation on the casing 10 can be reduced or suppressed when cleaning the indoor heat exchanger 11.

[0070] The air conditioner according to the third embodiment has effects similar to effects of the air conditioner of the first embodiment.

[0071] In the first to third embodiments described above, air conditioners including the humidification device 3, which is a humidified air supply device, have been described. However, the humidified air supply device is not limited to the described one, and may be a humidified air supply device, which is included in an indoor unit and to which water for humidification is supplied from a water tank, or the like.

[0072] Specific embodiments of the present disclosure have been described. However, the present disclosure is not limited to the above first to third embodiments, and various modifications can be made within the scope of the present disclosure.

REFERENCE SIGNS LIST

[0073]

1	Indoor unit
2	Outdoor unit
3	Humidification device
4	Humidification hose
10	Casing
11	Indoor heat exchanger
11a	Main heat exchange unit
11a-1	Front section
11a-2	Rear section
11b	Auxiliary heat exchange unit
12	Indoor fan
13	Electromagnetic valve
20	Outdoor fan
21	Compressor
22	Four-way switching valve
23	Outdoor heat exchanger
24	Electric expansion valve (expansion mechanism)
25	Accumulator
31	Horizontal flap
32	Horizontal flap drive motor
41	Humidifying rotor
42	Humidifying rotor drive motor
43	Heater
44	Damper
45	Humidification fan
46	Outdoor unit-side humidification duct
RC	Refrigerant circuit

Claims

1. An air conditioner comprising:

a refrigerant circuit (RC) in which a compressor (21), an outdoor heat exchanger (23), an expansion mechanism (24), and an indoor heat exchanger (11) are connected in a loop;
an indoor unit (1) having a casing (10) in which the indoor heat exchanger (11) is disposed in an airflow pathway (Pw) and an indoor fan (12) disposed in the airflow pathway (Pw) of the casing (10);
a humidified air supply device (3) that supplies humidified air into the casing (10); and
a control device (100) that performs cleaning operation of the indoor heat exchanger (11) by controlling the refrigerant circuit (RC) and the humidified air supply device (3) to supply humidified air from the humidified air supply device (3) into the casing (10) and to cause the indoor heat exchanger (11) to function as an evaporator,
wherein the control device (100) controls, during a first time period from when information related to start of the cleaning operation is received until a predetermined time elapses, the refrigerant circuit (RC) to regulate a flow rate of refrigerant to the indoor heat exchanger (11) more than during the cleaning operation or to set evaporation temperature (Te) of the indoor heat exchanger (11) higher than during the cleaning operation, and after the first time period, the control device (100) controls the refrigerant circuit (RC) and the humidified air supply device (3) to perform the cleaning operation.

2. The air conditioner according to claim 1, the air conditioner further comprising:

a flap (31) attached to a blow-out port (1a) of the casing (10) in a vertically tiltable manner,
wherein the control device (100) controls tilting of the flap (31) in a vertical direction to maintain the flap (31) tilted upward from a horizontal dur-

ing the first time period.

3. The air conditioner according to claim 2, wherein the control device (100) controls the indoor fan (12) to drive the indoor fan (12) at a predetermined number of rotations during the first time period.

4. The air conditioner according to any one of claim 1 to 3, wherein the control device (100) controls, during the cleaning operation, the amount of refrigerant that flows to the indoor heat exchanger (11) and the number of rotations of the indoor fan (12) so that temperature of the indoor heat exchanger (11) that functions as the evaporator is higher than 0°C and equal to or lower than a dew-point temperature.

5. The air conditioner according to any one of claim 1 to 4, wherein the cleaning operation is performed without the first time period after humidifying operation in which the humidified air supply device (3) supplies humidified air to the indoor unit (1), or after humidifying heating operation in which the humidified air supply device (3) supplies humidified air to the indoor unit (1) and the indoor heat exchanger (11) is caused to function as a condenser.

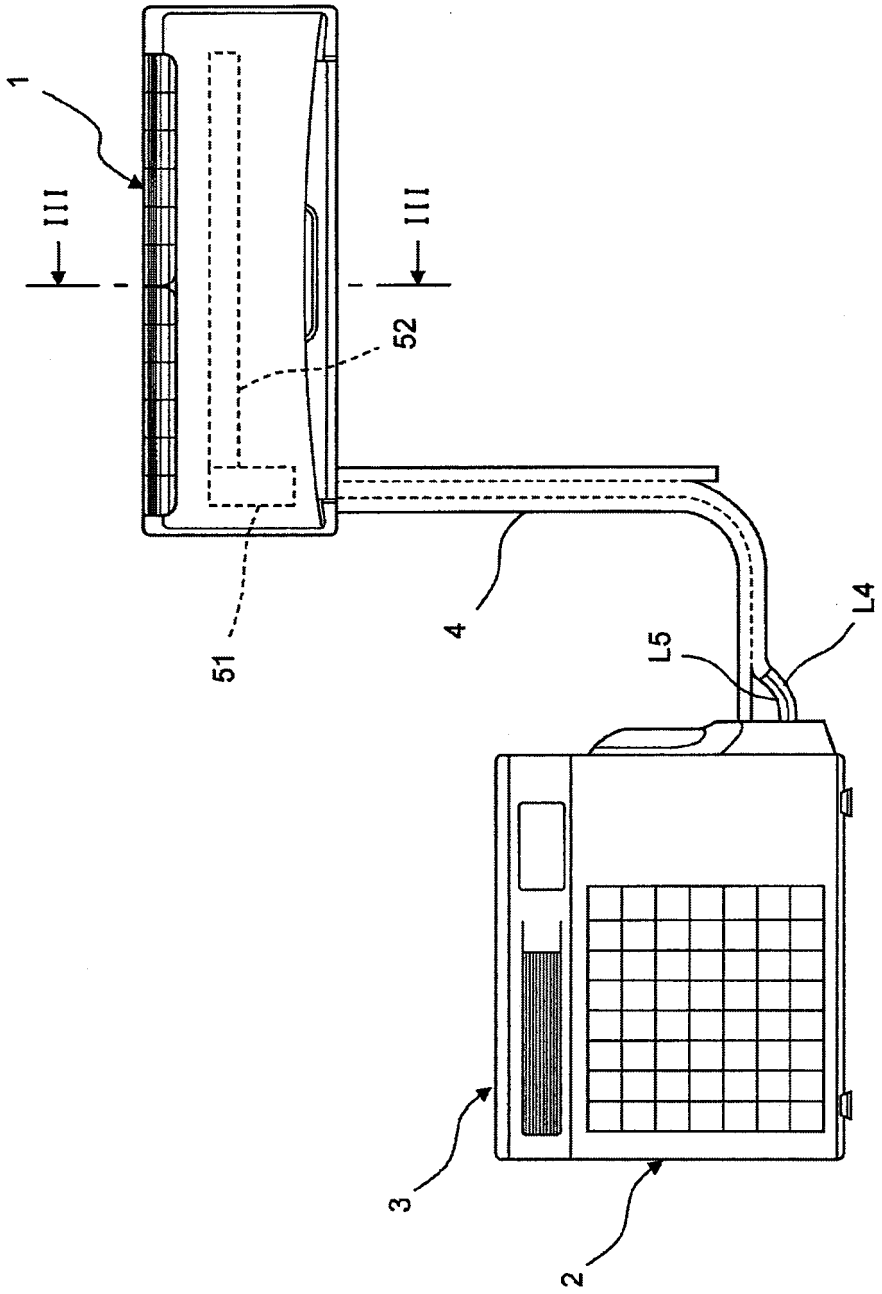


Fig.1

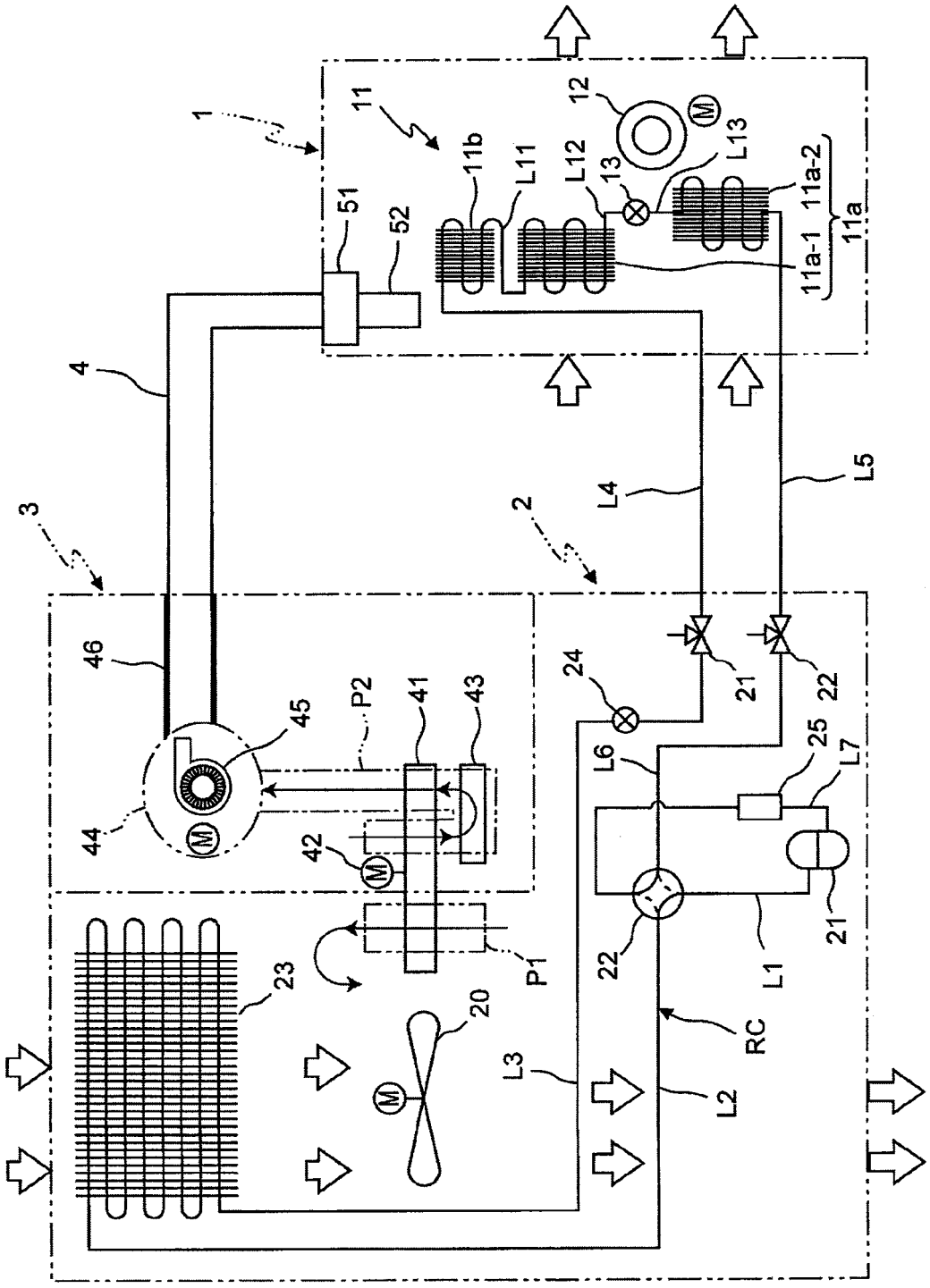

1
11
12
M
11b
L11
L12
13
L13
11a-2
11a
11a-1
51
52
4
3
2
L4
L5
46
45
P2
41
43
24
21
22
25
L6
L7
44
M
42
M
23
P1
20
M
L3
L2
RC
L1
21
22

Fig.2

Fig.3

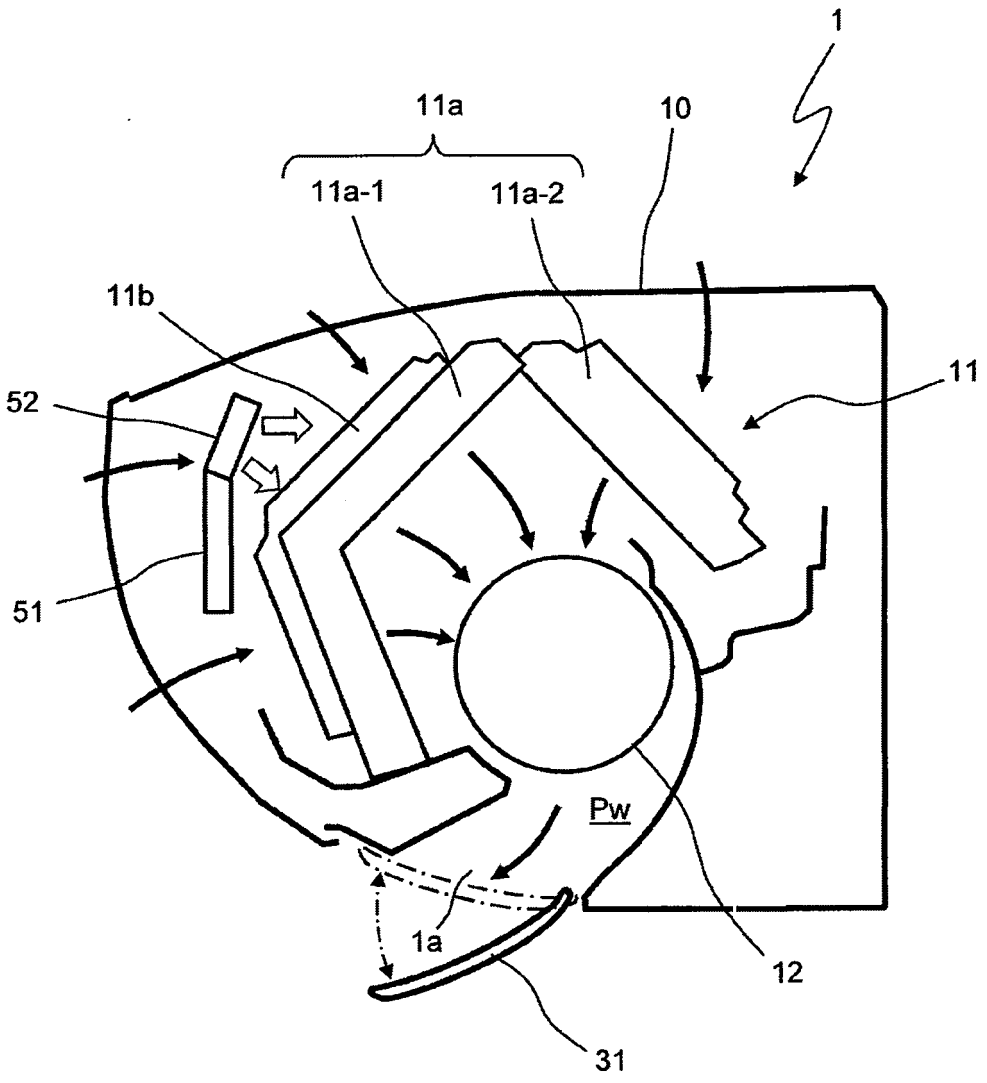


Fig.4

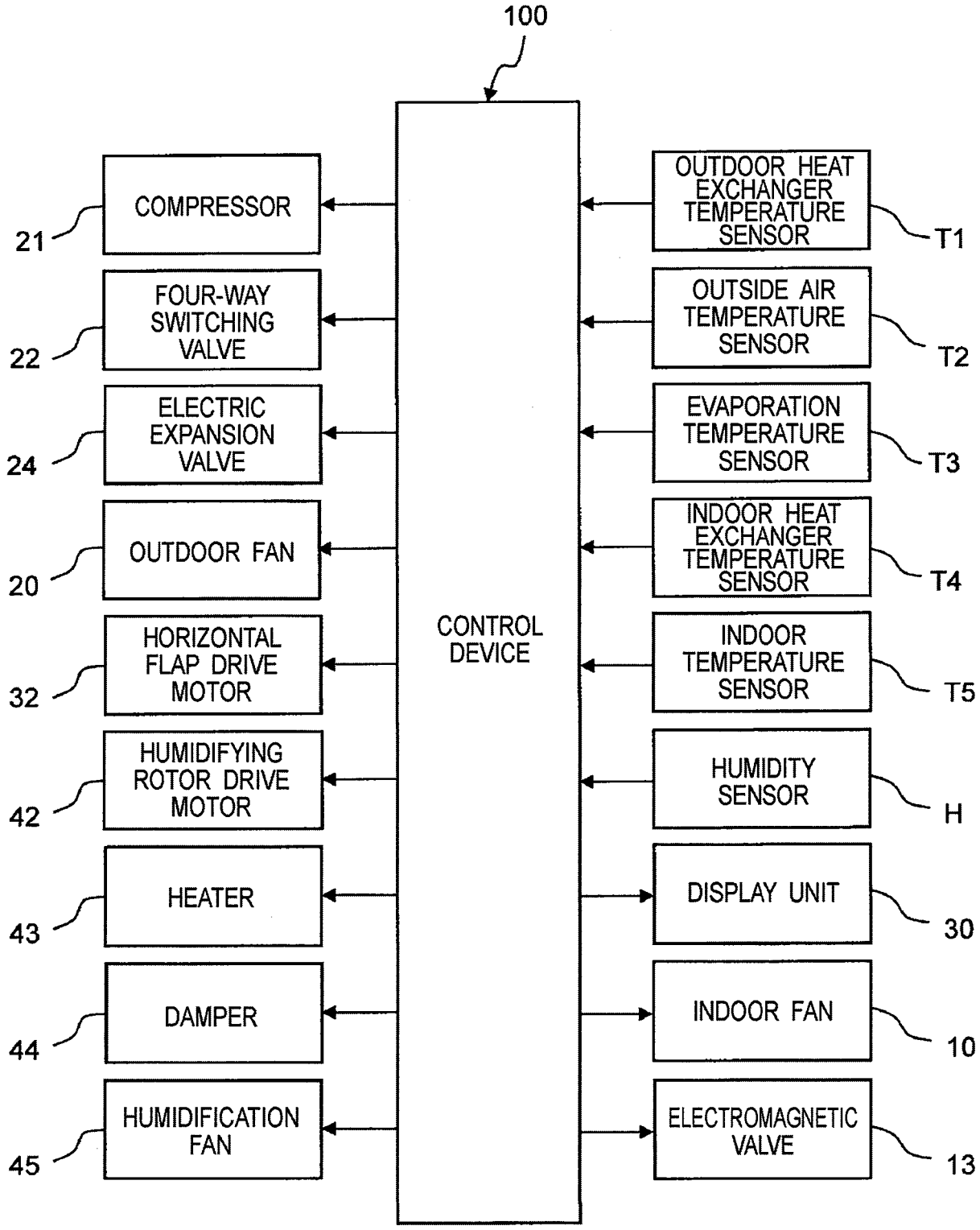
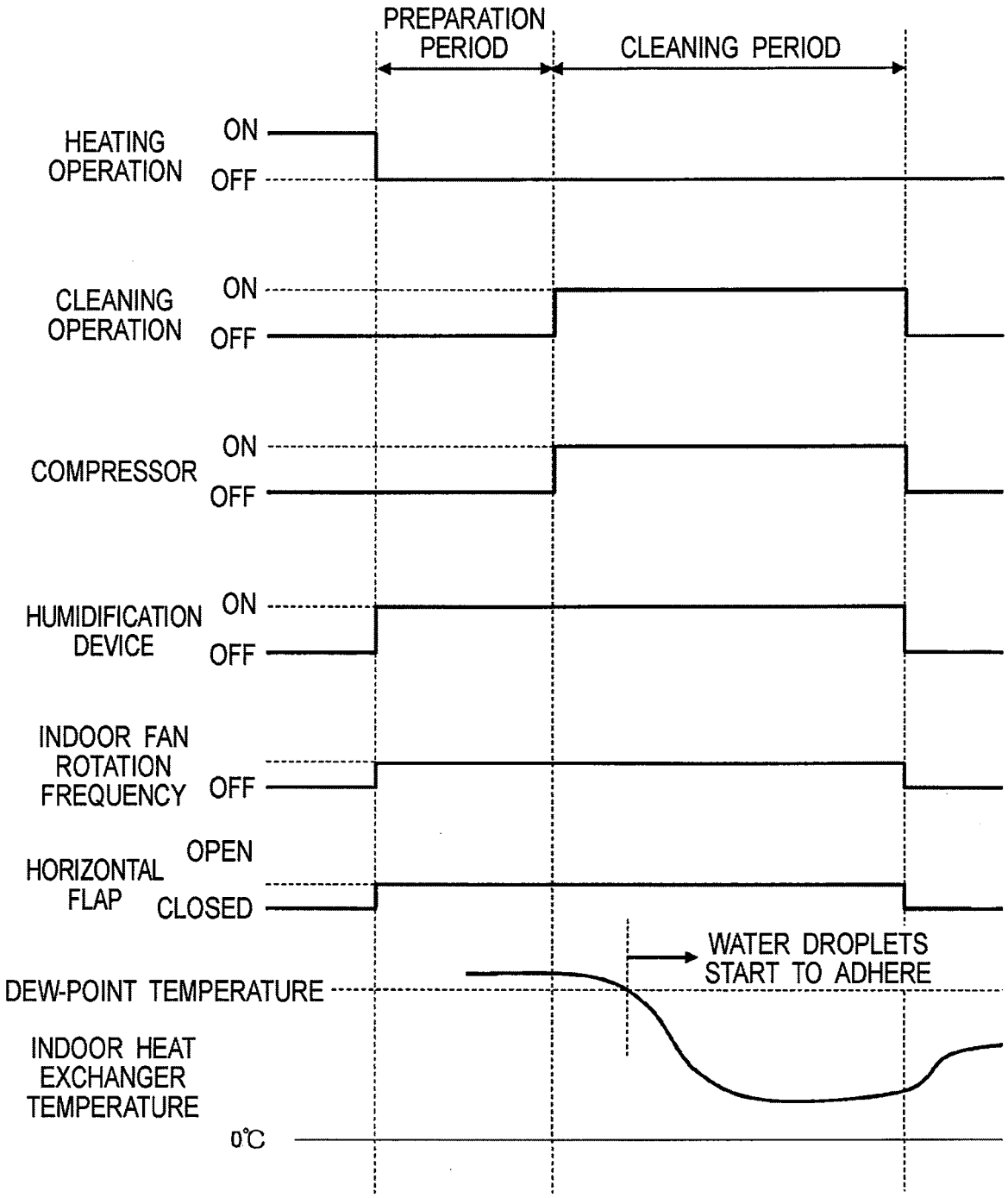

100
CONTROL DEVICE
COMPRESSOR
21
FOUR-WAY SWITCHING VALVE
22
ELECTRIC EXPANSION VALVE
24
OUTDOOR FAN
20
HORIZONTAL FLAP DRIVE MOTOR
32
HUMIDIFYING ROTOR DRIVE MOTOR
42
HEATER
43
DAMPER
44
HUMIDIFICATION FAN
45
OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
T1
OUTSIDE AIR TEMPERATURE SENSOR
T2
EVAPORATION TEMPERATURE SENSOR
T3
INDOOR HEAT EXCHANGER TEMPERATURE SENSOR
T4
INDOOR TEMPERATURE SENSOR
T5
HUMIDITY SENSOR
H
DISPLAY UNIT
30
INDOOR FAN
10
ELECTROMAGNETIC VALVE
13

Fig.5


PREPARATION PERIOD
CLEANING PERIOD
HEATING OPERATION
ON
OFF
CLEANING OPERATION
ON
OFF
COMPRESSOR
ON
OFF
HUMIDIFICATION DEVICE
ON
OFF
INDOOR FAN ROTATION FREQUENCY
OFF
HORIZONTAL FLAP
OPEN
CLOSED
WATER DROPLETS START TO ADHERE
DEW-POINT TEMPERATURE
INDOOR HEAT EXCHANGER TEMPERATURE
0℃

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/035601

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. F24F11/41(2018.01)i, F24F11/43(2018.01)i, F24F11/48(2018.01)i, F24F140/20(2018.01)n

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. F24F11/41, F24F11/43, F24F11/48, F24F140/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2019
Registered utility model specifications of Japan 1996-2019
Published registered utility model applications of Japan 1994-2019

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2009-300030 A (DAIKIN INDUSTRIES, LTD.) 24 December 2009, paragraphs [0031]-[0129], fig. 1-11 (Family: none)	1-5
Y	WO 2018/198397 A1 (HITACHI-JOHNSON CONTROLS AIR CONDITIONING, INC.) 01 November 2018, paragraphs [0009]-[0101], fig. 1-8 & JP 6276450 B1 & FR 3065792 A1 & CN 109154444 A & TW 201839325 A	1-5
Y	JP 2010-007999 A (DAIKIN INDUSTRIES, LTD.) 14 January 2010, paragraph [0061] (Family: none)	3-5

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

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14.11.2019	26.11.2019
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

- JP 6296633 B **[0002] [0003]**