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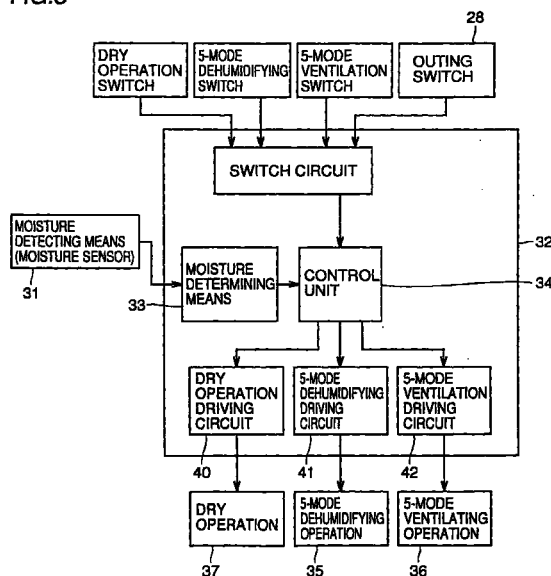
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(54) **Air conditioner having dehumidifying and ventilating functions**

(57) In order to solve the problems of ventilation and dehumidifying of an air conditioner, the air conditioner includes a refrigerant circuit formed by coupling at least a compressor (7), an indoor heat exchanger (4), a decompressor (8) and an outdoor heat exchanger (6), a humidifying/dehumidifying apparatus (10, 11, 12, 13, 14) provided separate from the refrigerant circuit, for removing moisture in the room, a moisture detection sensor (31) for detecting indoor moisture, and a control unit (34) for switching an operation mode based on the moisture detected by the moisture detection sensor (31). The humidifying/dehumidifying apparatus (10, 11, 12, 13, 14) guides the sucked indoor air to a path communicated to the room and a path communicated to the outside of the room in a ventilation mode (37, 35), and guides the sucked indoor air to the outside of the room in a dehumidifying mode.

FIG.5



EP 1 083 390 A2

Description**BACKGROUND OF THE INVENTION**

5 Field of the Invention

[0001] The present invention relates to an air conditioner having dehumidifying and ventilating functions and, more specifically, to an air conditioner capable of performing optimal operation in accordance with change in indoor or outdoor environment with improved user-friendliness. Description of the Background Art

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(First Prior Art)

[0002] Fig. 48 is a control block diagram schematically representing a conventional air conditioner. In a conventional air conditioner, dehumidifying, ventilating and drying operations have been performed separately as shown in Fig. 48. The dehumidifying operation includes two methods, that is, an operation in which an indoor fan flow rate is decreased and evaporation temperature of a refrigerant to be evaporated is lowered in an indoor heat exchanger to dehumidify in a cooling cycle operation utilizing a compressor (hereinafter referred to as "dry operation") and a method in which moisture in the air is dehumidified utilizing zeolite that absorbs and desorbs moisture (hereinafter referred to as "5-mode dehumidifying operation").

[0003] A method of ventilation utilizing the path of 5-mode dehumidifying operation utilizing zeolite is referred to as 5-mode ventilation.

[0004] In the above described conventional air conditioner, however, the dehumidifying operation and the ventilating operation are carried out separately. Though an operation mode is automatically selected corresponding to the change in indoor environment such as increase in room temperature or increase in moisture when, for example, the user is out, the operation does not always satisfactorily follow the change in the indoor situation to assure comfort.

[0005] Dehumidifying operation using the compressor when the user is out is not preferable to some users, as electricity charge is relatively high.

(Second Prior Art)

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[0006] In a conventional air conditioner, generally, various operation modes including heating, cooling, dehumidifying and automatic operation, for example, are selected and executed by an operation of a remote controller. As an additional function aside from such normal operation modes, some air conditioners have a dry operation mode intended for effectively drying laundry hang in a room. An example of the dry operation mode is as follows.

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(1) When the dry operation mode is selected, whether a heating operation or a dehumidifying operation to be carried out is determined based on a room temperature and an outdoor temperature, and the determined operation is started and continued for a prescribed time period.

(2) When the started operation is heating operation, the operation is switched to the dehumidifying operation from a specific time point (for example, 30 minutes) before the end of operation.

(3) When the started operation is the dehumidifying operation, the dehumidifying operation is continued for the prescribed time period entirely.

[0007] In case of (2), by the heating operation, water is evaporated from the wet laundry hang in the room for drying. The dehumidifying operation that follows removes the evaporated moisture from the room. In case of (3), moisture in the room is removed by the dehumidifying operation, whereby water is evaporated from laundry and the laundry dries.

[0008] Such a method of drying, however, may be insufficient to dry the laundry. More specifically, when the started operation is the dehumidifying operation and the room temperature is relatively low, operation of the compressor may be stopped frequently. When the compressor stops, the air fed by the indoor fan will be weak, and therefore it cannot promote evaporation of moisture from the laundry. When the started operation is the heating operation, sufficient effect of dehumidifying may not be attained by the dehumidifying before the end of operation and, in some cases, it is possible that water remaining in the room is re-absorbed by the laundry.

(Third Prior Art)

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[0009] A so called separate type air conditioner has been known, which includes an indoor unit installed on a room wall of which air conditioning is desired and an outdoor unit (not shown) placed outside of the room. Fig. 49 is a perspective view showing an appearance of an indoor unit of the conventional air conditioner. Recently, operation of the air

conditioner is typically controlled by using a remote controller 3 for transmitting an instruction or a request to an indoor unit 1, as shown in Fig. 49.

[0010] On indoor unit 1, a liquid crystal display 15 is arranged by the side of an air outlet 16 having an air directing plate 303 for changing the direction of air upward/downward. Liquid crystal display 15 displays various information including operation mode and temperature. Fig. 50 is an exploded perspective view of liquid crystal display 15. As can be seen from the exploded perspective view of Fig. 50, liquid crystal display 15 includes a combination of a liquid crystal panel 306 displaying characters, signs and the like, a backlight 307 consisting of a plurality of LEDs illuminating liquid crystal panel 306 from behind to make clear the liquid crystal display, and a unit cover 308 covering backlight 307 to make uniform the illuminating light incident on the liquid crystal panel 306.

[0011] The remote controller 3 here includes a remote controller display unit 309 displaying pre-set contents of instruction, and various operation buttons 310 to be operated to transmit a necessary instruction for controlling operation of the air conditioner. An instruction necessary for controlling the operation of the air conditioner is transmitted as the operation buttons 310 are operated, from remote controller 2 to indoor unit 1.

[0012] When the air in the room is dirty or moisture of the air in the room decreases or increases, a ventilating operation, a humidifying operation or a dehumidifying operation of the air conditioner is desired. Unless the user noticing such a state instructs an appropriate operation mode through the remote controller, generally such an operation is not executed. Some air conditioners have an indication of a recommended operation mode as well as the environment and condition in the room on the display unit so as to notify the user about the recommended operation mode. Such an indication, however, has been neglected or caused unnecessary concern, as it was difficult for the user to comprehend what kind of operation is to be done.

(Fourth Prior Art)

[0013] Indication of room temperature, power consumption and electricity charge at the display unit of an air conditioner has been described in Japanese Utility Model Laying-Open No. 62-117457. Fig. 51 is a block diagram representing functions of the conventional air conditioner. The air conditioner includes, on a remote controller, a power consumption display means utilizing a liquid crystal for displaying consumed power, cooling/heating display means, room temperature display means, inverter frequency display means and a timer display means.

[0014] Japanese Patent Laying-Open No. 11-101493 describes display of power consumption of air conditioning operation by kw unit, or by an amount equivalence of electricity charge.

[0015] The prior art technique described above simply displays the power consumption of air conditioning operation by the unit of kw or by the amount equivalence of electricity charge. When the unit electricity charge changes reflecting the change in economic conditions (such as exchange rate or crude oil price), the displayed amount may be erroneous. Further, if the unit of electricity charge comes to be changed frequently year by year or area by area, the display of the amount of electricity charge which is the equivalent of power consumption of the air conditioner operation will be erroneous, and the useful function would be meaningless.

SUMMARY OF THE INVENTION

[0016] The present invention was made in order to solve the above described problems, and an object of the present invention is to provide an air conditioner solving the problem of ventilation and dehumidifying of the air conditioner.

[0017] Another object of the present invention is to provide an air conditioner and a method of drying operation thereof enabling effective drying of laundry, by positively removing moisture in the room.

[0018] A further object of the present invention is to provide an air conditioner capable of guiding a user to select an optimal operation mode in accordance with the environment and the condition of the apparatus itself changing with time and to ensure execution of the operation procedure. It is also an object to provide an air conditioner capable of providing an advice about a suitable operation mode enabling human friendly air conditioning.

[0019] A still further object of the present invention is to provide an air conditioner capable of displaying power consumption of the operation of the air conditioner by an exact amount of electricity charge.

[0020] The above described objects can be attained by an air conditioner in accordance with an aspect of the present invention including a refrigerant circuit formed by coupling at least a compressor, an indoor heat exchanger, a decompressor and an outdoor heat exchanger, and a humidifying/dehumidifying apparatus provided independent from the refrigerant circuit, for removing moisture in the room, characterized in that moisture detecting means for detecting moisture in the room and control means for switching an operation mode based on the moisture detected by the moisture detecting means are provided, and that the humidifying/dehumidifying apparatus leads the sucked air of the room to a path communicated to the room and to a path communicated to the outside of the room in a first operation mode, and leads the sucked air of the room to the outside of the room in the second operation mode.

[0021] In accordance with the present invention, ventilation and dehumidifying operations of the air conditioner are switched when the user is out, and therefore, an air conditioner is provided that is capable of conditioning air in accordance with the environment.

[0022] According to another aspect, the present invention provides an air conditioner including a refrigerant circuit formed by coupling a compressor, a four way switching valve, an indoor heat exchanger, a decompressor and an outdoor heat exchanger, and a humidifying/dehumidifying apparatus provided independent from the refrigerant circuit, for removing moisture in the room, capable driving in an operation mode in that the refrigerant circuit and the humidifying/dehumidifying apparatus are driven simultaneously.

[0023] According to the present invention, moisture in the room is positively removed, and therefore an air conditioner capable of more effectively drying laundry can be provided.

[0024] According to a still further aspect, the present invention provides an air conditioner including a refrigerant circuit formed by coupling a compressor, an indoor heat exchanger and an outdoor heat exchanger, characterized in that a temperature sensor detecting a temperature of the air in the room, a moisture sensor detecting moisture of the air in the room, a display unit for displaying information and operation mode determining means for determining an optimal operation mode based on output from the aforementioned various sensors are provided, wherein the display unit displays an advice based on the result of determination made by the operation mode determining means.

[0025] According to the present invention, an air conditioner capable of guiding the user to select an optimal operation mold reflecting the environment and the conditions of the apparatus itself changing with time and to execute the operation procedures can be provided. Further, an air conditioner capable of providing an advice about the optimal operation mode for human friendly air conditioning can be provided.

[0026] According to a still further aspect, the present invention provides an air conditioner including a refrigerant circuit formed by coupling at least a compressor, an indoor heat exchanger, a decompressor and an outdoor heat exchanger, characterized in that it includes a load detecting unit detecting a load on the air conditioner, electricity charge calculating means for calculating electricity charge based on a unit charge and the detected load, a display unit displaying the calculated electricity charge, and unit charge changing means for changing the unit charge.

[0027] According to the present invention, an air conditioner capable of displaying the power consumption of the operation of the air conditioner by an equivalent exact amount of electricity charge can be provided.

[0028] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

Fig. 1 is a schematic diagram of an air conditioner in accordance with Embodiment 1A of the present invention.

Fig. 2 is a perspective view of an indoor unit body of the air conditioner in accordance with Embodiment 1A of the present invention.

Fig. 3 is a schematic view of a body display unit of the air conditioner in accordance with Embodiment 1A.

Fig. 4 is a plan view of a remote controller of the air conditioner in accordance with Embodiment 1A.

Fig. 5 is a schematic control block diagram representing an outline of the air conditioner in accordance with Embodiment 1A of the present invention.

Fig. 6 is a flow chart representing a process performed in the air conditioner in accordance with Embodiment 1A of the present invention.

Fig. 7 is a control block diagram representing an outline of the air conditioner in accordance with Embodiment 1B of the present invention.

Fig. 8 is a flow chart representing a process performed in the air conditioner in accordance with Embodiment 1B of the present invention.

Fig. 9 is a plan view of a remote controller in accordance with Embodiment 1B of the present invention.

Fig. 10 is a control block diagram representing an outline of the air conditioner in accordance with Embodiment 1C of the present invention.

Fig. 11 is a flow chart representing a process performed in the air conditioner in accordance with Embodiment 1C of the present invention.

Fig. 12 is a schematic diagram representing a configuration of the air conditioner in accordance with Embodiment 2 of the present invention.

Figs. 13 and 14 are schematic cross sections of a humidifying/dehumidifying apparatus of the air conditioner in accordance with an embodiment of the present invention.

Figs. 15 to 24 are flow charts representing the flow of an operation switching process performed in the air condi-

tioner in accordance with an embodiment of the present invention.

Fig. 25 is a perspective view of an outdoor unit of the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 26 is a plan view of a remote controller of the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 27 schematically shows an internal structure of an outdoor unit of the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 28 is a cross section schematically showing an internal structure of the outdoor unit of the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 29 is a flow chart representing the flow of the advice giving process performed in the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 30 shows an example of an advice display displayed on a liquid crystal display of the air conditioner in accordance with Embodiment 3A of the present invention.

Fig. 31 is a cross section schematically showing an internal structure of an outdoor unit of the air conditioner in accordance with Embodiment 3B of the present invention.

Fig. 32 is a flow chart representing a flow of the advice giving process performed in the air conditioner in accordance with Embodiment 3B of the present invention.

Fig. 33 represents an example of the advice displays displayed on the liquid crystal display of the air conditioner in accordance with Embodiment 3B of the present invention.

Fig. 34 represents a relation between time change and threshold value of indoor moisture.

Fig. 35 represents an example of the advice displays displayed on the liquid crystal display of the air conditioner in accordance with Embodiment 3B of the present invention.

Fig. 36 is a cross section schematically showing an internal structure of an outdoor unit of the air conditioner in accordance with Embodiment 3C of the present invention.

Fig. 37 is a flow chart representing the flow of the advice giving process performed in the air conditioner in accordance with Embodiment 3C of the present invention.

Fig. 38 represents an example of advice displays displayed on the liquid crystal display of the air conditioner in accordance with Embodiment 3C of the present invention.

Fig. 39 represents the relation between time change and the threshold value of contamination of indoor air.

Fig. 40 represents an example of advice displays displayed on the liquid crystal display of the air conditioner in accordance with Embodiment 3C of the present invention.

Fig. 41 is a schematic cross section representing an internal structure of the outdoor unit of the air conditioner in accordance with Embodiment 3D of the present invention.

Fig. 42 is a cross section schematically showing the internal structure of the outdoor unit of the air conditioner in accordance with Embodiment 3D of the present invention.

Fig. 43 is a flow chart representing the flow of the advice giving process performed in the air conditioner in accordance with Embodiment 3D of the present invention.

Fig. 44 represents an example of advice displays displayed on the liquid crystal display of the air conditioner in accordance with Embodiment 3D of the present invention.

Fig. 45 is a schematic diagram of the air conditioner in accordance with Embodiment 4 of the present invention.

Fig. 46 shows an internal structure of an indoor unit body of the air conditioner in accordance with Embodiment 4 of the present invention.

Fig. 47 is a control block diagram schematically representing the air conditioner in accordance with Embodiment 4 of the present invention.

Fig. 48 is a control block diagram schematically representing a conventional air conditioner.

Fig. 49 is a perspective view showing the appearance of an indoor unit of the conventional air conditioner.

Fig. 50 is an exploded perspective view of the liquid crystal display provided on the indoor unit of the conventional air conditioner.

Fig. 51 is a control block diagram representing functions of the conventional air conditioner.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment 1

[0030] Embodiments of the present invention will be described in the following with reference to the figures.

[0031] Fig. 1 is a schematic diagram of the air conditioner in accordance with Embodiment 1A of the present invention.

(Embodiment 1A)

[0032] As shown in Fig. 1, the air conditioner in accordance with Embodiment 1A includes an indoor unit 1, an outdoor unit 2 and a remote controller 3. Indoor unit 1 includes an indoor heat exchanger 4 and an indoor fan 5, while outdoor unit 2 includes an outdoor heat exchanger 6, a compressor 7, a decompressor 8 (expansion valve) and an outdoor fan 9.

[0033] Indoor unit 1 contains an apparatus including a moisture absorbing rotor 11 absorbing or desorbing moisture in the room, a dehumidifying fan 11 sucking the air in the room, a recovery heater 12 recovering, by deabsorption, the moisture absorbing rotor, a recovery fan 13 feeding air for recovery to the moisture absorbing rotor, and a dumper 14 switching flow path.

[0034] Fig. 2 is a perspective view of the indoor unit body of the air conditioner shown in Fig. 1. As shown in Fig. 2, indoor unit 1 includes a body display unit 15 notifying the state of operation, an air outlet 16 blowing out heated/cooled air to the room, and an air inlet 17 sucking the air of the room.

[0035] Fig. 3 is a schematic diagram of the body display unit of Fig. 2. There is the body display unit 15 at the center of indoor unit 1. As shown in Fig. 3, body display unit 15 includes a moisture lamp 18 which is turned on in accordance with the moisture in the room, a purity lamp 19 of which color changes in accordance with the degree of contamination of the room, a display unit 20 displaying indoor environment and the state of operation when "notification button" of remote controller 3 is pressed, and a light receiving portion 21 receiving a signal from the remote controller.

[0036] Fig. 4 is a plan view of the remote controller shown in Fig. 1. Remote controller 3 shown in Fig. 4 includes a remote controller display unit 22 displaying the state of operation, a transmission display 23 which is turned on when a signal is transmitted to indoor unit 1, a "operation on/off" switch 24 for turning on/off the operation of the air conditioner, a temperature switch 25 for setting the indoor temperature, a dehumidifying switch 26 for turning on/off the dehumidifying operation, a ventilation switch 27 for turning on/off the ventilation operation, and an outing switch 28 for switching to an operation mode in which ventilation and/or dehumidifying operation is automatically started when the user goes out.

[0037] The operation will be described in the following. Referring to Fig. 1, in cooling operation, a heat exchange medium at a high temperature condensed by compressor 7, is fed to outdoor heat exchanger 6 of outdoor unit 2. At outdoor heat exchanger 6, outdoor air deprives the heat exchange medium of heat as it passes through outdoor heat exchanger 6 by the operation of outdoor fan 9, and the heat exchange medium is cooled.

[0038] The heat exchange medium passes through decompressor 8, evaporated at indoor heat exchanger 4 of indoor unit 1, and deprives the air in the room of heat as the air in the room is passed by the indoor fan 5 through the indoor heat exchanger 6. In this manner, the air in the room is cooled.

[0039] Heating of the room is performed by reverse-circulating the heat exchange medium in the direction reverse to the cooling operation. More specifically, condensed heat exchange medium is fed to the indoor heat exchanger 4 of indoor unit 1, so as to warm up the air in the room passing through indoor heat exchanger 4. The heat exchange medium is further passed through the decompressor, evaporated at outdoor heat exchanger 6 of outdoor unit 2, and after the outdoor air is passed through outdoor heat exchanger 6 by indoor fan 9 and heat-exchange takes place, deprives the outdoor air of heat, and returns to compressor 7.

[0040] As to the dehumidifying operation utilizing moisture absorbing rotor 10 of zeolite, indoor air is sucked by moisture absorbing fan 11, the air is passed through moisture absorbing rotor 10 and at that time, moisture of the indoor air is absorbed by moisture absorbing rotor 10, and the resulting dried air is fed to the room.

[0041] As to the moisture absorbed by moisture absorbing rotor 10, the indoor air is sucked by a recovery fan 13, heated by recovery heater 12 and the air thus attained to a high temperature is fed to moisture absorbing rotor. At this time, the moisture in the moisture absorbing rotor 10 is deabsorbed, and the air containing much moisture is discharged to the outside of the room, so as to dehumidify the indoor environment.

[0042] In the ventilating operation by an apparatus containing moisture absorbing rotor 10 of zeolite, air outlet to the room in the dehumidifying operation is switched to the outside of the room by means of dumper 14, and indoor air is discharged to the outside of the room by the moisture absorbing fan. At this time, moisture absorbing rotor 10, recovery heater 12 and recovery fan 13 are off.

[0043] The operation of the air conditioner in accordance with the present embodiment will be described with reference to the operation procedure. Operation mode of the air conditioner is switched every time the operation selecting switch 29 on the control panel of remote controller 3 is pressed, in the order of "automatic" - "heating" - "cooling" - "dry" - "automatic", and the operation mode is displayed on display unit 22 of remote controller 3, and the user selects the operation mode accordingly.

[0044] When "operation on/off" switch 24 on the control panel of remote controller 3 is pressed, the contents of operation, set temperature and the room temperature are displayed in order on body display unit 15 of indoor unit 1, and during the operation, the room temperature is constantly displayed.

[0045] When the operation is to be stopped, "operation on/off" switch 24 of the control panel of remote controller 3 is pressed, then the display on the body display unit 15 on indoor unit 1 disappears and the operation is stopped.

[0046] When the temperature is to be changed, "Δ" "▽" switches of "temperature" switch 25 on the control panel of remote controller 3 is pressed, and by pressing once, the set temperature is increased/decreased by 1°C. Thus the temperature is set.

[0047] In the heating or cooling operation mode, the set temperature is displayed on the body display unit 15 on indoor unit 1 as well as on the display unit 22 on the control panel of remote controller 3.

[0048] In the automatic or dry operation mode, the amount of temperature to be increased is displayed on display unit 22 on the control panel of remote controller 3, while the set temperature is displayed on body display unit 15 of indoor unit 1.

[0049] At this time, the display of the set temperature on the body display unit 15 of indoor unit 1 returns to the display of the room temperature after approximately 4 seconds.

[0050] When the flow rate is to be changed, "flow rate" switch 30 on the control panel of remote controller 3 is pressed. Every time the switch 30 is pressed, the flow rate changes and the display "flow rate automatic" - "flow rate Δ" - "flow rate ΔΔ" - "flow rate ΔΔΔ" - "flow rate automatic" is given at the display unit 22 on the control panel of remote controller 3, and the display "flow rate automatic" - "flow rate minimum" - "flow rate medium" - "flow rate maximum" - "flow rate automatic" is displayed on the body display unit 15 of indoor unit 1.

[0051] As to the 5-mode dehumidifying operation by an apparatus containing moisture absorbing rotor 10 of zeolite, the operation mode is switched to "dehumidifying" - "humidifying" - "stop" - "dehumidifying" every time the "moisture" switch 26 on the control panel of remote controller 3 is pressed, and when "dehumidifying" operation is selected, the 5-mode dehumidifying operation takes place. In response to pressing of "moisture" switch 26, the display on the display unit 22 on the control panel of remote controller 3 is switched to "5-mode dehumidifying" - "5-mode humidifying ventilation" - "no display" - "5-mode dehumidifying", and the display on the body display unit 15 of indoor unit 1 is switched to "5-mode dehumidifying" - "5-mode humidifying" - "no display" - "5-mode dehumidifying."

[0052] In the ventilating operation by the apparatus containing the moisture absorbing rotor of zeolite, every time the "ventilation" switch 27 on the control panel of remote controller 3 is pressed, the operation mode is switched to "automatic ventilation" - "ventilation" - "intense ventilation" - "stop" - "automatic ventilation" and when any of the operation modes is selected, ventilating operation takes place. Further, in response to the pressing of "ventilation" switch 27, the display on the display unit 22 of the control panel of remote controller 3 is switched to "5-mode ventilation automatic" - "5-mode ventilation" - "5-mode intense ventilation" - "no display" - "5-mode ventilation automatic", while the display on the body display unit 15 of the indoor unit 1 is switched to "sensor automatic ventilation" - "continuous ventilation" - "intensive ventilation" - "no display" - "sensor automatic ventilation".

[0053] Fig. 5 is a control block diagram representing functions of the air conditioner in accordance with Embodiment 1A, and Fig. 6 is a flow chart of the process performed by the air conditioner in accordance with Embodiment 1A.

[0054] Referring to Figs. 5 and 6, when ventilation or dehumidifying of closed room while the user is out is desired, the user presses "outing" switch 28 on the control panel of remote controller 3. Then, "▲" appears on the display unit of the control panel of remote controller 3, "outing" display appears on the body display unit 15 of indoor unit 1, the backlight is turned off, and "outing" operation starts (step S1).

[0055] When "outing" switch on the control panel of remote controller 3 is pressed during the operation of the air conditioner, the operation mode before the pressing is canceled.

[0056] When "outing" operation is to be stopped, "outing" switch 28 or "operation on/off" switch 24 on the control panel of remote controller 3 is pressed, and "outing" operation stops.

[0057] At an indoor air inlet 17 of indoor unit 1, a moisture sensor 31 detecting moisture in the room is provided. The value of the moisture detected by moisture sensor 31 is input to moisture determining means 33 of a microcomputer 32 (step S2). At a control unit 34, the detected temperature is compared (step S3). If it is higher than a preset moisture (for example, moisture 70%), "5-mode dehumidifying" operation is performed (step S4), and if the detected temperature is lower than the preset moisture (for example, moisture 70%), "ventilation" operation is performed (step S5). Thus, it is possible for the user to enter a comfortable room when that from the outing, as the dumb hot environment can be avoided.

[0058] The "5-mode dehumidifying" operation if the detected moisture is higher than the preset moisture (for example, moisture 70%) may be "dry" operation.

(Embodiment 1B)

[0059] Fig. 7 is a control block diagram representing functions of the air conditioner in accordance with Embodiment 1B of the present invention. Fig. 8 is a flow chart of the process performed by the air conditioner in accordance with Embodiment 1B of the present invention. Fig. 9 is a plan view of the remote controller in accordance with Embodiment 1B of the present invention. Embodiment 1B will be described with reference to Figs. 7, 8 and 9. Referring to Figs. 7, 8 and 9, remote controller 3 includes an outing switch ① 28 and an outing switch ② 38. In the air conditioner in accordance with Embodiment 1B, a moisture sensor 31 for detecting indoor moisture is provided at an indoor air inlet 17 of

indoor unit 11. The moisture is detected by moisture sensor 31 (step S13). The detected value of the moisture is input to moisture determining means 33 of microcomputer 32, which value is compared at a control unit 34 (step S14). If the value is lower than a preset moisture (for example, moisture 70%), "ventilation" operation is performed (step S19), and when the value is higher than the preset moisture (for example, moisture 70%), "5-mode dehumidifying" operation is performed. More specifically, when the value is higher than the preset moisture (for example, moisture 70%), whether the preset outing switch is switch ① (step S11) or switch ② (step S12) is detected (step S15), and determined (step S16). If the switch ① has been selected (YES in step S16), "5-mode dehumidifying" operation is performed (step S17), and if the switch ② has been selected (NO in step S16), "dry operation" is performed (step S18). Therefore, if a user dislikes "5-mode dehumidifying" operation in which the moisture absorbing rotor is recovered by the recovery heater while the user is out, the user may go back home to the room free of dumb hot atmosphere, though the electricity charge is relatively high.

(Embodiment 1C)

[0060] Fig. 10 is a control block diagram representing the functions of the air conditioner in accordance with Embodiment 1C of the present invention. Fig. 11 is a flow chart representing the flow of the process performed by the air conditioner in accordance with Embodiment 1C.

[0061] As shown in Figs. 10 and 11, the air conditioner in accordance with Embodiment 1C has a moisture sensor 31 detecting indoor moisture and a temperature sensor 43 detecting room temperature, provided at an indoor air inlet 17 of the indoor unit 1. The values of the detected moisture (step S22) and the temperature (step S24) are input to a moisture and temperature determining means 44 of microcomputer 31, and the values are compared at control unit 34 (steps S23, S25). If the moisture is higher than the preset moisture (for example, temperature 70%) (YES in step S23) and the temperature is higher than the preset temperature (for example, 10°C) (NO in step S25), "dry" operation 37 is performed (step S27). If the moisture is lower than the preset moisture (for example, moisture 70%) (NO in step S23) and the temperature is higher than the preset temperature (for example 10°C), "ventilation" operation 36 is performed (step S28).

[0062] If the moisture is higher than the preset moisture (for example, moisture 70%) (YES in step S23) and the temperature is lower than the preset temperature (for example 10°C) (YES in step S25), "5-mode dehumidifying" operation 35 is performed (step S26). Thus, dumb hot atmosphere of the room can be avoided, and when the temperature lowers, not the dehumidifying operation by the compressor but 5-mode dehumidifying operation utilizing zeolite is performed. Therefore, degradation of performance caused by frosting of the compressor can be avoided, dehumidifying ability is improved and the room will be more comfortable.

[0063] As is apparent from the description above, the present invention provides an air conditioner including an outdoor unit containing at least a compressor, an outdoor heat exchanger, a four way switching valve and an outdoor fan, and an indoor unit 1 having at least an indoor heat exchanger and an indoor fan and containing an apparatus including a moisture absorbing rotor absorbing and desorbing moisture in the air of the room, a recovery heater recovering the moisture absorbing rotor and a recovery fan feeding air to the recovery heater, a switch is provided for selecting an operation mode of means automatically selecting dehumidifying operation or ventilating operation based on the moisture detected by a moisture sensor provided at an inlet of the indoor unit, and when the moisture detected by the moisture sensor provided at the inlet of the indoor unit is higher than a preset moisture, dehumidifying operation is performed, and if the moisture is lower than the preset moisture, ventilating operation is performed. Thus, hot and dumb atmosphere of the room can be avoided.

[0064] Further, means for selecting either a dry operation using a compressor or a 5-mode dehumidifying operation utilizing a moisture absorbing rotor in accordance with moisture and temperature detected by a moisture sensor and a temperature sensor provided at the inlet of the indoor unit is provided. When the moisture and the temperature detected by the moisture sensor and the temperature sensor provided at the inlet of the indoor unit is higher than a preset moisture and higher than a preset temperature, dry operation using the compressor is performed. When the moisture is higher than the preset moisture and the temperature is lower than the preset temperature, 5-mode dehumidifying operation utilizing the moisture absorbing rotor is performed. Thus, hot and dumb atmosphere of the room can be avoided. When the temperature lowers, not the dry operation by the compressor but 5-mode dehumidifying operation using zeolite is performed. Therefore, degradation of performance resulting from frosting of the compressor can be avoided, dehumidifying capability is improved and the room will be more comfortable.

Embodiment 2

[0065] The second embodiment of the present invention will be described in the following with reference to the figures. Fig. 12 is a schematic diagram of the air conditioner in accordance with Embodiment 2 of the present invention. As shown in Fig. 12, the air conditioner includes a refrigerating cycle apparatus 101, a humidifying/dehumidifying appa-

ratus 102, and a control unit 103 controlling operations of these apparatuses. Refrigerating cycle apparatus 101 constitutes a closed refrigerant circuit, formed by coupling a compressor 104, a four way switching valve 105, an outdoor heat exchanger 106, a decompressor 107 and an indoor heat exchanger 108, and in addition includes an outdoor fan 109 and an indoor fan 110 promoting heat exchange by outdoor heat exchanger 106 and indoor heat exchanger 108. In the figure, arrows represent the flow of the refrigerant.

[0066] Fig. 13 is a first illustration schematically showing a cross section of the humidifying/dehumidifying apparatus of the air conditioner in accordance with the present embodiment.

[0067] Humidifying/dehumidifying apparatus 102 includes, as shown in Fig. 13, a moisture absorbing rotor 111 formed of a cylindrical ceramics or the like and having a moisture absorbing material provided on its surface, first and second exhaust paths 112 and 113 branched downstream of the moisture absorbing rotor 111 and communicated to the outside of the room, a moisture absorbing fan 114 feeding sucked air through the moisture absorbing rotor 111 and exhausting the air through the first exhaust path 112 to the outside of the room, a heater 115 provided in the second exhaust path 113 and heating the air which passes through the moisture absorbing rotor 111, and a recovery fan 116 to desorb moisture from the moisture absorbing rotor 111 by feeding the air heated by the heater 115 through the moisture absorbing rotor 111 and evacuating moistened water through the second exhaust path 113 to the outside of the room.

[0068] Returning to Fig. 12, indoor temperature sensor 117 detects room temperature, moisture sensor 118 detects moisture in the room, outdoor temperature sensor 119 detects outdoor temperature, and these sensors are connected to the input side of control unit 103. The receiving unit 120 receives various wireless signals generated by the operation of remote controller 121 and inputs the received signals to control unit 103. On the output side of control unit 103, compressor 104 is connected through a variable frequency control circuit (hereinafter referred to as "inverter circuit") 122, and the four way switching valve 105, a fan motor 110a of outdoor fan 109, a fan motor 10a of indoor fan 110, a motor 111a for rotating moisture absorbing rotor 111, a fan motor 114a of moisture absorbing fan 114, heater 115 and a fan motor 116a of recovery fan 116 are connected through a relay circuit 123, respectively. An indoor fan control circuit 124 controls the number of rotation of indoor fan 110.

[0069] When cooling or dehumidifying operation is selected by the operation of remote controller 121 of the air conditioner having the above described structure, control unit 103 closes relay r2 to switch the four way switching valve 105 to the position of the dotted line, and closes relays r1 and r3 to drive outdoor fan 109 and indoor fan 110. Then, inverter circuit 122 functions and compressor 104 starts an operation, so that the refrigerant gas is fed to outdoor heat exchanger 106. The refrigerant gas is subjected to heat exchange with the outdoor air at the outdoor heat exchanger to be condensed and liquefied, and thereafter decompressed by decompressor 107 and evaporated at indoor heat exchanger 108. At this time, ambient atmosphere is deprived of heat, and cool air is fed to the inside of the room by the activation of indoor fan 110. The evaporated refrigerant gas is again fed to compressor 104 and the next cycle starts. By continuous repetition of the series of cycles, the room is gradually cooled or dehumidified. When heating operation is selected, control unit 103 switches four way switching valve 105 to the position of the solid line, and by the repetition of cycles in the reverse direction to the cooling or dehumidifying operation, the room is heated.

(Embodiment 2A)

[0070] The air conditioner in accordance with Embodiment 2A of the present invention will be described. Fig. 15 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2A of the present invention. Referring to Fig. 15, after hanging laundry indoors, a dry operation mode is selected by an operation of a remote controller 121 (step S101). Then, room temperature and outdoor temperature are detected by an indoor temperature sensor 117 and an outdoor temperature sensor 119, respectively (step S102). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21 °C, and the detected outdoor temperature is lower than the preset temperature, for example, lower than 18 °C, are determined (step S103). If it is true, the flow proceeds to step S104, and if not, the flow proceeds to step S102.

[0071] In step S104, control unit 103 switches a refrigerating cycle apparatus 101 to operate in a heating operation mode, and at the same time, switches a humidifying/dehumidifying apparatus 102 to operate in a dehumidifying mode. Switching of the humidifying/dehumidifying apparatus 102 to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123, and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and recovery fan motor 116a of humidifying/dehumidifying apparatus 102 are electrically conducted.

[0072] Fig. 13 is a schematic cross section representing humidifying/dehumidifying apparatus 102 in the dehumidifying mode. Referring to Fig. 13, in the dehumidifying mode operation of the humidifying/dehumidifying apparatus 102, the air A1 in the room is taken in by moisture absorbing fan 114 and passed through moisture absorbing rotor 111. At this time, the moisture-absorbing rotor 111 absorbs the moisture in the air. The dry air A2 after passing moisture absorbing rotor 111 is exhausted to the outside of the room through a first exhaust path 112. That portion of moisture

absorbing rotor 111 which absorbed the moisture moves toward a second exhaust path as the moisture absorbing rotor 111 rotates.

[0073] Further, part of the indoor air A3 is taken by a recovery fan 116, passed through moisture absorbing rotor 111 and flows into the second exhaust path 113 as dry air A4. A heater 115 to a high temperature heats the air A4.

When the air passes again the moisture absorbing rotor 111 from behind, it desorbs the moisture that has been absorbed by the moisture absorbing rotor 111, and emitted to the outside of the room as highly moist air A5 through the second exhaust path 113. The moisture absorbing rotor thus recovered with the moisture removed is rotated and again exhibits moisture-absorbing capability.

[0074] Thus, evaporation of water from the laundry hung in the room is promoted by the heating operation of a refrigerating cycle apparatus 101, and moisture in the room is removed by the dehumidifying operation of humidifying/dehumidifying apparatus 102, whereby the laundry can be dried quickly and efficiently.

(Embodiment 2B)

[0075] The air conditioner in accordance with Embodiment 2B of the present invention will be described. Fig. 16 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2B of the present invention. Referring to Fig. 16, after hanging laundry indoors, a dehumidifying operation mode is selected by an operation of remote controller 121 (step S111). Then, indoor temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S112). Thereafter, by control unit 103, whether the detected room temperature is higher than a preset temperature, for example, higher than 21°C and the detected outdoor temperature is higher than the preset temperature, for example, higher than 18°C, are determined (step S113). If it is true, the flow proceeds to step S114, and if not, the flow proceeds to step S112.

[0076] In step S114, control unit 103 switches the refrigerating cycle apparatus 101 to operate in a dry operation mode, and at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode. Switching of humidifying/dehumidifying apparatus 102 to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123, and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and recovery fan motor 116 are electrically conducted.

[0077] Accordingly, by the synergistic effect of the dry operation of refrigerating cycle apparatus 101 and the dehumidifying operation of humidifying/dehumidifying apparatus 102, evaporation of water from the laundry hanged in the room is promoted, and the moisture in the room is removed, whereby the laundry can be dried quickly and efficiently.

(Embodiment 2C)

[0078] The air conditioner in accordance with Embodiment 2C of the present invention will be described. Fig. 17 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2C of the present invention. Referring to Fig. 17, after hanging laundry indoors, the dry operation mode is selected by an operation of remote controller 121 (step S121). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S122). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21°C, and the detected outdoor temperature is lower than a preset temperature, for example, lower than 18°C, are determined (step S123). If it is true, the flow proceeds to step S124, and if not, the flow proceeds to step S122.

[0079] In step S124, control unit 103 switches the refrigerating cycle apparatus 101 to operate in the heating operation mode, and at the same time, switches the humidifying/dehumidifying apparatus 102 to operate in a ventilation mode. Switching of humidifying/dehumidifying apparatus to the ventilation mode is done when control unit 103 closes relay r5 of relay circuit 123 and moisture absorbing fan motor 114a of humidifying/dehumidifying apparatus 102 is electrically conducted.

[0080] Fig. 14 is a schematic cross section showing humidifying/dehumidifying apparatus 102 operating in the ventilation mode. Referring to Fig. 14, in the ventilation mode operation of humidifying/dehumidifying apparatus 102, indoor air A1 is sucked by moisture absorbing fan 114, passed to moisture absorbing rotor 111, and evacuated to the outside of the room through the second exhaust path 112 (A2).

[0081] Thus, evaporation of water from the laundry hanged in the room is promoted by the heating operation of the refrigerating cycle apparatus 101, and moisture in the room is removed by the ventilating operation of humidifying/dehumidifying apparatus 102, whereby the laundry can be dried quickly and efficiently.

(Embodiment 2D)

[0082] The air conditioner in accordance with Embodiment 2D of the present invention will be described. Fig. 18 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2D of the present invention. Referring to Fig. 18, after hanging laundry indoors, the dry operation mode is selected by an operation of remote controller 121 (step S131). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S132). Thereafter, by control unit 103, whether the detected room temperature is higher than a preset temperature, for example, higher than 21°C, and the detected outdoor temperature is higher than a preset temperature, for example, higher than 18°C, are determined (step S133). If it is true, the flow proceeds to step S134, and if not, the flow proceeds to step S132.

[0083] In step S134, control unit 103 switches the refrigerating cycle apparatus 101 to operate in the dry operation mode, and at the same time, switches the humidifying/dehumidifying apparatus 102 to operate in the ventilating mode. Switching of humidifying/dehumidifying apparatus to the ventilating mode is done when control circuit 103 closes relay r5 of relay circuit 123 and moisture absorption fan motor 114a of humidifying/dehumidifying apparatus 102 is electrically conducted.

[0084] In the ventilating mode operation of humidifying/dehumidifying apparatus 102, indoor air A1 is taken in by moisture absorbing fan 114, passed through moisture absorbing rotor 111 and exhausted to the outside of the room through the second exhaust path 112 (A2).

[0085] Accordingly, by the synergistic effect of the dry operation of refrigerating cycle apparatus 101 and the ventilating operation of humidifying/dehumidifying apparatus 102, evaporation of water from the laundry hang in the room is promoted, and moisture in the room is removed, whereby the laundry can be dried quickly and efficiently.

(Embodiment 2E)

[0086] The air conditioner in accordance with Embodiment 2E of the present invention will be described. Fig. 19 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2E of the present invention. Referring to Fig. 19, after hanging laundry indoors, the dry operation mode is selected by an operation of remote controller 121 (step S141). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S132). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21°C, and the detected outdoor temperature is lower than a preset temperature, for example, lower than 18°C, are determined (step S143). If it is true, the flow proceeds to step S144, and if not, the flow proceeds to step S142.

[0087] In step S144, control unit 103 switches the refrigerating cycle apparatus 101 to operate in the heating operation mode and, at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode. At this time, the dry operation time is set to a prescribed time period (for example, 4 hours).

[0088] Switching of the humidifying/dehumidifying apparatus 102 to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123, and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and receiver fan motor 116 of humidifying/dehumidifying apparatus 102 are electrically conducted.

[0089] When there is a lot of laundry hang in the room, dehumidifying of air in the room cannot catch up the moisture evaporated from the laundry, and it would be difficult to maintain the balance to enable satisfactory dehumidifying. In that case, the room moisture is kept relatively high, lowering the efficiency of drying the laundry.

[0090] Therefore, whether the time passed from the start of drying operation has attained a time period that is the prescribed operation time (in this example, 4 hours) minus a specific time period (for example, 30 minutes) is determined (step S145). If the time has passed, the flow proceeds to step S146, and if not, the flow proceeds to step S144.

[0091] In step S146, in response to an instruction from control unit 103, the refrigerating cycle apparatus 101 is switched to operate in the dry operation mode. At this time, the operation of humidifying/dehumidifying apparatus 102 in the dehumidifying mode is continued.

[0092] In step S147, whether the prescribed time period has passed from the start of drying operation mode is determined, and if the time has passed, the flow proceeds to step S148, and if not, proceeds to step S146. In step S148, the operation of the air conditioner in the dry operation mode is stopped.

[0093] Accordingly, dehumidifying of moisture evaporated from the laundry is promoted, and the laundry can be dried more efficiently.

(Embodiment 2F)

[0094] The air conditioner in accordance with Embodiment 2F of the present invention will be described. Fig. 20 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2F of the present invention. Referring to Fig. 20, after hanging laundry indoors, the dry operation mode is selected by an operation of remote controller 121 (step S151). The room temperature and the outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S152). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21°C, and the detected outdoor temperature is lower than a preset temperature, for example, lower than 18°C, are determined (step S153). If it is true, the flow proceeds to step S154, and if not, the flow proceeds to step S152.

[0095] In step S154, control unit 103 switches the refrigerating cycle apparatus 101 to operate in the heating operation mode and, at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode. At this time, the dry operation time is set to a prescribed time period (for example, 4 hours).

[0096] Switching of humidifying/dehumidifying apparatus 102 to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123, and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and recovery fan motor 116a of humidifying/dehumidifying apparatus 102 are electrically conducted.

[0097] When there is a lot of laundry hang in the room, dehumidifying of air in the room cannot catch up the moisture evaporated from the laundry, and it would be difficult to maintain the balance to enable satisfactory dehumidifying. In that case, the room moisture is kept relatively high, lowering the efficiency of drying the laundry.

[0098] Therefore, whether the time passed from the start of the dry operation mode has attained the time that is the prescribed time period (in this example, 4 hours) minus a specific time period (for example, 30 minutes) or not is determined (step S155). If the time has passed, the flow proceeds to step S156, and if not, the flow proceeds to step S154.

[0099] In step S156, based on an instruction from control unit 103, refrigerating cycle apparatus 101 is switched to operate in the dry operation mode and, at the same time, humidifying/dehumidifying apparatus 102 is switched to operate in the ventilating mode.

[0100] In step S157, whether the prescribed time period has passed from the start of dry operation mode or not is determined, and if the time has passed, the flow proceeds to step S158 and if not, proceeds to step S156. In step S158, the operation of the air conditioner in the dry operation mode is stopped.

[0101] Therefore, exhaustion of the moisture evaporated from the laundry to the outside of the room is promoted, and the laundry can be dried more efficiently.

(Embodiment 2G)

[0102] The air conditioner in accordance with Embodiment 2G of the present invention will be described. Fig. 21 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2G of the present invention. Referring to Fig. 21, after hanging laundry indoors, a dry operation mode is selected by an operation of remote controller 121 (step S161). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S162). Thereafter, by control unit 103, whether the detected room temperature is higher than a preset temperature, for example, higher than 21°C, and the detected outdoor temperature is higher than a preset temperature, for example, higher than 18°C, are determined (step S163). If it is true, the flow proceeds to step S164, and if not, the flow proceeds to step S162.

[0103] In step S164, control unit 103 switches refrigerating cycle apparatus 101 to operate in the dry operation mode and, at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode. At this time, the dry operation time is set to a prescribed time period (for example, 4 hours).

[0104] Switching of humidifying/dehumidifying apparatus to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123 and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and recovery fan motor 116 of humidifying/dehumidifying apparatus 102 are electrically conducted.

[0105] When there is a lot of laundry hang in the room, dehumidifying of air in the room cannot catch up the moisture evaporated from the laundry, and it would be difficult to maintain the balance to enable satisfactory dehumidifying. In that case, the room moisture is kept relatively high, lowering the efficiency of drying the laundry.

[0106] Therefore, whether the time passed from the start of the dry operation mode has attained the time that is the prescribed operation time (in this example, 4 hours) minus a specific time period (for example, 30 minutes) or not is determined (step S165). If the time has passed, the flow proceeds to step S166, and if not, proceeds to step S164.

[0107] In step S166, based on the instruction from control unit 103, refrigerating cycle apparatus 101 is continu-

ously operated in the dry operation mode, and humidifying/dehumidifying apparatus 102 is switched to operate in the ventilating mode.

[0108] In step S167, whether the prescribed time has passed from the start of the dry operation mode or not is determined, and if the time has passed, the flow proceeds to step S168 and if not, proceeds to step S166. In step S168, operation of the air conditioner in the dry operation mode is stopped.

[0109] Consequently, exhaustion of the moisture evaporated from the laundry to the outside of the room is promoted, and the laundry can be dried more efficiently.

(Embodiment 2H)

[0110] The air conditioner in accordance with Embodiment 2H of the present invention will be described. Fig. 22 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2H of the present invention. Referring to Fig. 22, after hanging laundry indoors, a dry operation mode is selected by an operation of remote controller 121 (step S171). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively (step S172). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21°C, and the detected outdoor temperature is lower than a preset temperature, for example, lower than 18°C, are determined (step S173). If it is true, the flow proceeds to step S174, and if not, the flow proceeds to step S172.

[0111] In step S174, control unit 103 switches refrigerating cycle apparatus 101 to operate in heating operation mode and, at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode. At this time, dry operation time is set to a prescribed time period (for example, 4 hours).

[0112] Switching of humidifying/dehumidifying apparatus 102 to the dehumidifying mode is done when control unit 103 closes relays r4 to r7 of relay circuit 123 and motor 111a for rotating moisture absorbing rotor, moisture absorbing fan motor 114a, heater 115 and recovery fan motor 116a of humidifying/dehumidifying apparatus 102 are electrically conducted.

[0113] When there is a lot of laundry hang in the room, dehumidifying of air in the room cannot catch up the moisture evaporated from the laundry, and it would be difficult to maintain the balance to enable satisfactory dehumidifying. In that case, the room moisture is kept relatively high, lowering the efficiency of drying the laundry.

[0114] Therefore, whether time passed from the start of the dry operation mode has attained the time that is the prescribed operation time (in this example, 4 hours) minus a specific time period (for example 30 minutes) is determined (step S175). If the time has passed, the flow proceeds to step S176, and if not, proceeds to step S174.

[0115] In step S176, based on an instruction from control unit 103, refrigerating cycle apparatus 101 is switched to operate in the dry operation mode. At this time, humidifying/dehumidifying apparatus 102 is continuously operated in the dehumidifying mode.

[0116] In step S177, whether the prescribed time period has passed from the start of the dry operation mode is determined, and if the time has passed, the flow proceeds to step S180, and if not, the flow proceeds to step S178.

[0117] In step S178, whether compressor 104 of the air conditioner is stopped or not is determined. If the compressor is stopped, the flow proceeds to step S179, and if not, the flow returns to step S176. Therefore, while the compressor 104 is stopped, the process step S179 is executed.

[0118] In step S179, an instruction is given from control unit 103 to indoor fan control circuit 124, and indoor fan 110 is operated with high flow rate. At this time, operation of refrigerating cycle apparatus 101 in the dry operation mode and operation of humidifying/dehumidifying apparatus 102 in the dehumidifying mode are continued.

[0119] In step S180, the operation of the air conditioner in the dry operation mode is stopped.

[0120] Therefore, even when compressor 104 stops, the strong wind blown out to the room directly reaches the laundry, promoting evaporation of moisture from the laundry enabling quick drying of the laundry.

(Embodiment 2I)

[0121] The air conditioner in accordance with Embodiment 2I of the present invention will be described. Fig. 23 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2I of the present invention. Referring to Fig. 23, after hanging laundry indoors, the dry operation mode is selected by an operation of remote controller 121 (step S181). Then, room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively, and moisture in the room is detected by the moisture sensor 118 (step S182). Thereafter, by control unit 103, whether the detected room temperature is lower than a preset temperature, for example, lower than 21°C, and the detected outdoor temperature is lower than a preset temperature, for example, lower than 18°C, are determined (step S183). If it is true, thus flow proceeds to step S184, and if not, the flow proceeds to step S182.

[0122] In step S184, whether the detected moisture is higher than a preset moisture, for example, higher than 80%, is determined. If it is higher, the flow proceeds to step S185, and if it is lower, the flow proceeds to step S186.

[0123] In step S185, control unit 103 switches refrigerating cycle apparatus 101 to operate in the heating operation mode, and at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the ventilating mode.

5 [0124] In step S186, control unit 103 switches refrigerating cycle apparatus 101 to operate in the heating operation mode and, at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode.

[0125] Accordingly, if the moisture is high, moist indoor air is positively exhausted to the outside of the room, attaining similar effects as realized by dehumidifying operation. If the moisture is low, moisture which is difficult to remote by ventilation is absorbed and desorbed by moisture absorbing rotor 111, so as to further lower the moisture, and by the
10 combination with the heating operation by refrigerating cycle apparatus 101, quick drying of the laundry becomes possible.

(Embodiment 2J)

15 [0126] The air conditioner in accordance with Embodiment 2J of the present invention will be described. Fig. 24 is a flow chart representing the flow of the operation switching process that takes place in the air conditioner in accordance with Embodiment 2J of the present invention. Referring to Fig. 24, after hanging laundry indoors, the drying operation mode is selected by an operation of remote controller 121 (step S191). The room temperature and outdoor temperature are detected by indoor temperature sensor 117 and outdoor temperature sensor 119, respectively and
20 moisture in the room is detected by moisture sensor 118 (step S192). Thereafter, by control unit 103, whether the detected room temperature is higher than a preset temperature, for example, higher than 21°C, and the detected outdoor temperature is higher than a preset temperature, for example, higher than 18°C, are determined (step S193). If it is true, the flow proceeds to step S194, and if not, the flow proceeds to step S192.

[0127] In step S194, whether detected moisture is higher than a preset moisture, for example, higher than 80% or not is determined. If it is higher, the flow proceeds to step S195, and if it is lower, the flow proceeds to step S196.
25

[0128] In step S195, control unit 103 switches refrigerating cycle apparatus 101 to operate in the dry operation mode, and switches humidifying/dehumidifying apparatus 102 to operate in the ventilating mode.

[0129] In step S196, control unit 103 switches refrigerating cycle apparatus 101 to operate in the dry operation mode, and at the same time, switches humidifying/dehumidifying apparatus 102 to operate in the dehumidifying mode.

30 [0130] Accordingly, when moisture is high, moist indoor air is positively exhausted to the outside of the room, attaining similar effects as attained by the dehumidifying operation. If the moisture is low, moisture which is difficult to remove by ventilation is absorbed and desorbed by using moisture absorbing rotor 111 so as to further lower the moisture, and, by the combination with the dry operation by refrigerating cycle apparatus 101, quick drying of the laundry becomes possible.

35 [0131] As described above, according to the present invention, the humidifying/dehumidifying apparatus is used additionally to dry the laundry, together with heating or dehumidifying operation by the refrigerating cycle apparatus. Therefore, as compared with the drying solely by the refrigerating cycle apparatus, the laundry can be dried in a shorter time with high efficiency. Even when the compressor is stopped, the laundry can be dried by the humidifying/dehumidifying apparatus, and therefore, the drying operation time can be used effectively.

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Embodiment 3

[0132] The third embodiment of the present invention will be described with reference to the figures.

45 (Embodiment 3A)

[0133] Fig. 2 shows a main portion of the indoor unit of the air conditioner in accordance with Embodiment 3A, and Fig. 3 schematically shows the liquid crystal display. Fig. 25 is a plan view representing a main portion of the outdoor unit. Fig. 26 is a plan view showing a main portion of the remote controller. Fig. 27 is a schematic cross section showing the internal structure of the indoor unit, and Fig. 28 is a cross section schematically showing the internal structure of the outdoor unit.
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[0134] The relation between the indoor unit and the remote controller and the structure of the liquid crystal display in accordance with Embodiment 3A are the same as in the prior art, and therefore description will be given with reference to Figs. 49 and 50, and portions and components corresponding to those of Figs. 49 and 50 are denoted by the same reference characters.
55

[0135] The air conditioner in accordance with Embodiment 3A includes, as in the prior art, an indoor unit 1 and an outdoor unit 314. The operation of the air conditioner is controlled by a microcomputer (not shown) receiving an instruction transmitted from a remote controller 3. Referring to Fig. 27, here, indoor unit 1 has an indoor cabinet 311 formed

of resin, for example, having an air inlet 17 at a front side and an air outlet 16, in which an air directing plate 303 is attached, at a lower side. In the indoor cabinet 311, cooling and heating equipment (not shown) such as the indoor heat exchanger 318 and an indoor fan 319 is arranged. In the figure, the reference character A represents the indoor airflow, and the character B represents the wall surface.

[0136] In the indoor cabinet of the indoor unit 1, a moisture sensor 313 is attached near the air inlet 17, so as to detect the indoor moisture.

[0137] Referring to Fig.2, above the air outlet 16 of indoor cabinet 311, a liquid crystal display 15 is provided, inclined slightly downward with an angle for better view, approximately at the center of the front face of indoor cabinet 311. More specifically, the liquid crystal display 15 is provided to give various information such as the operation mode and the temperature. By this structure, when the user looks at the indoor unit, he/she quickly and necessarily notices liquid crystal display at the central eye-catching position. Liquid crystal display 15 includes a combination of: a liquid crystal display panel 306 displaying characters, signs and the like; a back light 307 formed of a plurality of LEDs illuminating and clarifying the liquid crystal display; and a unit cover 308 covering the back light 307 and making uniform the light incident on and illuminating liquid crystal panel 306. It is not necessary that the liquid crystal display 15 be arranged approximately at the center of indoor cabinet 311 above air outlet 16. It is needless to say that the display may be arranged at any other place as long as it is on the front side of indoor unit 11. Further, the light emitting element of back light 307 is not limited to LEDs and EL light emitting a plurality of colors may be used.

[0138] Outdoor unit 314 has an outdoor unit 315 formed of metal, for example, as shown in Figs. 25 and 28. An air inlet 316 sucking outdoor air is formed in three directions of outdoor cabinet 315, and an air outlet 317 exhausting the heat-exchanged air is formed approximately at the center of the remaining direction. In the outdoor cabinet 315, a cooling and heating equipment (not shown) is provided, including an outdoor heat exchanger 320, a compressor, a decompressor, an outdoor fan 321, and a temperature sensor detecting the outdoor temperature. In the figure, the reference character A represents a passage of the outdoor air.

[0139] The operation of the air conditioner in Embodiment 3A will be described. Fig 29 is a flow chart representing the advice displaying process that takes place in the air conditioner of Embodiment 3A. Referring to Fig. 29, in the advice displaying process, first, the indoor moisture is detected by a moisture sensor 313 arranged in indoor unit 1, and outdoor temperature is detected by outdoor temperature sensor 322 arranged in outdoor unit 314 (step S201).

[0140] The indoor air moisture and the outdoor temperature are monitored by a microcomputer through moisture sensor 313 and outdoor temperature sensor 322. Whether, by abrupt change in the weather, the indoor air moisture and the outdoor temperature attains higher than a predetermined indoor moisture (for example, moisture of 80% or higher) and lower than a reference value of the outdoor temperature (for example, 18 °C or lower), respectively, are determined (step S202). If it is yes, the flow proceeds to step S203, and if not, it proceeds to step S201.

[0141] In step S203, the display on liquid crystal display 15 arranged at the indoor cabinet 311 of indoor unit 1 is switched from a normal display to an advice display. In the normal display, temperature in operation, for example, is given, while in the advice display, an advice recommending ventilation operation is given.

[0142] Fig. 30 represents an example of the advice display given on the liquid crystal display 15 in Embodiment 3A. Referring to Fig. 30, as the advice display, "outdoor temperature decreased, moisture increased" and "dry operation recommended" are displayed alternately and repeatedly for 5 seconds each, and finally, "press operation switch button and dry operation starts" is displayed for 10 seconds. In this manner, the advice display includes a notice recommending switching of the operation mode as well as a button to be pressed for necessary operation to switch the operation mode.

[0143] If the air conditioner is not in operation, an advice display is given in which "outdoor temperature decreased, moisture increased" and "dry operation recommended" are displayed repeatedly.

[0144] As liquid crystal display 15 gives the advice display recommending execution of the dry operation, the user is easily reminded of the necessity of the dry operation.

[0145] Returning to Fig. 29, in step S204, the user, noticing the advice display by liquid crystal display 15, instructs dry operation. The instruction by the user of the dry operation is given by pressing "operation switch button" 310a among the operation buttons 310 of remote controller 3 as shown in Fig. 26. Thus, an instruction requesting execution of dry operation by the compressor is given to the indoor unit 1.

[0146] Then, the compressor of the air conditioner in operation (step S105) executes the dry operation. Accordingly, the moisture in the air is removed by the dry operation, and moisture in the room reduces to a comfortable range. Thus, convenience of the air conditioner is significantly improved.

(Embodiment 3B)

[0147] Fig. 31 is a schematic cross section representing the internal structure of the indoor unit in accordance with Embodiment 3B. The relation between the indoor unit, outdoor unit and the remote controller, and the structure of the liquid crystal display in accordance with Embodiment 3B are the same as in the prior art, and the structure of the main

portion of the indoor unit is the same as that of Embodiment 3A. Therefore, components and portions corresponding to those of Figs. 2, 27, 49 and 50 are denoted by the same reference characters, and detailed description thereof will not be repeated here.

[0148] Referring to Fig. 31, the air conditioner in accordance with Embodiment 3B includes indoor unit 1, and in an indoor cabinet 311 of indoor unit 1, a moisture sensor 329 arranged near an air inlet 17 for detecting moisture of the indoor air, and a humidifying/dehumidifying apparatus 323 for removing moisture from the indoor air are contained. The humidifying/dehumidifying apparatus 323 here includes a moisture absorbing path formed by a moisture absorbing rotor 324 having a moisture absorbing material such as zeolite absorbing water applied thereon and a moisture absorbing fan 325 feeding the indoor air taken in by moisture absorbing rotor 324 to the room through air outlet 16, and a recovery path including a recovery heater 326 heating the air and a recovery fan 327 feeding the heated air to moisture absorbing rotor 324 for desorbing moisture of the moisture absorbing rotor. Namely, the humidifying/dehumidifying apparatus is similar to the apparatus described in Japanese Patent Laying-Open Nos. 8-270980 and 10-477706.

[0149] The operation of air conditioner in Embodiment 3B will be described. Fig. 32 is a flow chart representing the advice displaying process that takes place in the air conditioner of Embodiment 3B. Referring to Fig. 32, in the advice displaying process, first, the indoor moisture is detected by moisture sensor 313 arranged in indoor unit 1 (step S211). The indoor air moisture is monitored by a microcomputer through moisture sensor 313.

[0150] Whether the indoor air moisture during the operation of the air conditioner is lower than a preset moisture (for example, lower than 30%) or not is determined (step S121). If it is true, the flow proceeds to step S213, and if not, the flow proceeds to step S211.

[0151] In step S213, the display on liquid crystal display 15 arranged on indoor cabinet 311 of indoor unit 1 is switched from a normal display to an advice display. In the normal display, temperature in operation, for example, is given, while in the advice display, an advice recommending execution of a humidifying operation is given.

[0152] Fig. 33 represents an example of the advice display given on the liquid crystal display 15 in Embodiment 3B. Referring to Fig. 30, as the advice display, "room dry" and "additional humidifying recommended" are displayed alternately and repeatedly for 5 seconds each, and finally, "press moisture button and humidifying operation starts" is displayed for 10 seconds. In this manner, the advice display includes a notice recommending switching of the operation mode as well as a button to be pressed for necessary operation to switch the operation mode.

[0153] If the air conditioner is not in operation, an advice display is given in which "room dry" and "additional humidifying recommended" are displayed repeatedly, though not shown.

[0154] As liquid crystal display 15 gives the advice display recommending execution of the humidifying operation, the user is easily reminded of the necessity of the humidifying operation.

[0155] Returning to Fig. 32, in step S214, the user, noticing the advice display by liquid crystal display 15, instructs humidifying operation of the humidifying/dehumidifying apparatus (step S214). The instruction by the user of the humidifying operation of the humidifying/dehumidifying apparatus is given by pressing "moisture button" 310b among the operation button 310 of remote controller 3, as shown in Fig. 25. Thus, an instruction requesting execution of humidifying operation by the humidifying/dehumidifying apparatus is given to the indoor unit 1.

[0156] When the instruction requesting execution of the humidifying operation is given to indoor unit 1, the humidifying operation by the humidifying/dehumidifying apparatus 323 is executed simultaneously when the air conditioner is in operation, and the humidifying operation is executed by itself by the humidifying/dehumidifying apparatus 323 when the air conditioner is not in operation (step S215). Accordingly, the moisture of the indoor air taken in by dehumidifying fan 325 is absorbed by moisture absorbing rotor 324, and the dried air is discharged to the outside of the room. The air heated by recovery heater 326 is fed to moisture absorbing rotor 324 by recovery fan 327, desorbs moisture of the absorbing rotor 324, and the resulting moist air is fed to the room. Thus, the indoor air is humidified.

[0157] Fig. 34 shows the relation between change with time and the threshold value of indoor moisture. As can be seen from Fig. 34, when the moisture of the indoor air during the operation of the air conditioner becomes a preset moisture B (moisture 30%) or lower, humidifying operation by humidifying/dehumidifying apparatus 323 is executed, and indoor moisture increases. Thus, moisture of the indoor air attains to an appropriate level, and the moisture of the indoor air becomes higher than the reference moisture B.

[0158] Returning to Fig. 32, in step S216, the moisture of the indoor air is detected by moisture sensor 313 arranged in indoor unit 1. Whether the moisture of the indoor air during the operation of the air conditioner has attained higher than the preset moisture B or not is determined (step S217). If it is true, the flow proceeds to step S218, and if not, the flow proceeds to step S216.

[0159] In step S218, the display on liquid crystal display 15 arranged on indoor cabinet 311 of indoor unit 1 is switched from the normal display to an advice display.

[0160] Fig. 35 is a second illustration showing an example of the advice display given on liquid crystal display 15 of Embodiment 3B. Referring to Fig. 35, as the advice display, "comfortable moisture attained" and "cancel humidifying operation" are displayed alternately and repeatedly for 5 seconds each. In this manner, as the advice display, notification recommending change in the operation mode is given.

[0161] As the liquid crystal display 15 gives the advice display recommending cancellation of the humidifying operation, the user is easily reminded of the necessity of canceling the humidifying operation.

[0162] Returning to Fig. 32, in step S219, the user, noticing the advice display by liquid crystal display 15, stops the humidifying operation of the humidifying/dehumidifying apparatus. The instruction by the user of stopping the humidifying operation by the humidifying/dehumidifying apparatus is given by an operation of remote controller 3, as shown in Fig. 26. Thus, the humidifying operation by the humidifying/dehumidifying apparatus is stopped. Thereafter, the normal display is given on liquid crystal display 15.

(Embodiment 3C)

[0163] Fig. 36 is a schematic cross section showing the internal structure of the indoor unit in accordance with Embodiment 3C.

[0164] The relation between the indoor unit, the outdoor unit and the remote controller as well as the structure of the liquid crystal display are the same as in the prior art, and the structure of the main portion of the indoor unit is the same as that of Embodiment 3A. Therefore, components and portions corresponding to those in Figs. 2, 17, 49 and 50 are denoted by the same reference characters and detailed description thereof will not be repeated here.

[0165] Referring to Fig. 36, the air conditioner in accordance with Embodiment 3C includes an indoor unit 1, and operation of the air conditioner is controlled by a microcomputer (not shown) receiving an instruction transmitted from remote controller 2. Here, indoor unit 1 includes an indoor cabinet 311 formed of resin, for example, and in the indoor cabinet 311 having an air inlet 17 formed at a front side position and an air outlet 16 containing an air directing plate 303 changing the direction of the wind in upward/downward formed at a lower position, there is cooling/heating equipment (not shown) such as an indoor heat exchanger 318 and an indoor fan 319. In the figure, the reference character A represents the distribution path of the indoor air, and the reference character B represents a wall surface, respectively.

[0166] A gas sensor 329 is arranged near air inlet 17 of indoor cabinet 311 provided in indoor unit 1, for detecting contamination of the indoor air. A ventilating apparatus exhausting dirty indoor air to the outside of the room is provided. A humidifying/dehumidifying apparatus 323 such as disclosed in Japanese Patent Laying-Open Nos. 8-270980 and 10-477706 proposed by the applicant of the present invention may be used as the ventilating apparatus. The humidifying/dehumidifying apparatus 323 includes a moisture absorbing path formed by a moisture absorbing rotor 324 having a moisture absorbing material such as zeolite absorbing water applied thereon, and a dehumidifying fan 325 leading the indoor air taken in by the moisture absorbing rotor 324 to the room through air outlet 16.

[0167] Humidifying/dehumidifying apparatus 323 additionally includes a recovery path including a recovery heater 326 heating the air, and a recovery fan 327 feeding the heated air to the moisture absorbing rotor 324 for the desorbing the moisture of the moisture absorbing rotor. The system utilizes the moisture absorbing path to take in the dirty air of the room by dehumidifying fan 325 and exhausting the dirty air to the outside of the room through moisture absorbing rotor 324, and the recovery path is not used for this operation.

[0168] Different from the ventilating system by the humidifying/dehumidifying apparatus 323, a method using an air cleaner (not shown) to remove dirt and purify the indoor air is also possible. The air cleaner may be a combination of a cleaning filter and a circulating fan that takes in the indoor air through the cleaning filter and blows out the air to the room through the air outlet, or it may be formed by using an electric dust collector (not shown).

[0169] Approximately at the center of indoor cabinet 311, liquid crystal display 15, that is, liquid crystal display 15 for displaying various information such as the operation mode and the temperature is arranged. As shown in Fig. 50, liquid crystal display 15 has such a structure that includes a liquid crystal panel 306 displaying characters, signs and the like, a backlight 307 formed of a plurality of LEDs illuminating the liquid crystal panel 306 from behind to make clear the liquid crystal display, and a unit cover 308 covering backlight 307 and making uniform the illuminating light incident on liquid crystal panel 306. It is not necessary that liquid crystal display 15 is arranged on the side of air outlet 16, and naturally, it may be arranged at any other position on the front side of indoor unit 1. The light emitting element of backlight 307 is not limited to LEDs, and EL light emitting a plurality of different colors may be used.

[0170] The operation of air conditioner in Embodiment 3C will be described. Fig. 37 is a flow chart representing the advice displaying process that takes place in the air conditioner in Embodiment 3C. Referring to Fig. 37, in the advice displaying process, first, degree of contamination in the room is detected by gas sensor 329 arranged on indoor unit 1 (step S221). The degree of contamination of the indoor air is monitored by a microcomputer through gas sensor 329.

[0171] Whether the degree of contamination of the indoor air during the operation of air conditioner has exceeded a preset reference value (reference value A of Fig. 38) or not is determined (step S222). If it is true, the flow proceeds to step S223, and if not, the flow proceeds to step S221.

[0172] In step 223, the display on liquid crystal display 15 arranged at the indoor cabinet 311 of indoor unit 1 is switched from a normal display to an advice display. In the normal display, temperature in operation, for example, is given, while in the advice display, an advice recommending execution of ventilation operation is given.

[0173] Fig. 38 is a first illustration representing an example of the advice display given on the liquid crystal display

15 in Embodiment 3C. Referring to Fig. 38, as the advice display, "to take in fresh air" and "automatic ventilation recommended" are displayed alternately and repeatedly for 5 seconds each, and finally, "press ventilation button and ventilation starts" is displayed for 10 seconds. In this manner, the advice display includes notice recommending switching of the operation mode as well as a button to be pressed for necessary operation to switch the operation mode.

[0174] If the air conditioner is not in operation, though not shown, an advice display is given in which "to take fresh air" and "automatic ventilation recommended" are displayed repeatedly.

[0175] As liquid crystal display 15 gives the advice display recommending execution of air cleaning operation, the user is easily reminded of the necessity of the air cleaning operation.

[0176] Returning to Fig. 32, in step S224, the user, noticing the advice display by liquid crystal display 15, instructs additional automatic ventilation operation. The instruction by the user of the additional automatic ventilating operation is given by pressing "ventilation button" 310c among the operation buttons 310 of remote controller 3, as shown in Fig. 26. Thus, an instruction requesting execution of automatic ventilating operation is given to indoor unit 1.

[0177] When the instruction requesting execution of the automatic ventilating operation is given to indoor unit 1, the ventilating operation by humidifying/dehumidifying apparatus 323 is additionally performed in the air conditioner in operation, and the ventilating operation by humidifying/dehumidifying apparatus 323 by itself is executed when the air conditioner is not in operation (step S225). By the execution of the automatic ventilating operation, contaminated indoor air is exhausted to the outside of the room.

[0178] Fig. 39 represents the change in the degree of contamination of the indoor air with time and the threshold value. As can be seen in Fig. 39, when the degree of contamination of the indoor air during the operation of the air conditioner exceeds a preset degree of contamination A, automatic ventilating operation by humidifying/dehumidifying operation 323 is executed, decreasing the degree of contamination. Thus, the contamination of the indoor air is eliminated, and degree of contamination of the indoor air becomes lower than the preset degree of contamination B.

[0179] Returning to Fig. 37, in step S226, the degree of contamination of the indoor air is detected by gas sensor 329 arranged on indoor unit 1. Whether the degree of contamination of the indoor air during the operation of the air conditioner is smaller than the preset degree of contamination B or not is determined (step S227). If it is true, the flow proceeds to step S228, and if not, the flow proceeds to S226.

[0180] In step S228, the display on liquid crystal display 15 arranged on indoor cabinet 311 of indoor unit 1 is switched from a normal display to an advice display. In the advice display, an advice notifying that humidifying operation will be terminated is given.

[0181] Fig. 40 is a second illustration showing an example of the advice display given on liquid crystal display 15 of Embodiment 3C. Referring to Fig. 40, an advice display is given in which "air cleaned" and "end ventilating operation" are displayed repeatedly for 5 seconds, respectively. In this manner, the advice display recommending change of the operation mode is given.

[0182] As liquid crystal display 15 gives the advice display recommending cancellation of automatic ventilating operation, the user is easily reminded of the necessity to cancel automatic ventilating operation.

[0183] Returning to Fig. 37, in step S229, the user, noticing the advice display by liquid crystal display 15, instructs termination of automatic ventilating operation by humidifying/dehumidifying apparatus. The instruction by the user to stop the automatic ventilating operation by the humidifying/dehumidifying apparatus is given by an operation of remote controller 3, as shown in Fig. 26. Thus, the automatic ventilating operation by the humidifying/dehumidifying apparatus is stopped. Thereafter, the normal display is given on liquid crystal display 15.

[0184] It is unnecessary to say that the microcomputer of the air conditioner in accordance with Embodiment 3C may have an operation controlling function that is referred to as automatic operation mode. When the air conditioner is in the automatic operation mode, after an advice display recommending execution of the ventilating operation is given on liquid crystal display 15, ventilating operation by the humidifying/dehumidifying operation may be started, without waiting for an instruction by the user to execute the ventilating operation. If such a configuration is adapted, automatic ventilating operation is executed when cleaning of the air is necessary, without troubling the user, and therefore, the air conditioner would be more user-friendly.

(Embodiment 3D)

[0185] Fig. 41 is a schematic cross section schematically showing the internal structure of the indoor unit in accordance with Embodiment 3D, and Fig. 42 is a cross section schematically showing the internal structure of the outdoor unit. The relation between the indoor unit, the outdoor unit and the remote controller as well as the structure of the liquid crystal display in Embodiment 3D are the same as those in the prior art, and the structure of the main portion of the indoor unit is the same as that of Embodiment 3A. Therefore, components and portions corresponding to those of Figs. 2, 2, 27, 28, 49 and 50 will be denoted by the same reference characters, and detailed description thereof will not be repeated here.

[0186] The air conditioner in accordance with Embodiment 3D includes indoor unit 1. As shown in Fig. 41, an indoor

cabinet 311 of indoor unit 1 includes a moisture sensor 313 and indoor temperature sensor 328 arranged near the air inlet 17 for detecting moisture and temperature of the indoor air, as well as a humidifying/dehumidifying apparatus 323 for removing moisture from the indoor air. The humidifying/dehumidifying apparatus 323 includes a moisture absorbing path formed by a moisture absorbing rotor 324 having a moisture absorbing material such as zeolite absorbing moisture applied thereon, and a dehumidifying fan 325 taking the indoor air through moisture absorbing rotor 324 and feeding the air to the room through an air outlet. Humidifying/dehumidifying apparatus 323 further includes a recovery path including a recovery heater 326 heating the air, and a recovery fan 323 feeding the heated air to moisture absorbing rotor 324 for desorbing the moisture of the moisture absorbing rotor. The humidifying/dehumidifying apparatus here may be the apparatus disclosed in Japanese Patent Laying-Open Nos. 8-270980 and 10-477706.

[0187] As shown in Fig. 42, outdoor unit 314 includes an outdoor cabinet 315 formed of metal, for example. Air inlets 316 taking outdoor air are formed in three directions of outdoor cabinet 315, and an air outlet 317 blowing out the heat-exchanged air is formed approximately at a central position in the remaining direction. In the outdoor cabinet 315, cooling/heating equipment (not shown) is arranged, including an outdoor heat exchanger 320, the compressor, the decompressor, the outdoor fan 321, and a temperature sensor 322 for detecting outdoor temperature provided at the air inlet 316. The reference character A in the figure shows the distribution path of the outdoor air.

[0188] The operation of the air conditioner in Embodiment 3D will be described. Fig. 43 is a flow chart representing the advice displaying process that takes place in the air conditioner of Embodiment 3D. Referring to Fig. 43, in the advice displaying process, first, indoor temperature and moisture as well as outdoor temperature are detected (step S231). The indoor moisture is detected by moisture sensor 313 arranged in indoor unit 1, the indoor temperature is detected by indoor temperature sensor 328, and outdoor temperature is detected by outdoor temperature sensor 322 arranged in outdoor unit 314.

[0189] The indoor temperature and moisture and outdoor temperature are monitored by a microcomputer through moisture sensor 313, indoor temperature sensor and the outdoor temperature sensor 322.

[0190] In accordance with the change in environment during the operation of the air conditioner, decrease in outdoor temperature after the stop of operation is expected, and whether dew condensation is expected or not is determined by the microcomputer (step S232). Whether the dew condensation is expected or not is determined dependent on whether the following equation (1) holds.

$$((\text{Room temperature} + \text{outdoor temperature})/2 - 4) \leq ((\text{room temperature} \times \text{room moisture} (\%) \times 0.01518) - 6.26) \quad (1)$$

[0191] When the equation (1) holds, dew condensation is expected, and the flow proceeds to step S233. If not, the flow proceeds to step S231.

[0192] In step S233, the display on liquid crystal display 15 arranged on indoor cabinet 311 of indoor unit 1 is switched from a normal display to an advice display. In the normal display, temperature in operation, for example, is given, while in the advice display, an advice recommending execution of dehumidifying operation is given.

[0193] Fig. 44 shows an example of the advice display given on liquid crystal display 15 in Embodiment 3D. Referring to Fig. 44, as the advice display, "dew condensation likely" and "prevention of dew condensation recommended" are displayed alternately and repeatedly for 5 seconds each, and finally, "press dew condensation button" is displayed for 10 seconds. In this manner, the advice display includes a notice recommending switching of the operation mode as well as a button to be pressed for necessary operation to switch the operation mode.

[0194] If the air conditioner is not in operation, "dew condensation likely" and "prevention of dew condensation recommended" are displayed repeatedly, though not shown.

[0195] As liquid crystal display 15 gives the advice display recommending execution of the dehumidifying operation and suggesting a button to be pressed for necessary operation to change the operation mode, the user is easily reminded of the necessity of executing the dehumidifying operation.

[0196] Returning to Fig. 43, in step S234, the user, noticing the advice display by liquid crystal display 15, instructs the dehumidifying operation by the humidifying/dehumidifying operation. The instruction by the user of the dehumidifying operation by the humidifying/dehumidifying apparatus is given by pressing "dew condensation button" 310d among the operation buttons 310 of remote controller 3 as shown in Fig. 26. Thus, an instruction requesting execution of the dehumidifying operation by the humidifying/dehumidifying apparatus is given to the indoor unit 1.

[0197] When the instruction requesting execution of the dehumidifying operation by humidifying/dehumidifying apparatus 323 is given to the indoor unit 1, the dehumidifying operation by the humidifying/dehumidifying apparatus 323 is additionally performed if the air conditioner is in operation, and the dehumidifying operation by humidifying/dehumidifying apparatus 323 by itself is executed when the air conditioner is not in operation (step S135). Accordingly, the moisture of the indoor air taken in by dehumidifying fan 325 is absorbed by moisture absorbing rotor 324, the dried air is fed to the room, the moisture of moisture absorbing rotor 324 is desorbed by the air heated by recovery heater 326, and discharged to the outside of the room by recovery fan 327. As a result, moisture of the indoor air decreases, and such a state is attained in that dew condensation in the room can be avoided even if the outdoor temperature lowers abruptly.

Accordingly, dew condensation can be prevented even when the outdoor temperature lowers abruptly, and hence gathering of mold can be avoided.

(Additional Embodiment)

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[0198] The following various configurations may be additionally provided for Embodiments 3A to 3D described above.

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[0199] First, the advice display of liquid crystal display 15 may be given with a backlight color different from that in the normal display. Generally, the normal display on liquid crystal display 15 is given with the backlight of yellow or green. The advice display recommending execution of air cleaning operation or ventilating operation may be given with the backlight changed to red, for example. Here, the advice display such as "switch operation to dry" appears on a background of which color is different from the familiar one, which is more noticeable by the user, and as a result, the user is more likely be aware of the display.

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[0200] Second, the advice display on liquid crystal display 15 may be given until a preset time of notification is passed. It is known from the conventional experience that it takes about 5 to 30 seconds until the user notices the advice display on liquid crystal display 15. Therefore, the time period of such length is preset as the time for advice display, and after the lapse of this time, the advice display on liquid crystal display 15 may be turned off. More specifically, the advice display on liquid crystal display 15 need not be continuously given for a long time until the user notices. Therefore, after the lapse of a prescribed time which is assumed to be sufficient for the user to notify the advice display, the advice display is canceled and the normal display is resumed on the liquid crystal display 15. As to the method of advice display, the backlight 307 of liquid crystal display 15 may be flickered or may be kept on continuously. When the backlight is to be flickered, the preferred frequency of flicking is about 1 second per one time.

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[0201] Third, the order of the advice display on liquid crystal display 15 may be changed from the example in the embodiment in which the displayed contents are repeated from "message A" → "message B" → "message A" → "message B" → "message C", to the order of "message A" → "message B" → "message C" → "message A" → "message B" → "message C".

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[0202] Further, though the display time is 5 seconds for "message A", 5 seconds for "message B" and 10 seconds for "message C", the display time may be 5 seconds or 10 seconds for all the messages "A", "B" and "C", dependent on the contents. What is important is that by varying the order and time of display, the advice display on liquid crystal display 15 becomes more noticeable to the user.

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[0203] Fourth, the advice display on liquid crystal display 15 is preferably be re-displayed upon request of the user through remote controller 2, even after the advice has been cancelled after the lapse of notification time. If such a configuration is adapted, even after the advice display is canceled, it is possible for the user to confirm the advice display on liquid crystal display 15 by giving an instruction using remote controller 2, even if the user missed the advice display on liquid crystal display 15. Thus, the user can surely recognize the advice display. When the user request re-display of the advice display, the condition which gave rise to the advice display on liquid crystal display 15 may have been already resolved. Therefore, if the condition which gave rise to the advice display has already been solved, it is unnecessary to notice the user the condition of the advice display. Therefore, a configuration may be adapted in that the advice display is not given on liquid crystal display 15 in such a case, even if there is a request from the user.

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[0204] Fifth, the advice display on liquid crystal display 15 may be given together with an alarm by sound or voice. More specifically, when the display is given on liquid crystal display 15 recommending various operations or notifying the change in condition of environment or the apparatus itself, it is preferred that the user is reminded of the situation by simultaneous warning by a buzzer or voice notifying that the advice display is given, so that appropriate instruction is requested. Such a configuration makes it less likely that the user misses the advice display.

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[0205] Though the present invention has been described with reference to an air conditioner, application thereof is not limited thereto, and the present invention may be applied to other electric appliances including a refrigerator, a washing machine, a microwave oven, a heating apparatus and the like, within the scope thereof.

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[0206] As described above, in accordance with the air conditioner of the present invention, when the indoor air is contaminated, or when the indoor air moisture decreases or increases, an advice display recommending ventilating operation, humidifying operation or dry operation is given on the liquid crystal display. Therefore, the user is easily reminded of the environment changing with time, noticing the liquid crystal display, and therefore, the user can surely give the necessary instruction to the air conditioner according to the situation. Further, an advice display recommending execution of an operation based on the expected environment after the stop of operation in accordance with the environment during operation is given on the liquid crystal display, the user is assured and can cope with the situation easily without unnecessary concern or confusion.

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5 showing an internal structure of the indoor unit body of the present embodiment, and Fig. 47 is a schematic diagram representing the control system of the air conditioner in accordance with the present embodiment.

10 404 and an indoor fan 405, whereas the outdoor unit 2 includes an outdoor heat exchanger 406, a compressor 407, a decompressor 408 and an outdoor fan 409.

central portion of indoor unit 1. Referring to Fig. 3, the body display unit 15 includes a moisture lamp 18 which is turned on in accordance with the moisture indoors, a cleanliness lamp 19 of which color changes in accordance with the degree of indoor contamination, a display unit 20 displaying the indoor environment and the state of operation when "notification button" of the remote controller is pressed, and a light receiving unit 16 receiving a signal from the remote controller.

20 **[0211]** Fig. 4 is a plan view of remote controller 3. Referring to Fig. 4, remote controller 3 includes a remote control-
 25 ler display unit 22 displaying the state of operation, a transmission display 23 which is turned on when a signal is trans-
 mitted to indoor unit 1, a switch 24 for turning on/off the operation of the air conditioner, a temperature switch 25 for
 setting room temperature, a notification switch 451 to ask the state of operation, a reset switch 452 used for battery
 exchange of the remote controller, and a liquid crystal switch 453 for turning on/off the light of the liquid crystal at the
 body display unit.

30 406, the outdoor air is passed by the operation of outdoor fan 409, through outdoor heat exchanger 406 and, at this time, the outdoor air deprives the heat exchange medium of heat, and the heat exchange medium is cooled. Thereafter, the heat exchange medium passes through decompressor 408, and is evaporated at indoor heat exchanger 404 of indoor unit 1. At this time, the indoor air is passed through indoor heat exchanger 404 by the operation of indoor fan 405, and the indoor air is deprived of heat.

35 **[0214]** In this manner, the indoor air is cooled and the room is cooled.
[0215] Heating of the room is performed by circulating the heat exchange medium in the reverse direction to the cooling operation.

40 **[0217]** The heat exchange medium is further passed through decompressor 408 and evaporated at outdoor heat exchanger 406 of outdoor unit 2. At the same time, the outdoor unit is passed through outdoor heat exchanger 406 by the operation of indoor fan 405, and heat exchange takes place. Thus, the heat exchange medium deprives the outdoor air of heat, and returns to compressor 407.

45 **[0219]** Operation mode of air conditioner is displayed at the remote controller display unit 22 on remote controller 3, switching from "automatic" - "heating" - "cooling" - "dry" - "automatic" every time the "operation selection" switch 29 on the control panel of remote controller 3 is pressed, as shown in Fig. 4. Thus, the operation mode is selected.

50 during operation, the room temperature is constantly displayed.

55 1°C. In the heating or cooling operation mode, the set temperature is displayed on the remote controller display unit 23 on the control panel of remote controller 3 as well as on the body display unit 15 of indoor unit 1.

played on the body display unit 15 of indoor unit 1.

[0224] At this time, the display of the set temperature at the body display unit 15 of indoor unit 1 is returned to the room temperature display after about 4 seconds.

[0225] When the flow rate is to be changed, "flow rate" switch 30 of the control panel of remote controller 3 is pressed and every time the switch is pressed, the display on the remote controller display unit on the control panel of remote controller 3 changes from "flow rate automatic" - "flow rate Δ " - "flow rate $\Delta\Delta$ " - "flow rate $\Delta\Delta\Delta$ " - "flow rate automatic", and the display on the body display unit 15 of indoor unit 1 changes from "flow rate automatic" - "flow rate minimum" - "flow rate medium" - "flow rate maximum" - "flow rate automatic", and the flow rate changes.

[0226] In the present invention, the operation time or electricity charge is displayed by pressing "notification" switch 451 on the control panel of remote controller 3, within 40 seconds after the "operation on/off" switch 24 on the control panel of remote controller 3 is pressed and the operation is stopped. Namely, on the body display unit 15 of indoor unit 1, "operation time" of the air conditioner, "unit price of electricity charge" and "amount of electricity charge" are displayed in the order of "operation time" → "unit price of electricity charge" and → "amount of electricity charge".

[0227] For example, exemplary display may be "operation time 3 hours 30 minutes" → "calculated at 23 yen/kwh" → "expected electricity charge amount about 50 yen".

[0228] "Unit price of electricity charge" is set to "23 yen/kwh" at the time of shipment. Dependent on the area of the user's residence or dependent on year, "unit price of electricity charge" may vary. By pressing "emergency operation" switch 425 (see Figs. 46, 47) on the body of indoor unit 1 for more than 5 seconds, "unit price of electricity charge" can be changed.

[0229] As to the remote controller 3, first, "reset" switch 452 on the control panel of remote controller 3 is pressed, and "liquid crystal" switch 453 is pressed for more than 5 seconds.

[0230] Further, while continuously pressing "liquid crystal" switch 453, every time " Δ " switch or " ∇ " switch on the "temperature" switch 25 on the control panel of remote controller 3 is pressed, the unit price may be increased or decreased by 1 yen. After "unit price of electricity charge" is set in this manner, by releasing "liquid crystal" switch 453 and pressing "liquid crystal" switch 453 again, the setting of "unit price of electricity charge" is completed.

[0231] Fig. 47 is a control block diagram schematically showing the air conditioner in accordance with the fourth embodiment. Referring to Fig. 47, by operating "liquid crystal" switch 453, "temperature" switch 25 and "reset" switch 452 of remote controller 3, signals enter light receiving unit 25 of body display unit 15 of indoor unit 1. These signals are input to switch determining means 428 of microcomputer 426 together with the signal of "emergency operation" switch 425 on the body of indoor unit 1, and it is determined that "unit price of electricity charge" is to be changed. By unit price changing means 431 at the control unit 427, "unit price of electricity charge" is changed. Operation time of loads such as compressor 407, indoor fan 405 and outdoor fan 409 as well as power consumption are measured by operation time measuring means 429 and power consumption measuring means 430 of microcomputer 426. By charge calculating means 432, the electricity charge is calculated, and the electricity charge is displayed on body display unit 15 through a display circuit.

[0232] Accordingly, even when the economic conditions changed, the unit of the electricity charge can be changed and hence, the amount of electricity charge corresponding to the power consumption can be displayed accurately.

[0233] Though the "emergency operation" switch on the body of the indoor unit and operation of the switches on the remote controller are necessary to change the unit price of electricity charge in the example above, the "emergency operation" switch on the body of the indoor unit may be replaced by a switch on the remote controller, so that the unit price of electricity charge may be changed simply by the operation of the remote controller.

[0234] Alternatively, a unit price changing button for changing the unit price of electricity charge may be provided on the remote controller or on the body of the indoor unit, so as to enable change of the unit price of electricity charge in a simple manner.

[0235] As is apparent from the description above, the present invention provides an air conditioner including an outdoor unit containing at least a compressor, an outdoor heat exchanger, a four way switching valve, a decompressor and an outdoor fan, an indoor unit having at least an indoor heat exchanger and an indoor fan, and a remote controller for remote controlling operations, wherein means for changing unit price of electricity charge displayed on the display unit on the indoor unit is provided, and by operating a switch on the indoor unit and by continuously pressing a switch on the remote controller, the unit price of electricity charge can be displayed on the display unit. Even when the economic conditions change, it is possible to change the unit price of electricity charge, and therefore, the amount of electricity charge can be changed as the economic conditions change. This is very useful for the user to grasp the expected expense.

[0236] Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.

Claims

1. An air conditioner, including a refrigerant circuit formed by coupling at least a compressor (7), an indoor heat exchanger (4), a decompressor (8) and an outdoor heat exchanger (6), and a humidifying/dehumidifying apparatus (10, 11, 12, 13, 14) provided separate from said refrigerant circuit, for removing moisture in a room, comprising:

moisture detecting means (31) for detecting moisture in the room, and
control means (34) for switching operation modes based on the moisture detected by said moisture detecting means (31); wherein
in a first operation mode (37, 35), said humidifying and dehumidifying apparatus (10, 11, 12, 13, 14) guides sucked indoor air to a path into the room as well as to a path to the outside of the room, and in a second operation mode (36), guides the sucked indoor air to the outside of the room.
2. The air conditioner according to claim 1, further comprising selecting means (29) for selecting said operation modes.
3. The air conditioner according to claim 1, wherein said control means (34) switches to said first operation mode (35) when the moisture detected by said moisture detecting means (31) is higher than a prescribed value.
4. The air conditioner according to claim 1, wherein said control means (34) switches to said second operation mode (36), when the moisture detected by said moisture detecting means (31) is lower than a prescribed value.
5. The air conditioner according to claim 1, further comprising temperature detecting means (43) for detecting room temperature; wherein

said control means (34) includes mode selecting means (S25) for selecting either a third operation mode (37) in which said humidifying/dehumidifying apparatus (10, 11, 12, 13, 14) is not driven or said first operation mode (35), based on the temperature detected by said temperature detecting means (43), when the moisture detected by said moisture detecting means (31) is higher than a prescribed moisture.
6. The air conditioner according to claim 5, wherein said mode selecting means (S25) selects third operation mode (37) when the temperature detected by said temperature detecting means (43) is higher than a prescribed temperature.
7. The air conditioner according to claim 5, wherein said mode selecting means (S25) selects said first operation mode (35) when the temperature detected by said temperature detecting means (43) is lower than a prescribed temperature.
8. An air conditioner, including a refrigerant circuit formed by coupling a compressor (104), a four way valve (105), an indoor heat exchanger (108), a decompressor (107) and an outdoor heat exchanger (106), and a humidifying/dehumidifying apparatus (102) provided separate from said refrigerant circuit, for removing moisture in a room, capable of driving in an operation mode in which said refrigerant circuit and said humidifying/dehumidifying apparatus (102) are driven simultaneously.
9. The air conditioner according to claim 8, wherein

said humidifying/dehumidifying apparatus (102) includes
a rotatable moisture absorption rotor (111) absorbing moisture in the air,
a first evacuation path (A1, A2) and a second evacuation path (A3, A4, A5) through which sucked air of the room is communicated to the outside of the room, passing at least a part of said moisture absorbing rotor (111), and
a heater (115) for heating air provided in said second path (A3, A4, A5), upstream of said moisture absorbing rotor.
10. The air conditioner according to claim 9, wherein said humidifying/dehumidifying apparatus (102) can be driven either in a dehumidifying mode in which said heater (115) is heated, or in a ventilation mode in which said heater is not heated.

11. The air conditioner according to claim 8, further comprising:

an indoor temperature sensor (117) detecting room temperature;
 an outdoor temperature sensor (119) detecting outdoor temperature; and
 first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing
 rotor (111) and said heater (115); wherein
 said first control means (103) controls based on the room temperature detected by said indoor temperature
 sensor (117) and the outdoor temperature detected by said outdoor temperature sensor (119).

12. The air conditioner according to claim 8, further comprising:

an indoor temperature sensor (117) detecting room temperature;
 an outdoor temperature sensor (119) detecting outdoor temperature;
 a moisture sensor (118) detecting indoor moisture; and
 first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing
 rotor (111) and said heater (115); wherein
 said first control means controls based on the room temperature detected by said indoor temperature sensor
 (117), the outdoor temperature detected by said outdoor temperature sensor (119) and the moisture detected
 by said moisture sensor (118).

13. The air conditioner according to claim 10, further comprising:

an indoor temperature sensor (117) detecting room temperature;
 an outdoor temperature sensor (119) detecting outdoor temperature; and
 second control means for switching driving mode of said humidifying/dehumidifying apparatus (102) based on
 the room temperature detected by said indoor temperature sensor (117) and the outdoor temperature detected
 by said outdoor temperature sensor (119).

14. The air conditioner according to claim 10, further comprising:

an indoor temperature sensor (117) detecting room temperature;
 an outdoor temperature sensor (119) detecting outdoor temperature;
 first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing
 rotor (111) and said heater (115); and
 second control means (103) for switching driving mode of said humidifying/dehumidifying apparatus (102);
 wherein
 said first control means (103) and said second control means (103) control based on the room temperature
 detected by said indoor temperature sensor (117) and the outdoor temperature detected by said outdoor tem-
 perature sensor (119).

15. The air conditioner according to claim 10, further comprising

first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing
 rotor (111) and said heater (115); and
 second control means (103) for switching driving mode of said humidifying/dehumidifying apparatus (102);
 wherein
 said first control means controls said refrigerant circuit to be driven in a heating operation mode for a pre-
 scribed time period and in a dehumidifying operation mode after the lapse of said prescribed time period, and
 said second control means controls said humidifying/dehumidifying apparatus to be driven in said dehumidify-
 ing mode for said prescribed time period.

16. The air conditioner according to claim 10, comprising:

first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing
 rotor (111) and said heater (115); and
 second control means (103) for switching driving mode of said humidifying/dehumidifying apparatus (102);
 wherein
 said first control means (103) controls said refrigerant circuit to be driven in a heating operation mode for a pre-

scribed time period and in a dry operation mode after the lapse of said prescribed time period, and said second control means (103) controls said humidifying/dehumidifying apparatus to be driven in said ventilation mode for said prescribed time period.

5 17. The air conditioner according to claim 15, wherein said second control means controls said humidifying/dehumidifying apparatus to be driven in the ventilation mode, after the lapse of said prescribed time period.

18. The air conditioner according to claim 10, further comprising:

10 first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing rotor (111) and said heater (115); and
second control means for switching driving mode of said humidifying/dehumidifying apparatus (102); wherein said first control means controls said refrigerant circuit to be driven in the dry operation mode, and
15 said second control means controls said humidifying/dehumidifying apparatus to be driven in said dehumidifying mode for a prescribed time period and to be driven in said ventilating mode after the lapse of said prescribed time period.

19. The air conditioner according to claim 10, wherein

20 said refrigerant circuit further includes an indoor fan (110) for feeding indoor air to said indoor heat exchanger (108);
said air conditioner further comprising:
first control means (103) for separately controlling said indoor fan (110), said four way switching valve (105), said moisture absorbing rotor (111) and said heater (115); and
25 second control means for switching driving mode of said humidifying/dehumidifying apparatus (102); wherein said first control means is capable of driving said indoor fan (110) at least in two modes of high flow rate and low flow rate, and controls said indoor fan (110) in said high flow rate mode while said refrigerant circuit is driven in a heating operation mode and said compressor (104) is stopped; and
said second control means control said humidifying/dehumidifying apparatus to be driven in said dehumidifying mode.
30

20. The air conditioner according to claim 10, further comprising:

35 an indoor temperature sensor (117) detecting room temperature;
an outdoor temperature sensor (119) detecting outdoor temperature;
a moisture sensor (118) detecting indoor moisture;
first control means (103) for separately controlling said four way switching valve (105), said moisture absorbing rotor (111) and said heater (115); and
second control means (103) for switching driving mode of said humidifying/dehumidifying apparatus (102);
40 wherein
said first control means (103) controls said refrigerant circuit to be driven either in a heating operation mode or a dry operation mode, based on the room temperature detected by said indoor temperature sensor (117) and the outdoor temperature detected by said outdoor temperature sensor (119); and
said second control means (103) controls said humidifying/dehumidifying apparatus (102) to be driven in said
45 dehumidifying mode when the moisture detected by said moisture sensor (118) is lower than a prescribed value, and controls said humidifying/dehumidifying apparatus (102) to be driven in said ventilating mode, when said moisture is higher than the prescribed value.

50 21. An air conditioner, including a refrigerant circuit formed by coupling a compressor, an indoor heat exchanger (318) and an outdoor heat exchanger (320), comprising:

a temperature sensor (318) detecting temperature of indoor air;
a moisture sensor (328) for detecting moisture of the indoor air;
a display unit (15) for displaying information; and
55 operation mode determining means for determining an optimal operation mode based on outputs of said various sensors; wherein
said display unit (15) displays an advice based on a result of determination made by said operation mode determining means.

22. The air conditioner according to claim 21, wherein said display unit (15) displays an optimal operation mode determined by said operation mode determining means, as well as an operation procedure to set said optimal operation mode.
- 5 23. The air conditioner according to claim 22, further comprising
- outdoor temperature sensor (322) for detecting outdoor temperature; wherein
said operation mode determining means determines said optimal operation mode to be a dry operation mode
driving said compressor, when increase in moisture of the indoor air is detected by said moisture sensor (328)
10 and abrupt decrease in outdoor temperature is detected by said outdoor temperature sensor (322).
24. The air conditioner according to claim 22, further comprising
- humidifying/dehumidifying apparatus (323) provided independent from said refrigerant circuit for humidifying or
15 dehumidifying indoor air; wherein
said operation mode determining means determines said optimal operation mode to be a humidifying operation
mode driving said humidifying/dehumidifying apparatus (323), when abrupt decrease in moisture of the
indoor air is detected by said moisture sensor (328).
- 20 25. The air conditioner according to claim 22, further comprising:
- a gas sensor (329) detecting degree of contamination of the indoor air; and
a humidifying/dehumidifying apparatus (323) provided separate from said refrigerant circuit, for dehumidifying,
humidifying or ventilating the indoor air; wherein
25 said operation mode determining means determines said optimal operation mode to be a ventilation mode for
ventilation by said humidifying/dehumidifying apparatus (323), when increase in the degree of contamination
of the indoor air is detected by said gas sensor (329).
26. The air conditioner according to claim 22, further comprising:
- 30 a humidifying/dehumidifying apparatus (323) provided independent from said refrigerant circuit, for dehumidifying or humidifying indoor air;
an outdoor temperature sensor (322) for detecting outdoor temperature; and
predicting means (S232) predicting dew condensation after an operation is stopped, based on the temperature
35 of the indoor air detected by said temperature sensor (313), the moisture of the indoor air detected by said
moisture sensor (328) and the outdoor temperature detected by said outdoor temperature sensor (322);
wherein
said operation mode determining means determines said optimal operation mode to be a dehumidifying operation
mode in which dehumidifying operation is performed by said humidifying/dehumidifying apparatus (323),
40 when dew condensation after the stop of operation is predicted by said predicting means (S232).
27. The air conditioner according to claim 21, wherein said display unit (15) displays an advice based on the result of determination by said operation mode determining means in a color different from a normal display color.
- 45 28. The air conditioner according to claim 22, wherein said display unit (15) displays an advice based on the result of determination made by said operation mode determining means, for a prescribed period.
29. The air conditioner according to claim 28, further comprising
- 50 receiving means for receiving a signal input requesting display of an advice at said display unit (15); wherein
after the lapse of said prescribed period, said display unit (15) re-displays said advice in response to the reception by said receiving means.
30. The air conditioner according to claim 29, wherein re-display of said advice is not given if an optimal operation mode determined by said operation mode determining means after the lapse of said prescribed period is the same
55 as present operation mode.
31. The air conditioner according to claim 21, further comprising sound generating means for generating sound or

voice; wherein

said sound generating means generates sound or voice in synchronization with the display of said advice by said display unit 15.

5 32. The air conditioner according to claim 21, wherein said display unit (15) is arranged approximately at the center of an indoor cabinet 311 covering the indoor heat exchanger (318), inclined downward at a prescribed angle.

10 33. An air conditioner including a refrigerant circuit formed by coupling at least a compressor (407), an indoor heat exchanger (404), a decompressor (408) and an outdoor heat exchanger (406), comprising:

a load detecting unit (429, 430) for detecting a load on said air conditioner;
electricity charge calculating means (432) for calculating amount of electricity charge, based on said detected load and a unit price of electricity charge;

15 a display unit (15) for displaying said calculated amount of electricity charge; and
unit price changing means (431) for changing the unit price of electricity charge.

20 34. The air conditioner according to claim 33, wherein said display unit (15) displays, when the unit price of electricity charge is changed by said unit price changing means (431), changed said unit price.

35. The air conditioner according to claim 33, further comprising

25 a remote controller terminal (3) for remote controlling operation of said air conditioner; and
a switch (425) provided on an indoor unit (1) including the indoor heat exchanger (404); wherein
said unit price changing means (431) changes the unit price based on a signal from said switch (425) and a signal received from said remote controller terminal (3).

30 36. The air conditioner according to claim 35, wherein said remote controller terminal (3) transmits said signal for changing the unit price, when a prescribed button thereon is continuously pressed for a prescribed time period.

37. The air conditioner according to claim 33, further comprising a switch (425) provided on an indoor unit (1) including said indoor heat exchanger (404); wherein

35 said unit price changing means (431) changes the unit price based on a signal from said switch (425).

38. The air conditioner according to claim 33, further comprising

40 a remote controller terminal (3) for remote controlling an operation of said air conditioner; wherein
said unit price changing means (431) changes the unit price based on a signal received from said remote controller terminal (3).

39. The air conditioner according to claim 33, further comprising

45 a remote controller terminal (3) for remote controlling an operation of said air conditioner; wherein
said remote controller terminal (3) has a display unit (23) for displaying a unit price,
a button (25) for changing the unit price displayed on said display unit (23), and
transmitting means for transmitting the changed unit price; and
said unit price changing means (431) changes the unit price based on the signal received from said remote controller terminal (3).

FIG. 1

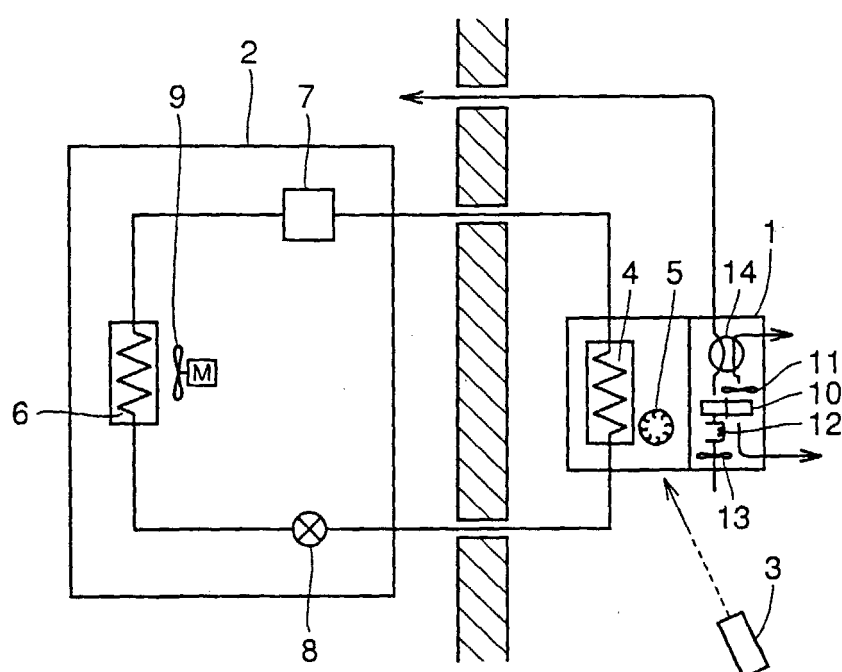


FIG.2

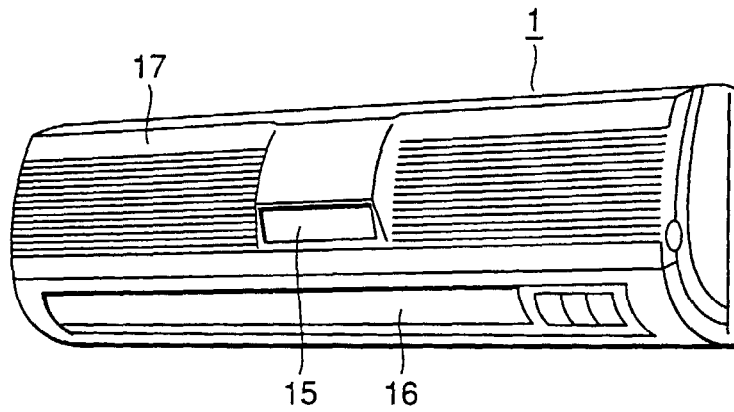


FIG.3

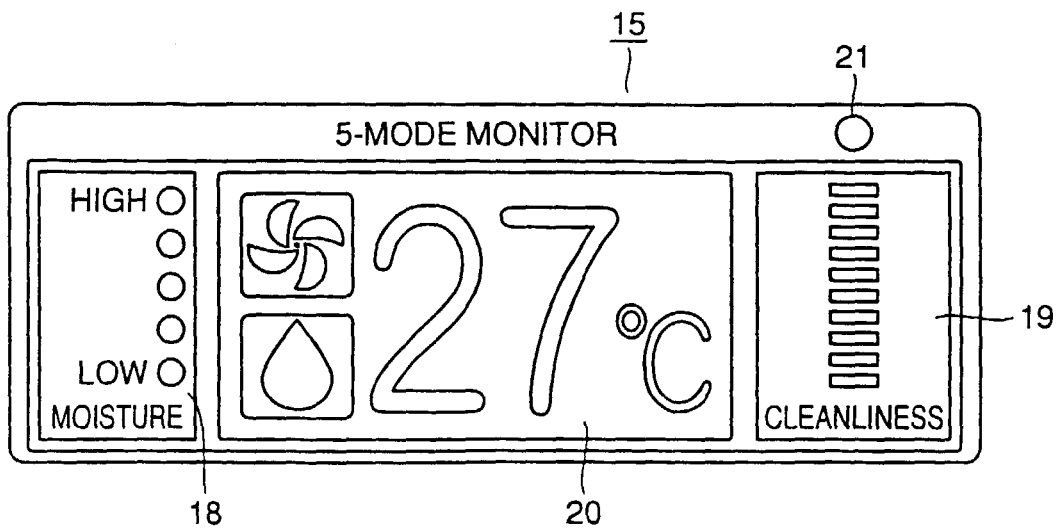


FIG. 4

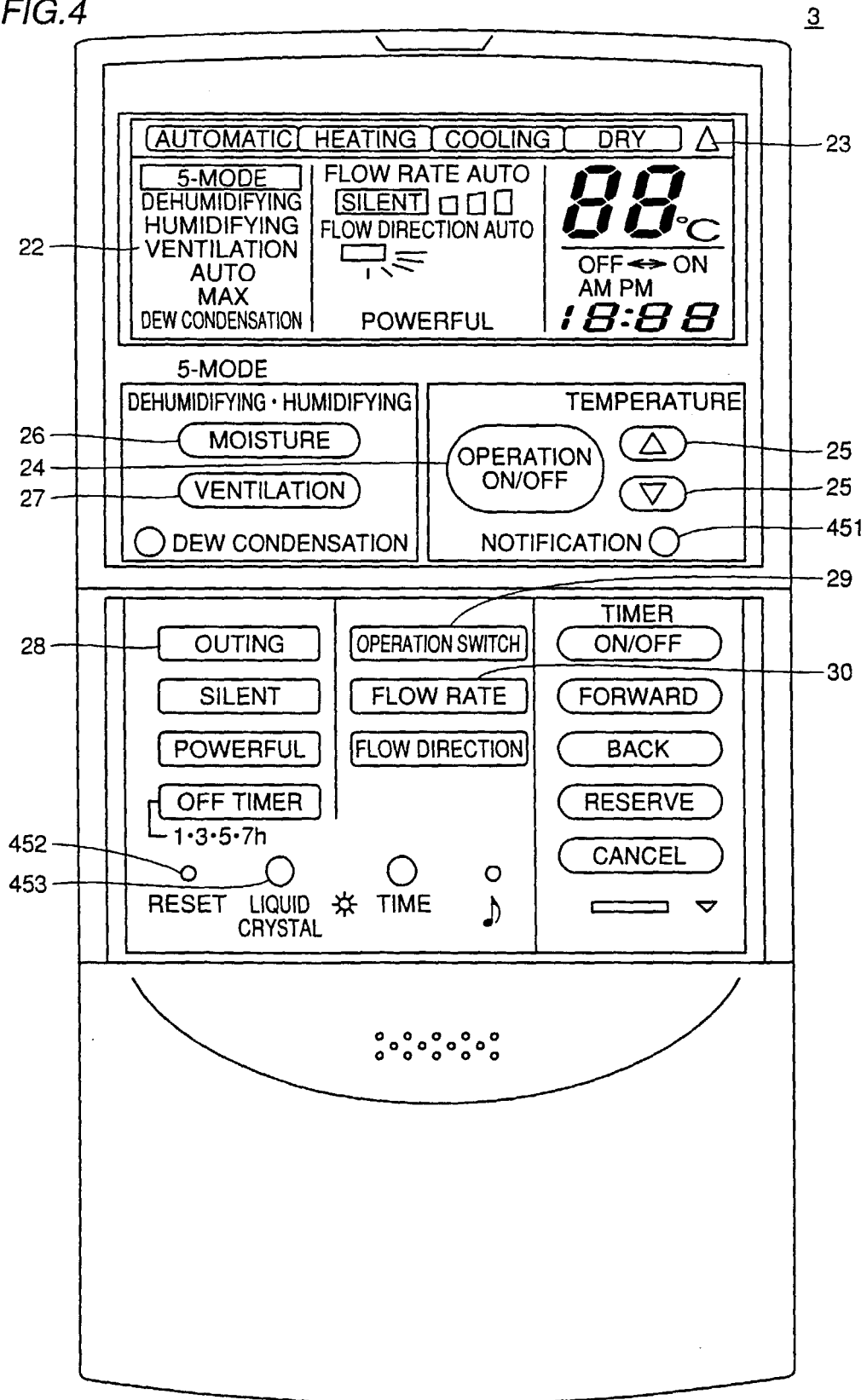


FIG.5

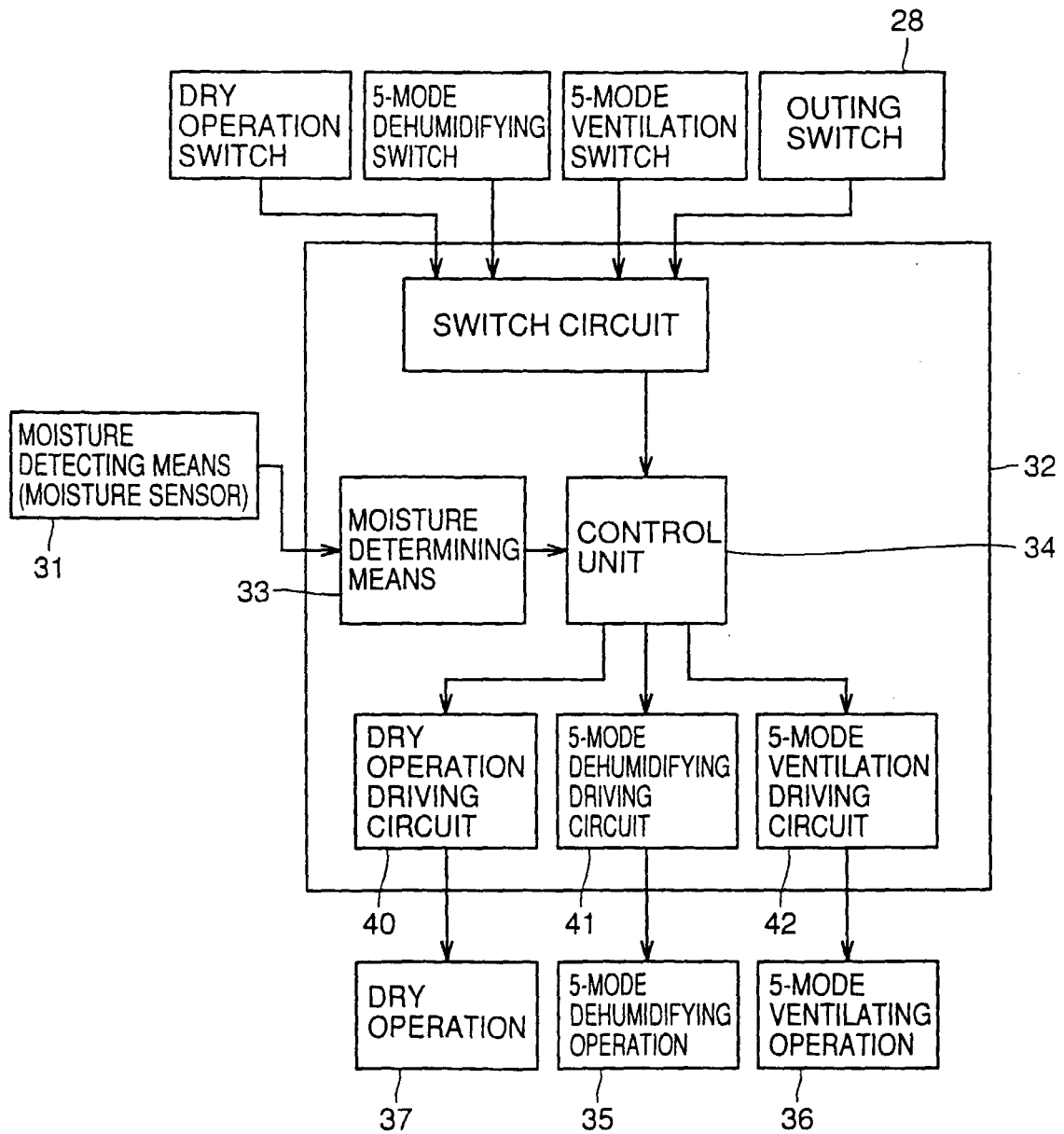


FIG.6

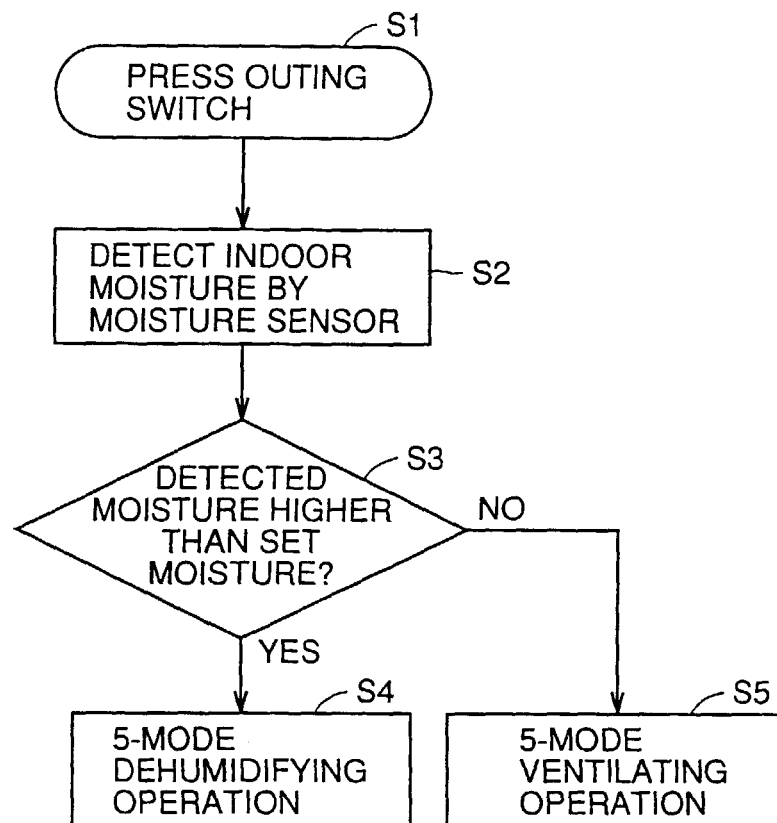


FIG.7

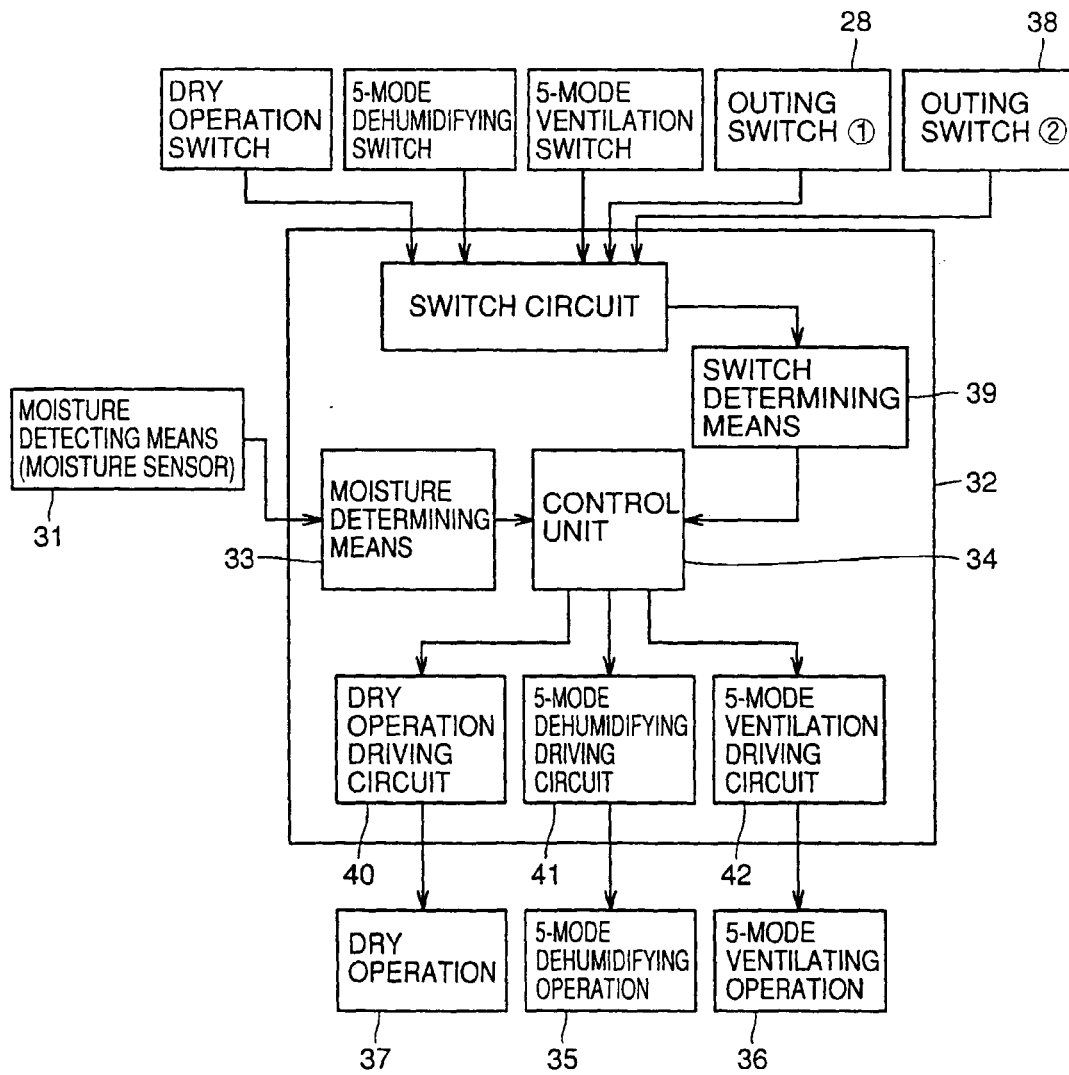


FIG.8

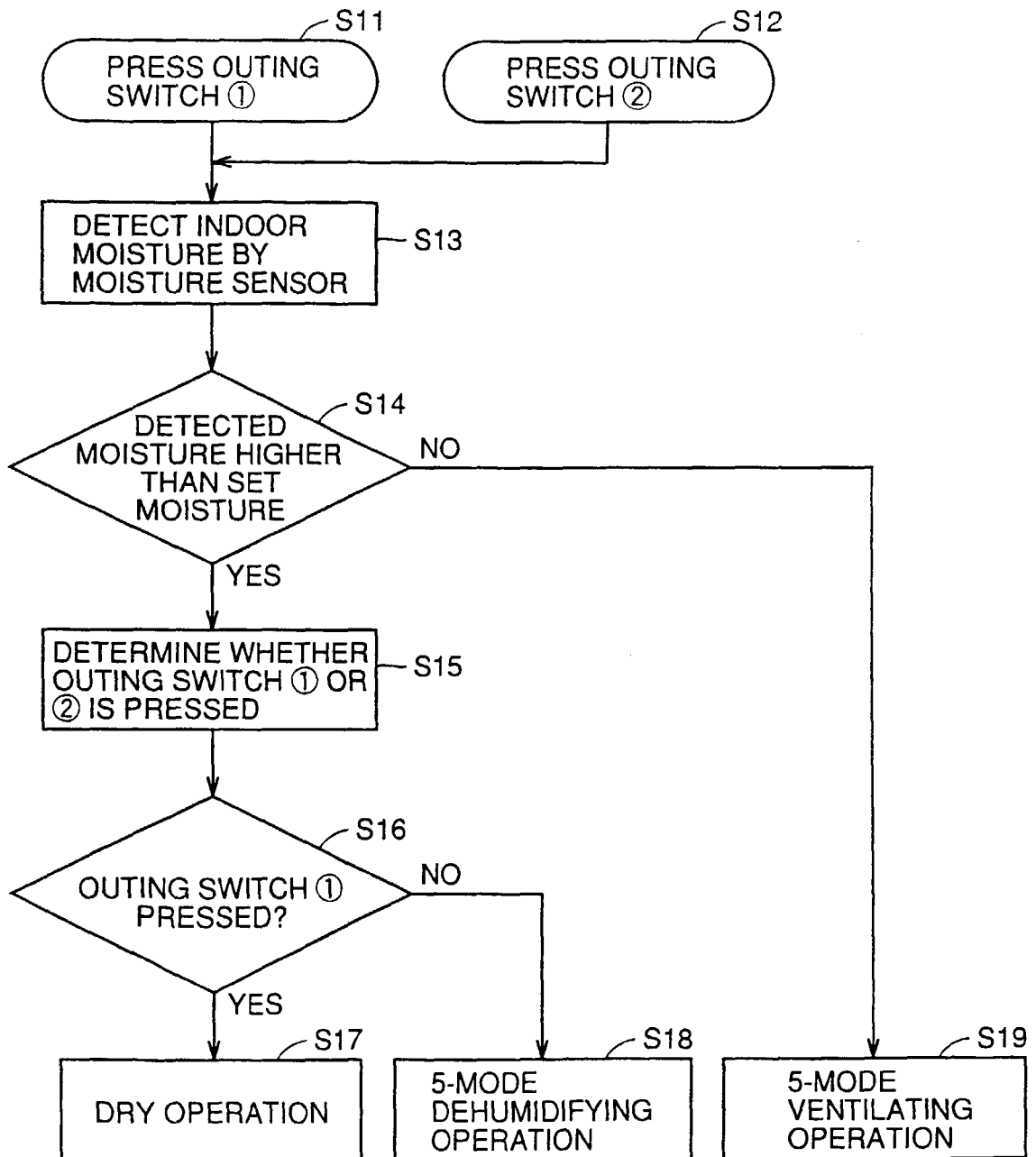


FIG. 9

3

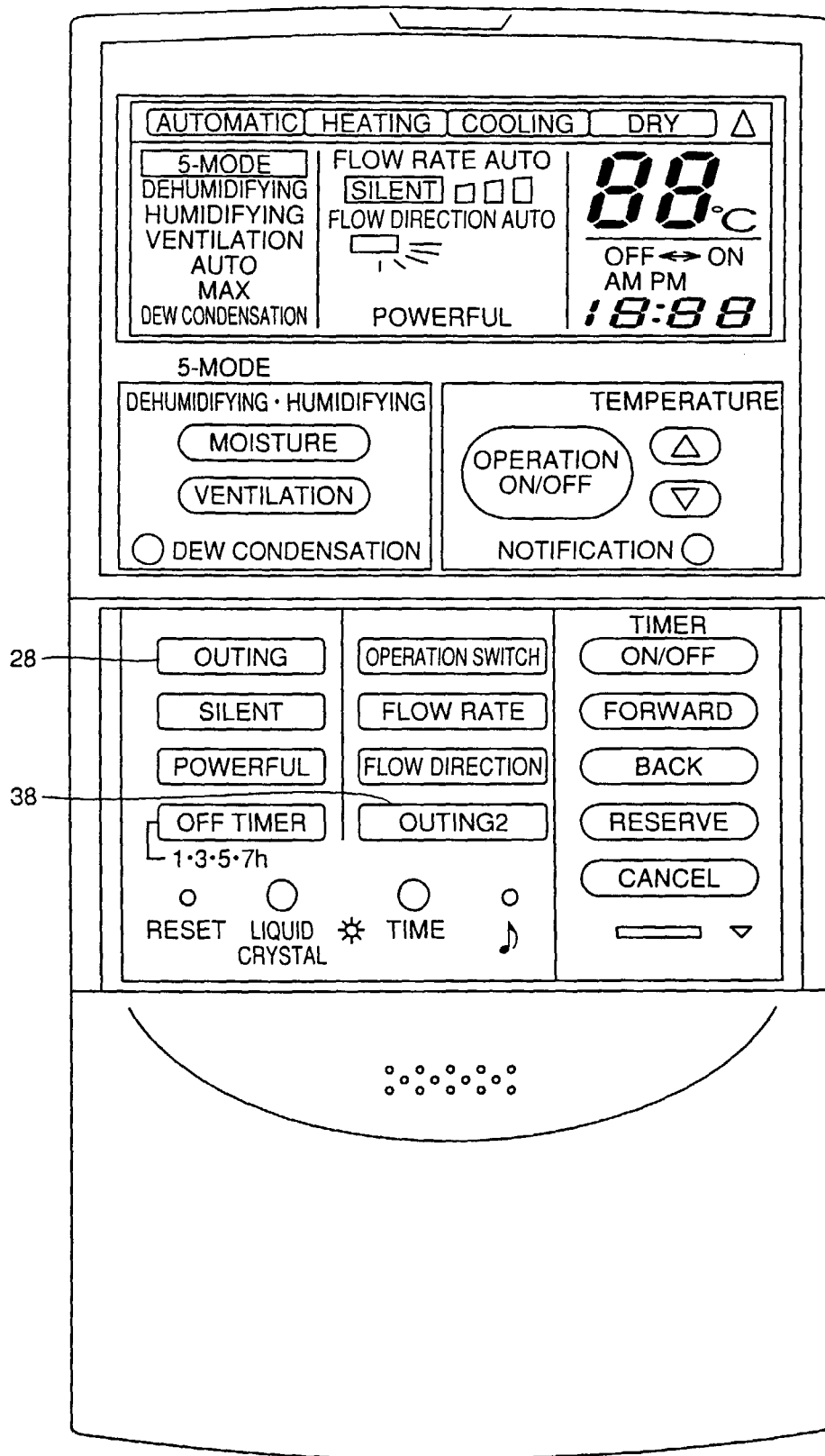


FIG. 10

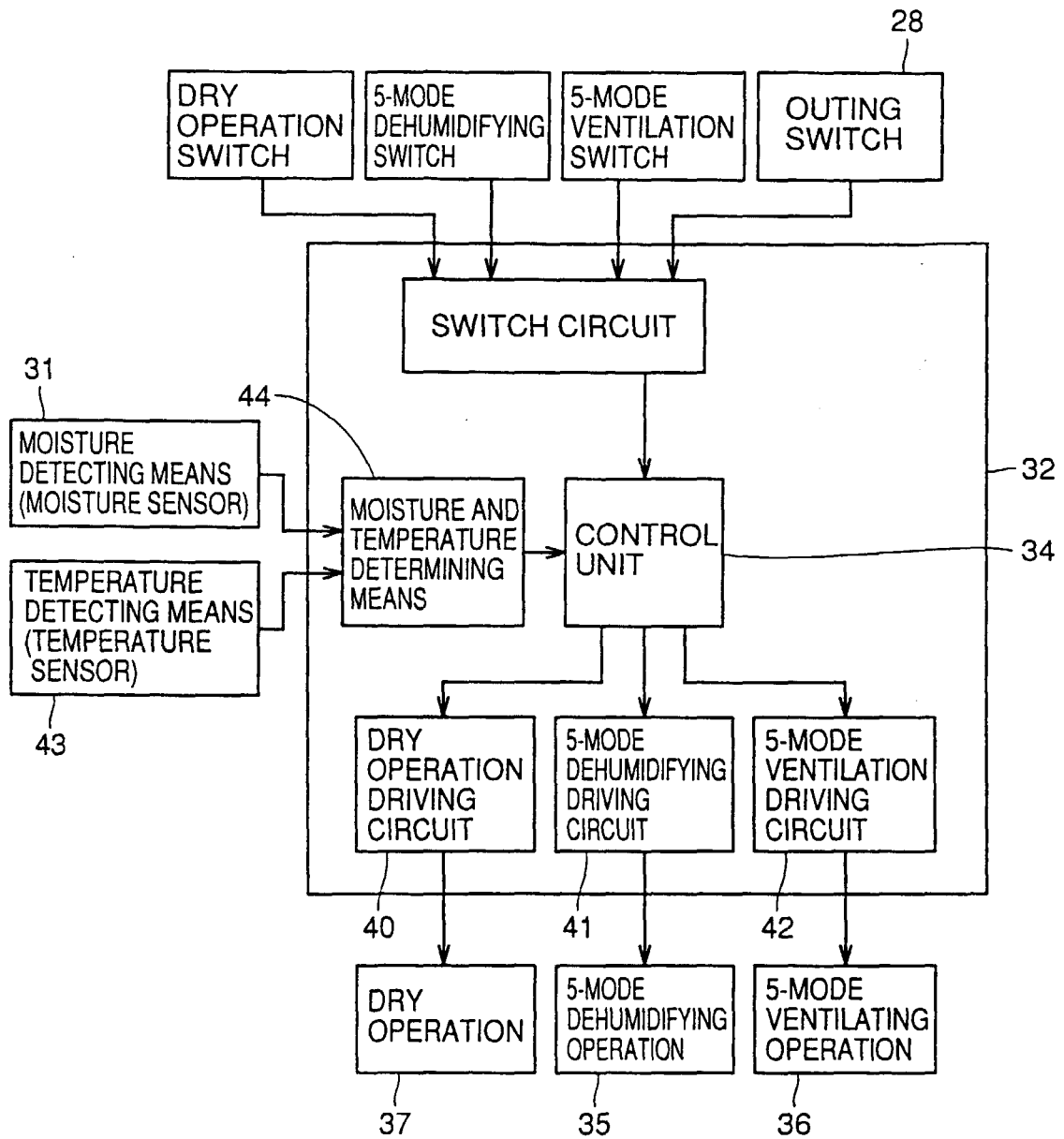


FIG.11

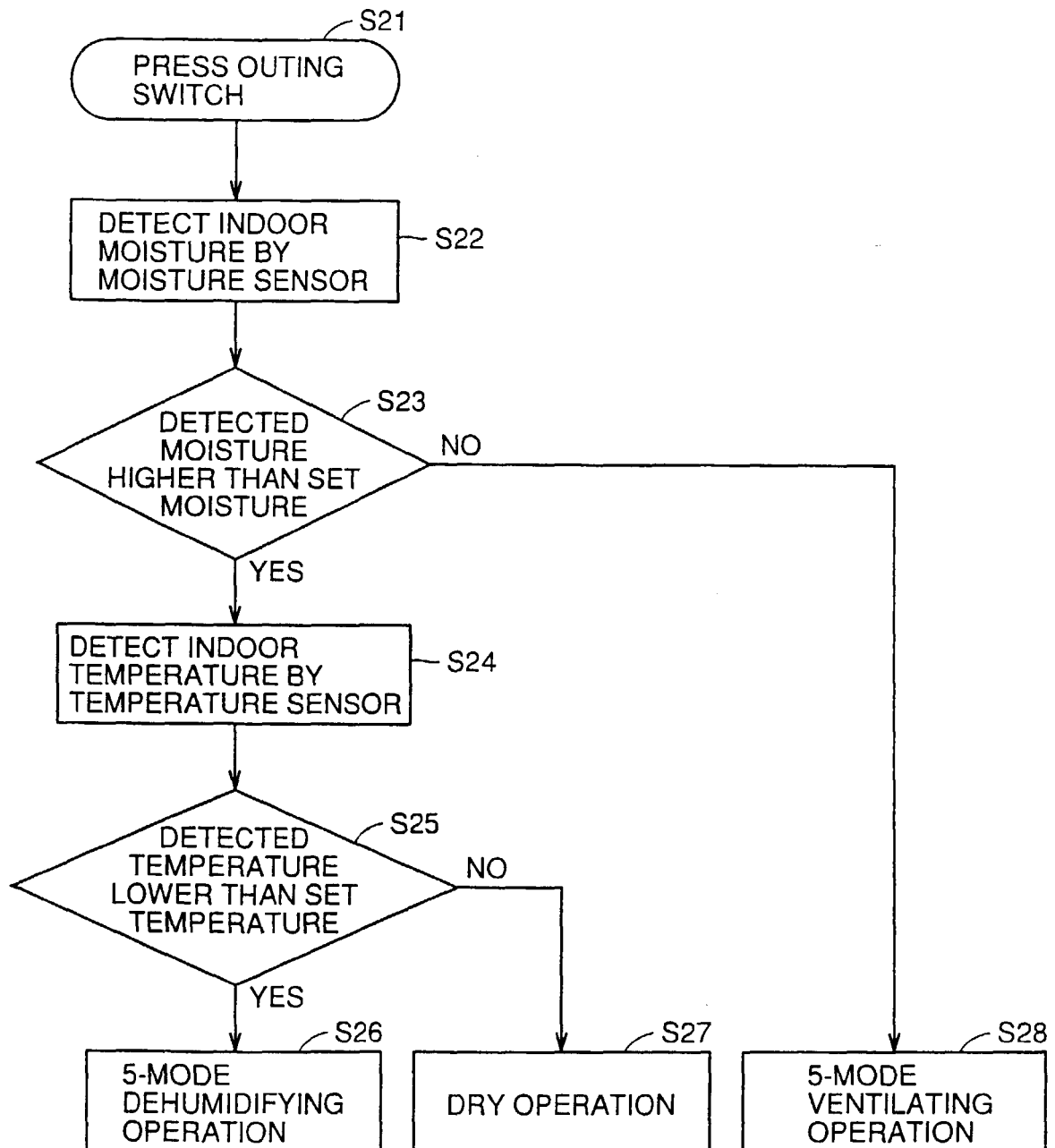


FIG. 12

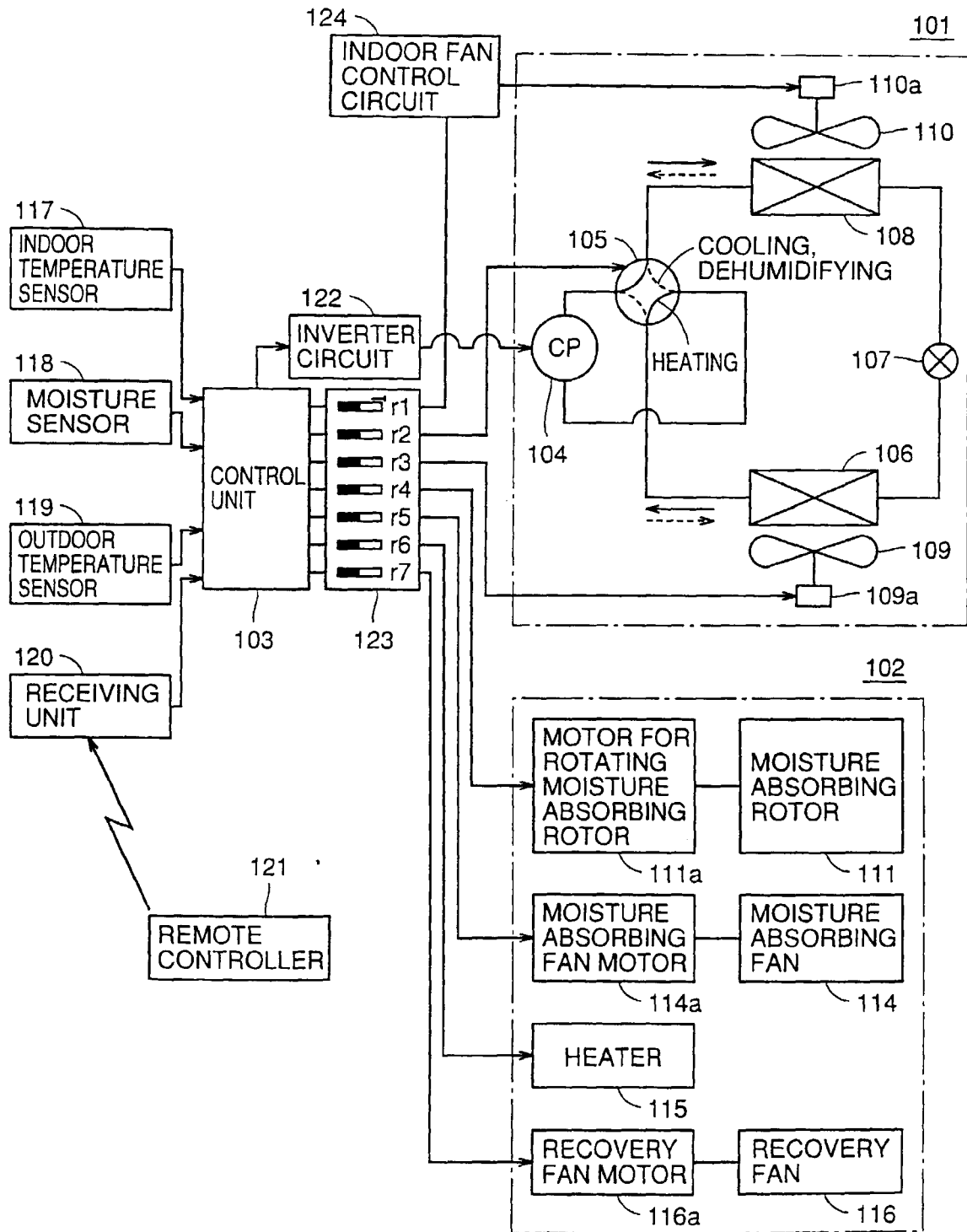


FIG.13

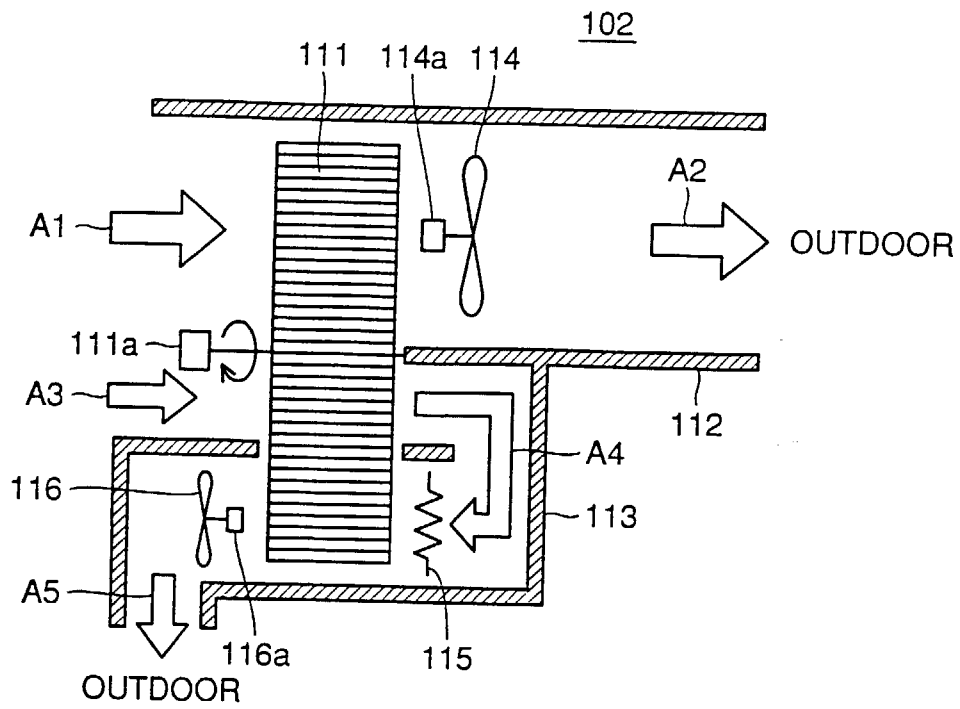


FIG.14

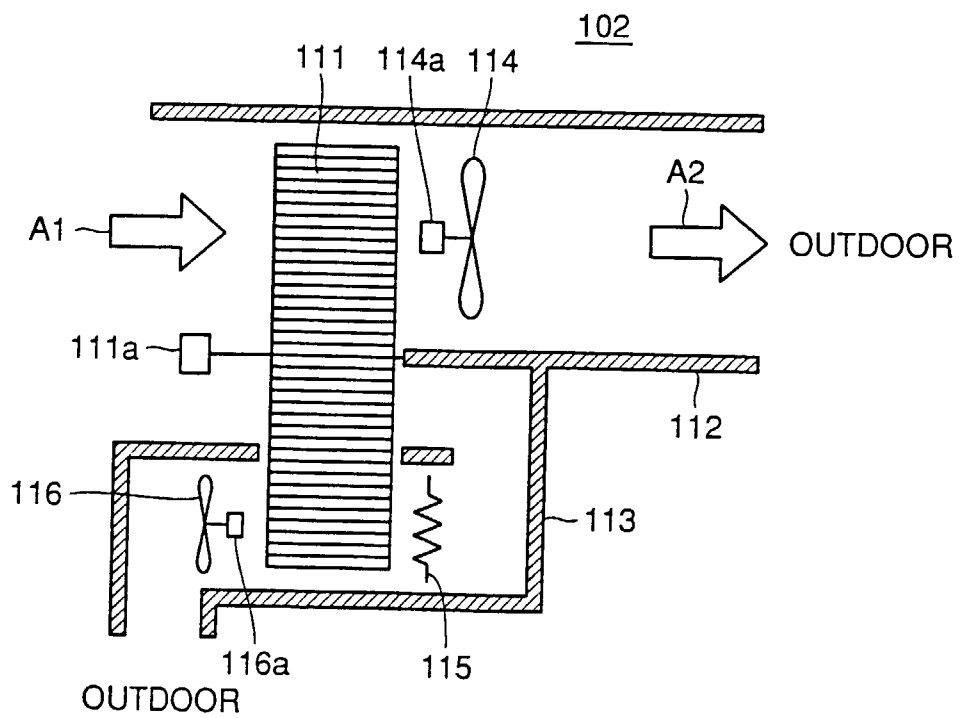


FIG.15

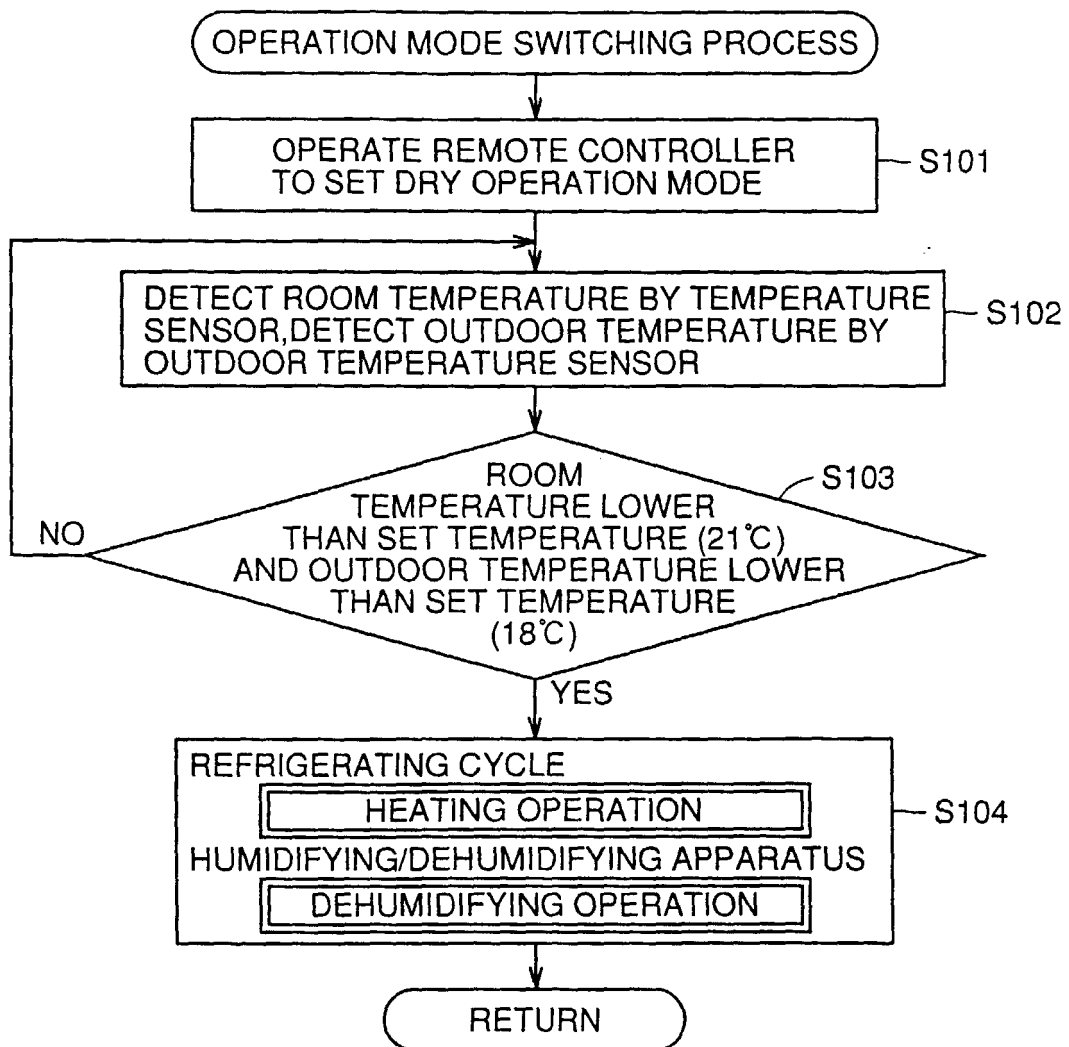


FIG.16

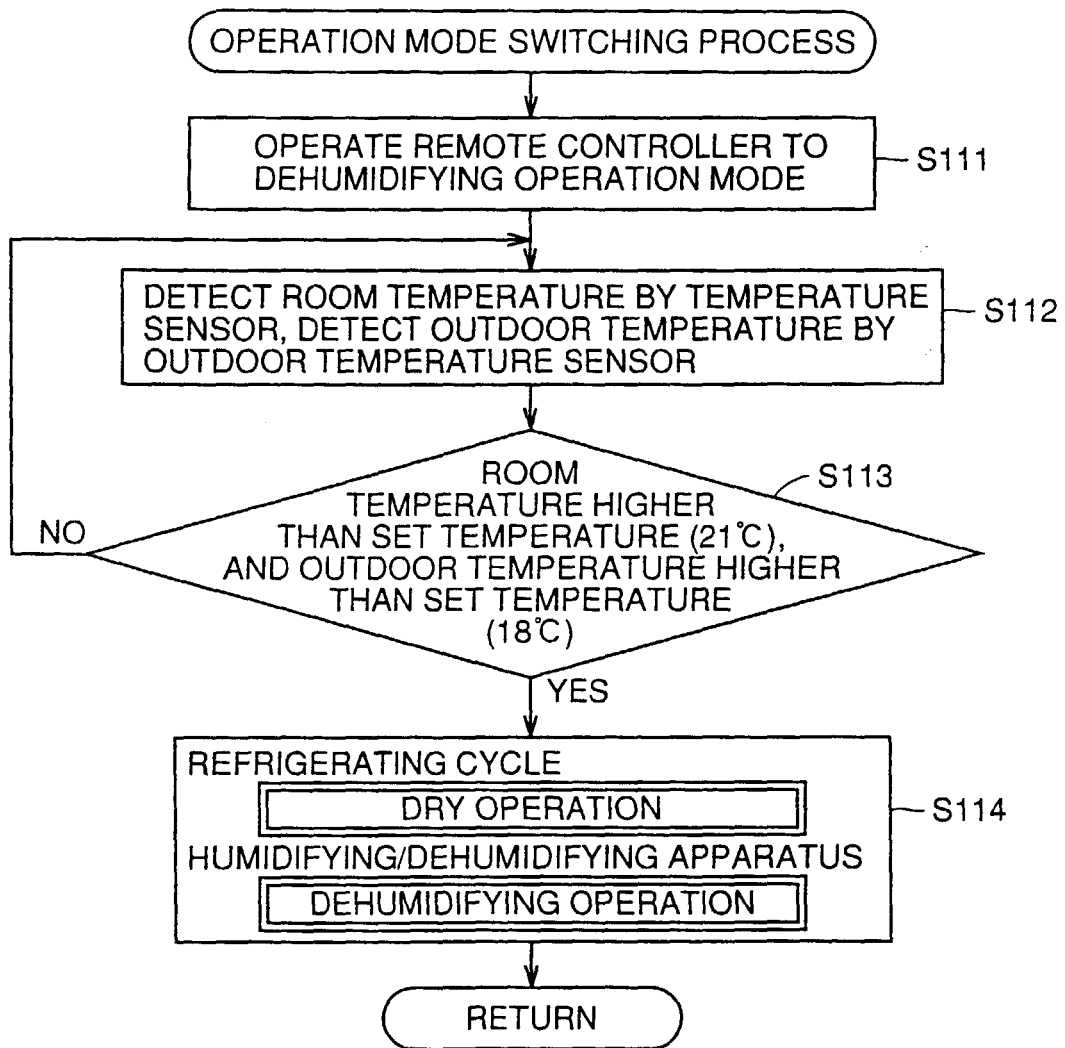


FIG.17

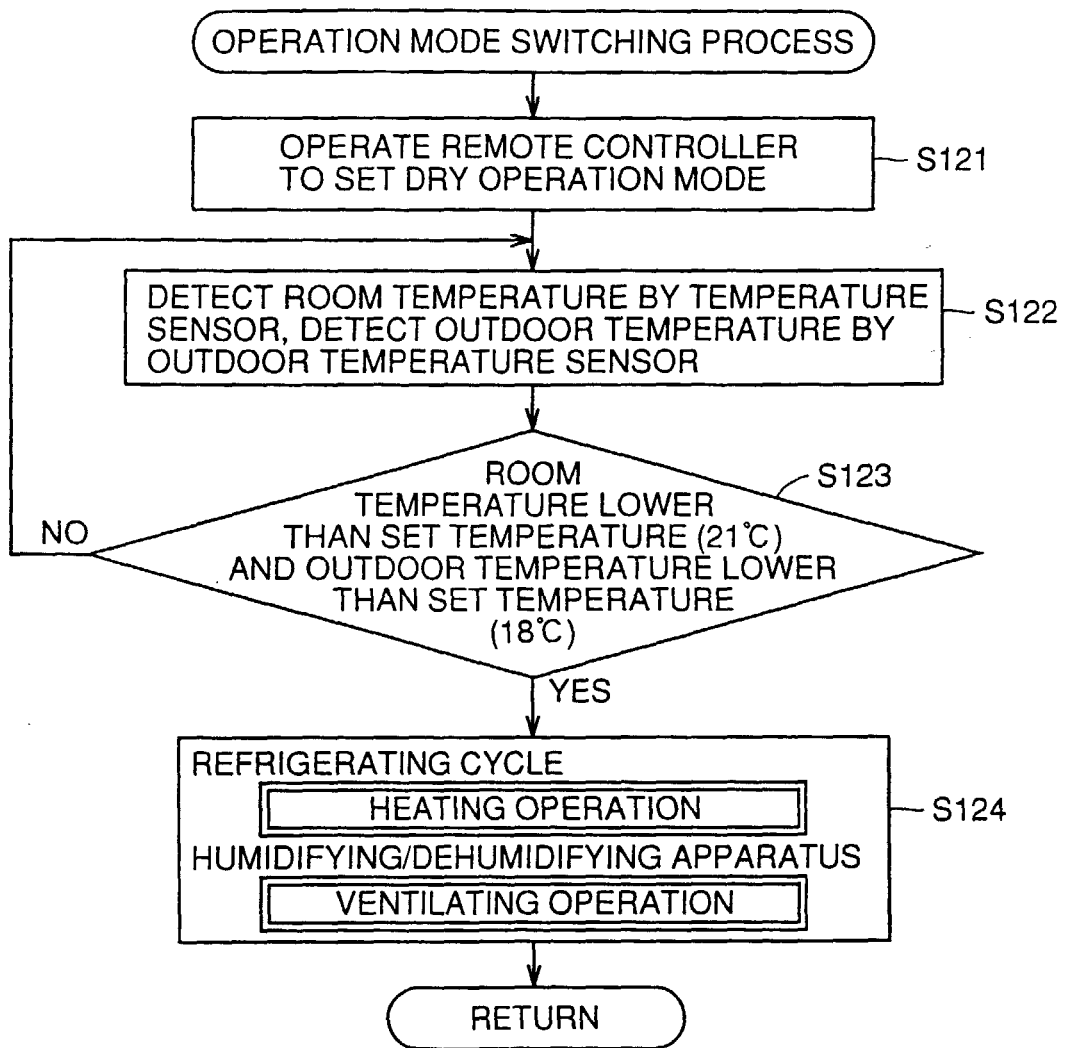


FIG.18

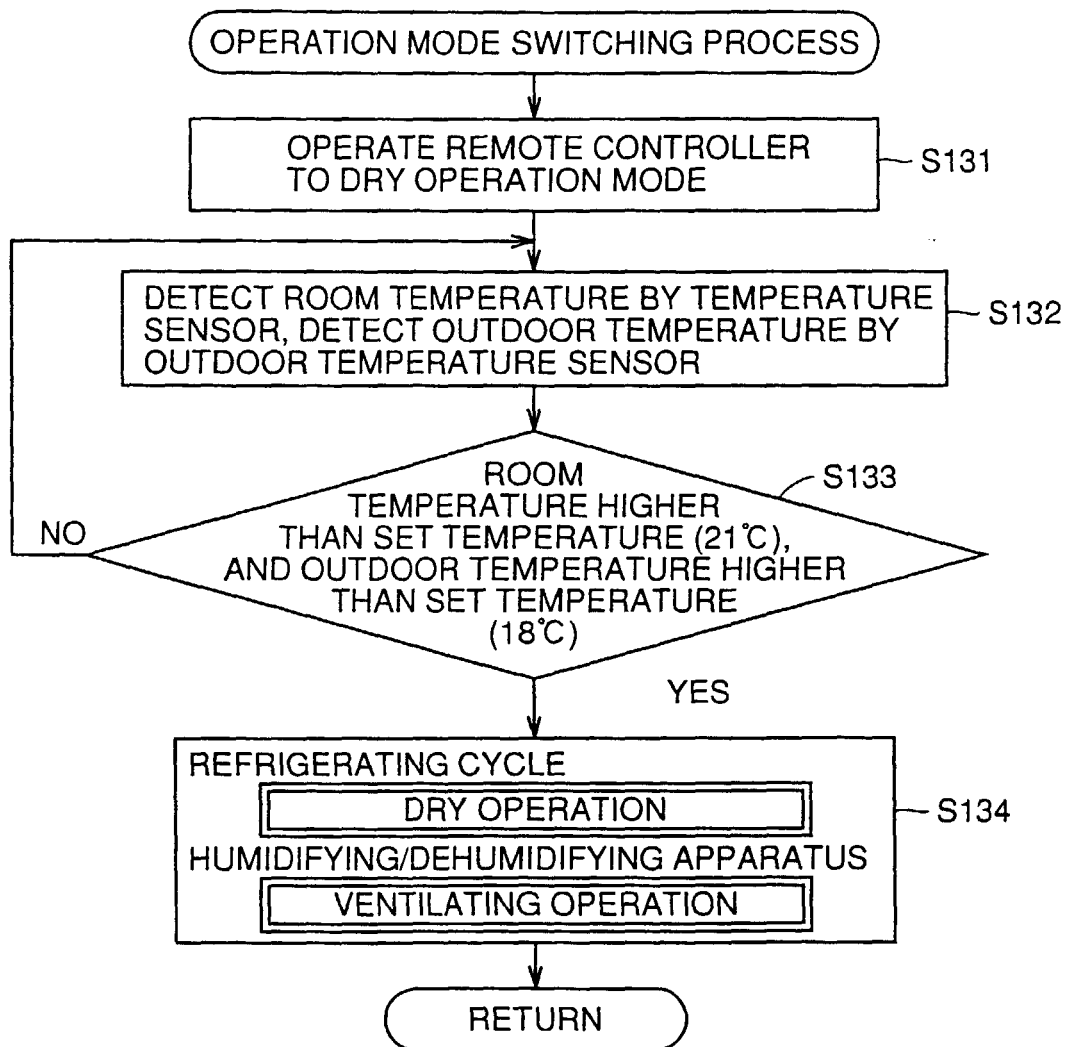


FIG.19

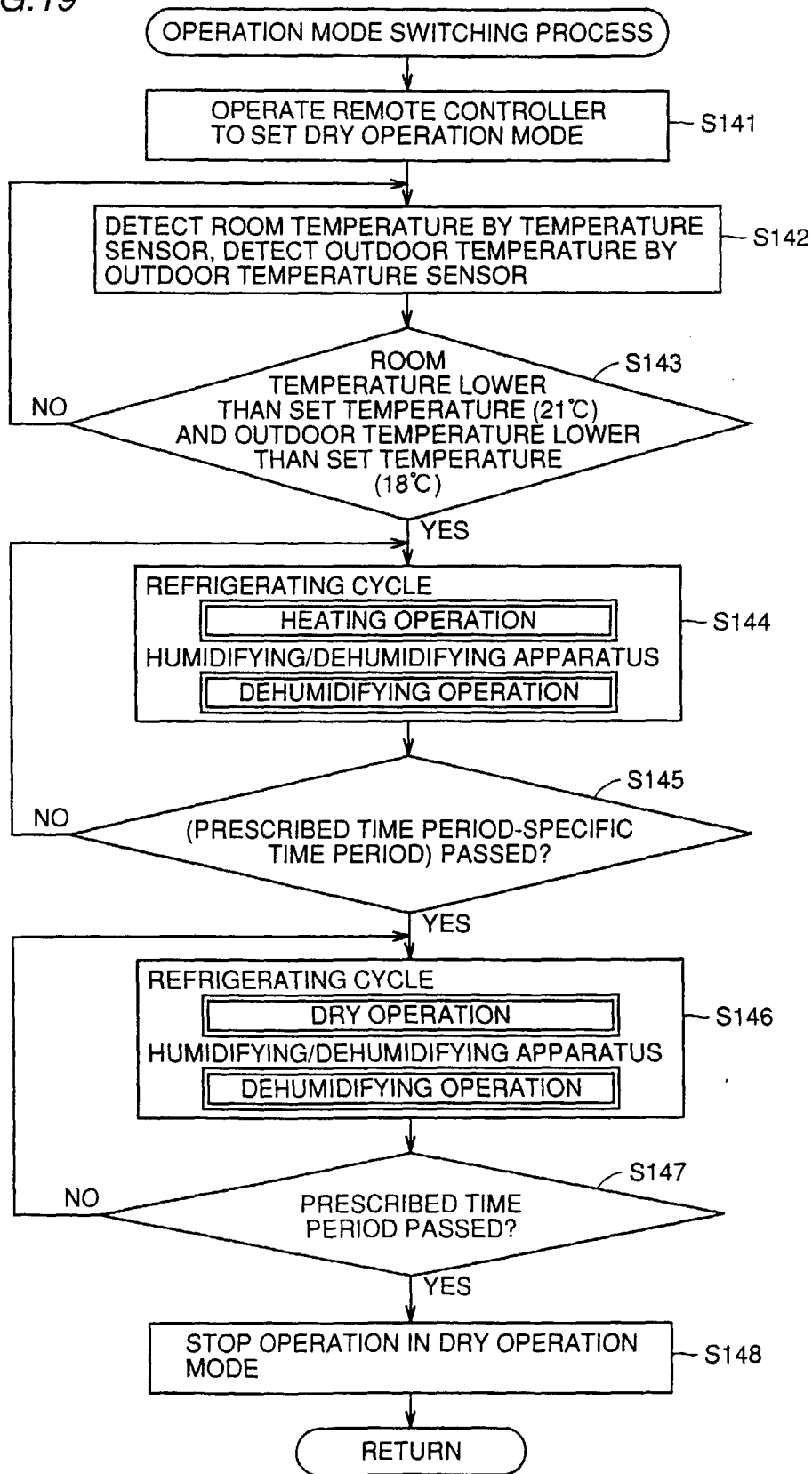


FIG.20

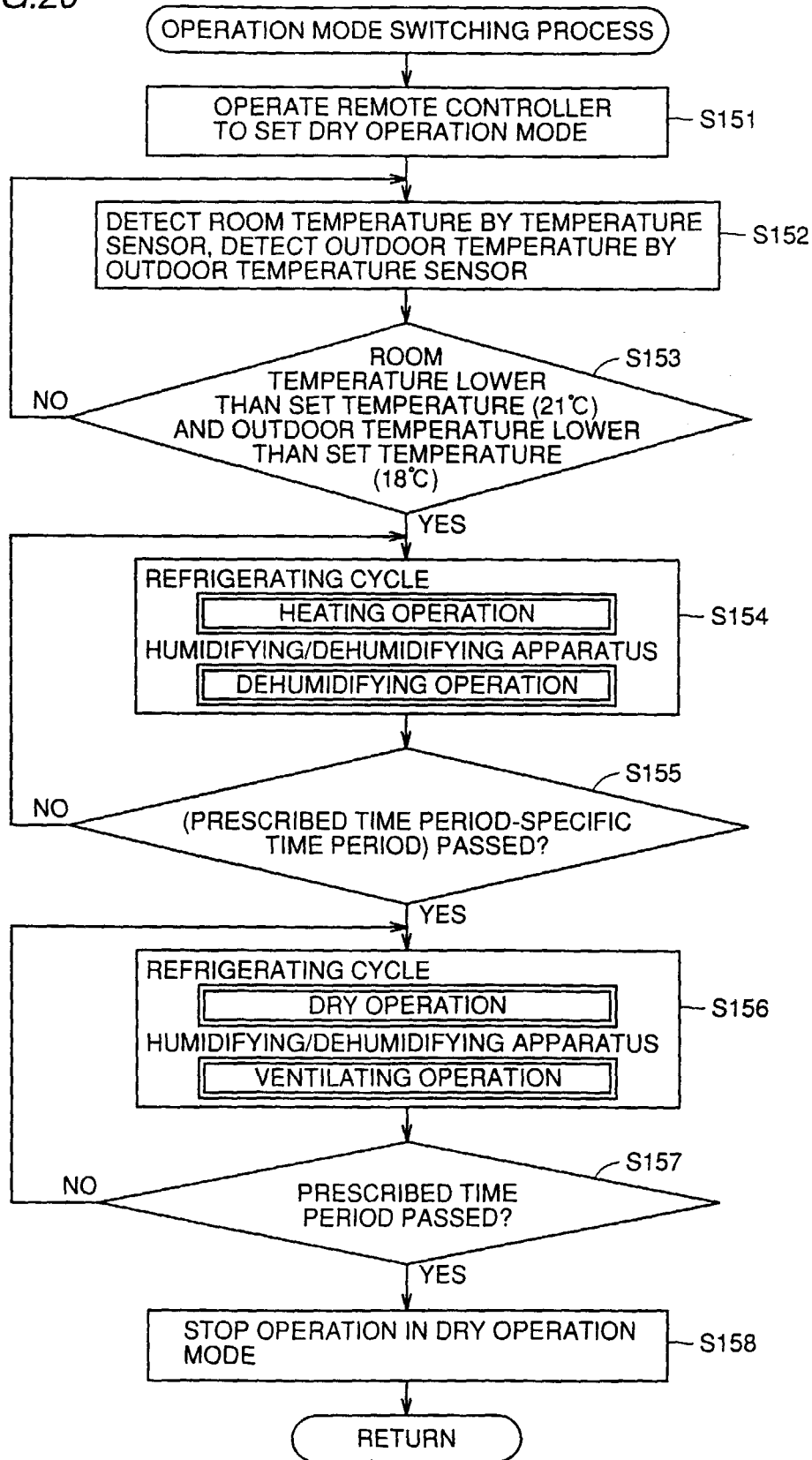


FIG.21

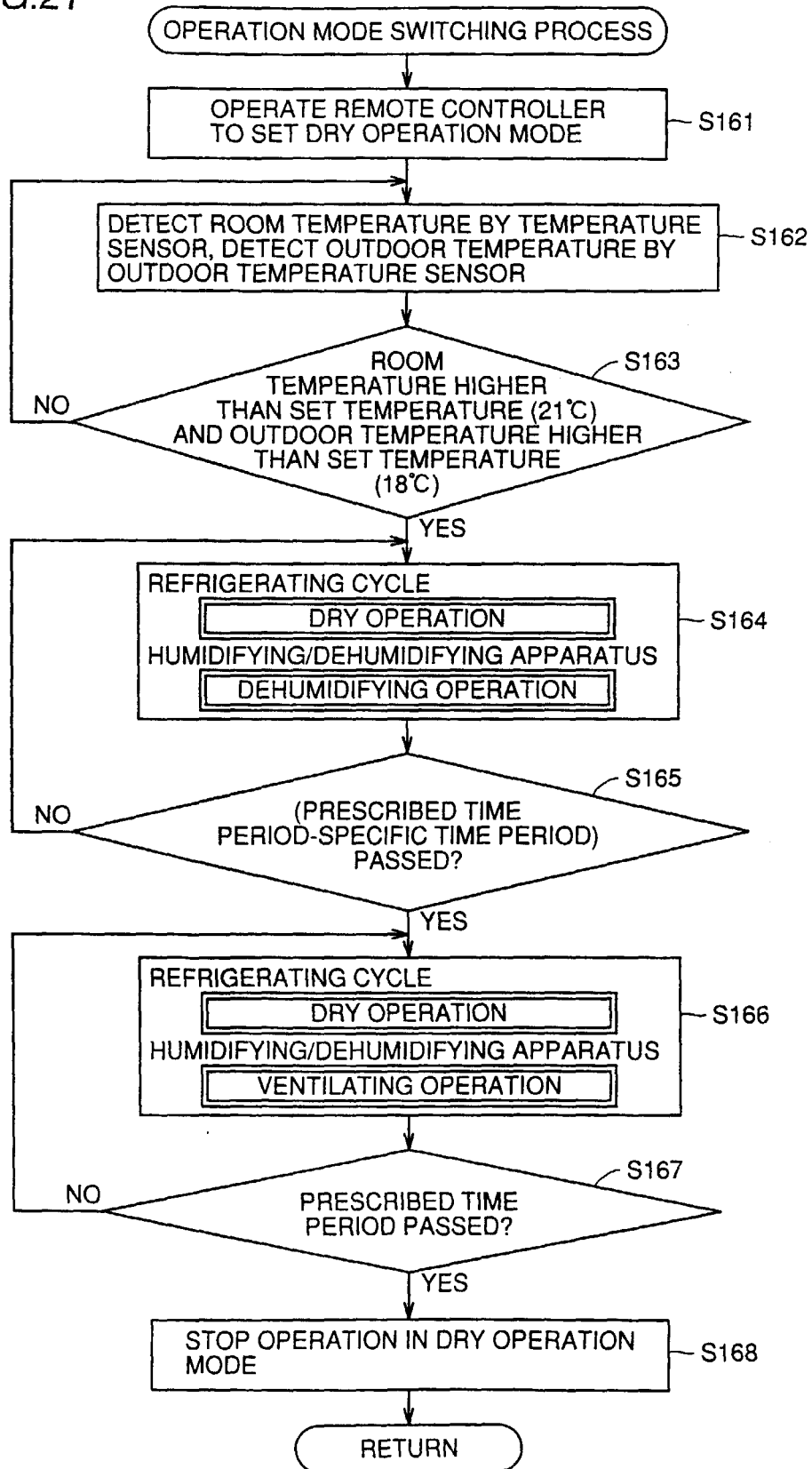


FIG.22

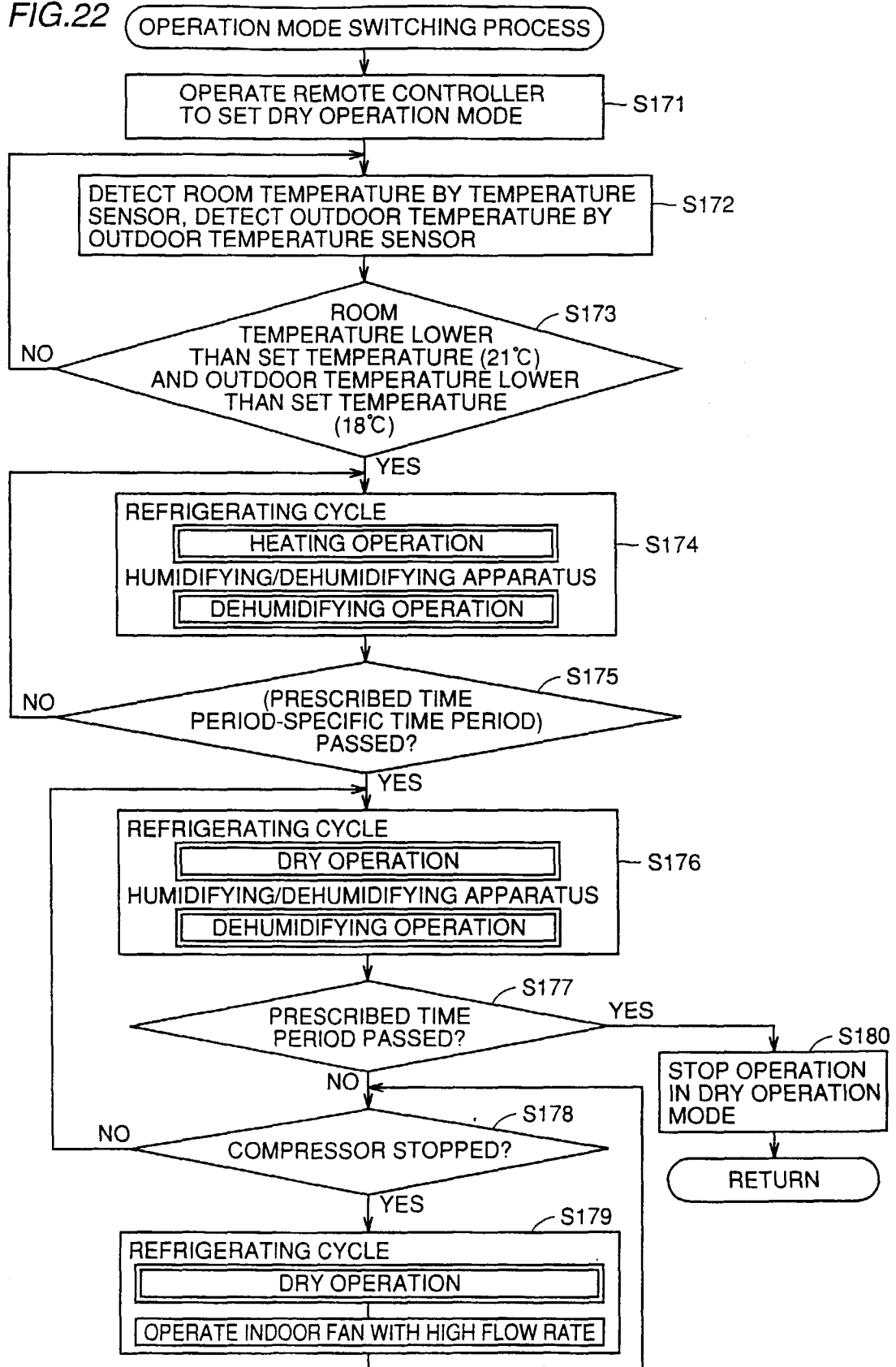


FIG.23

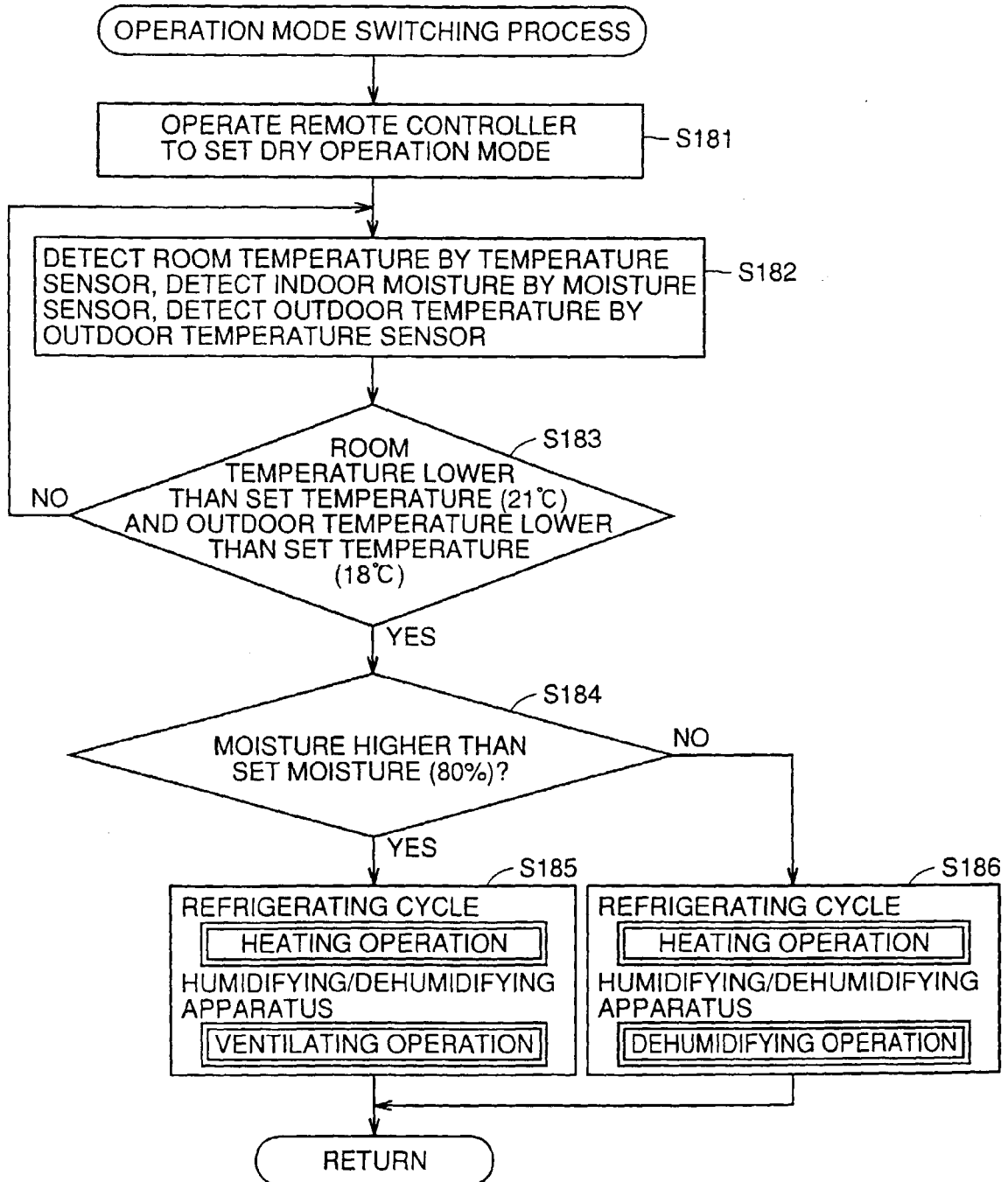


FIG.24

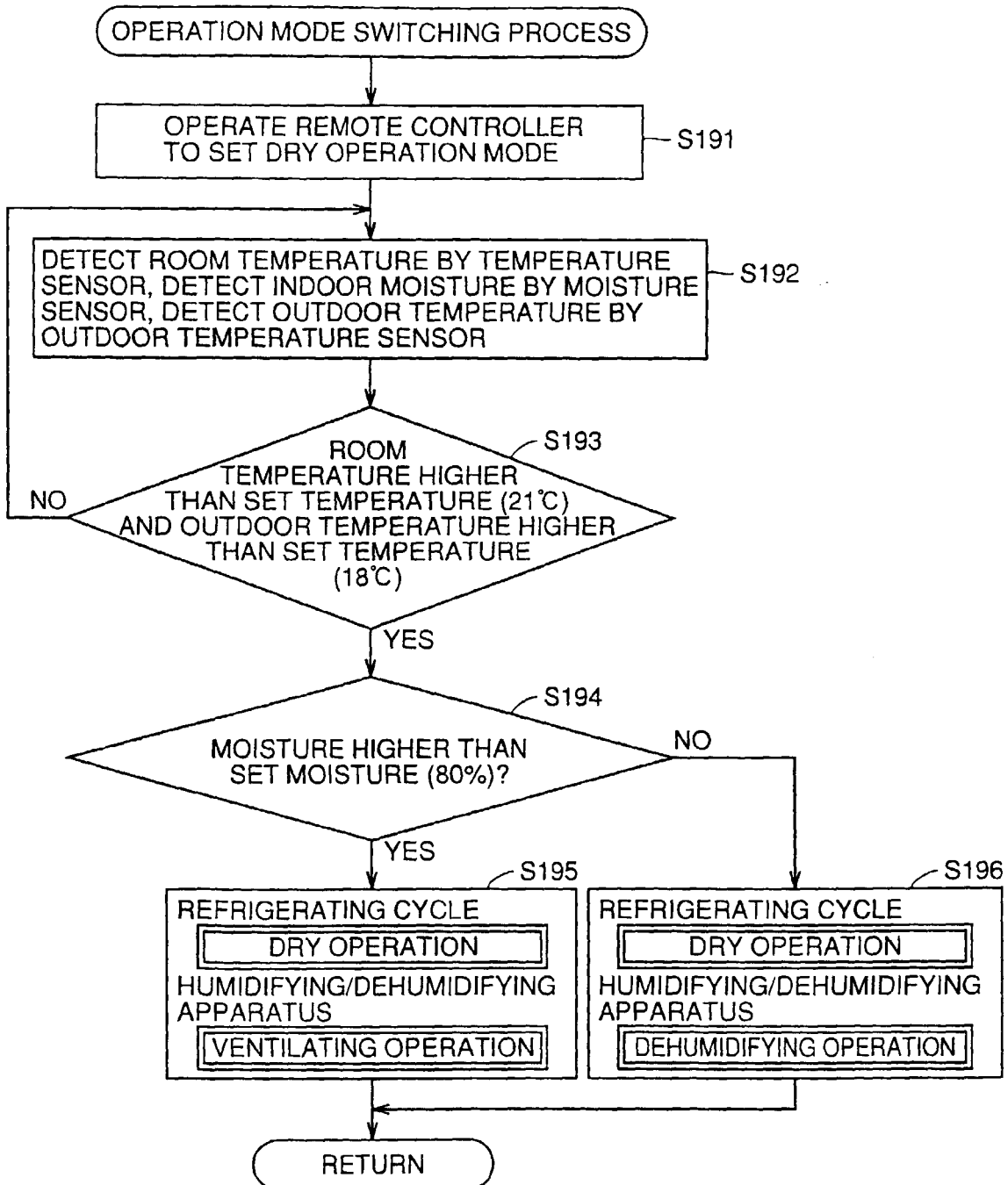


FIG.25

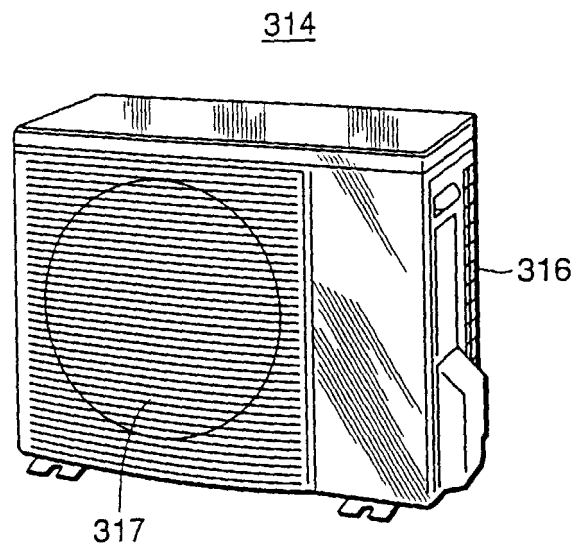


FIG.26

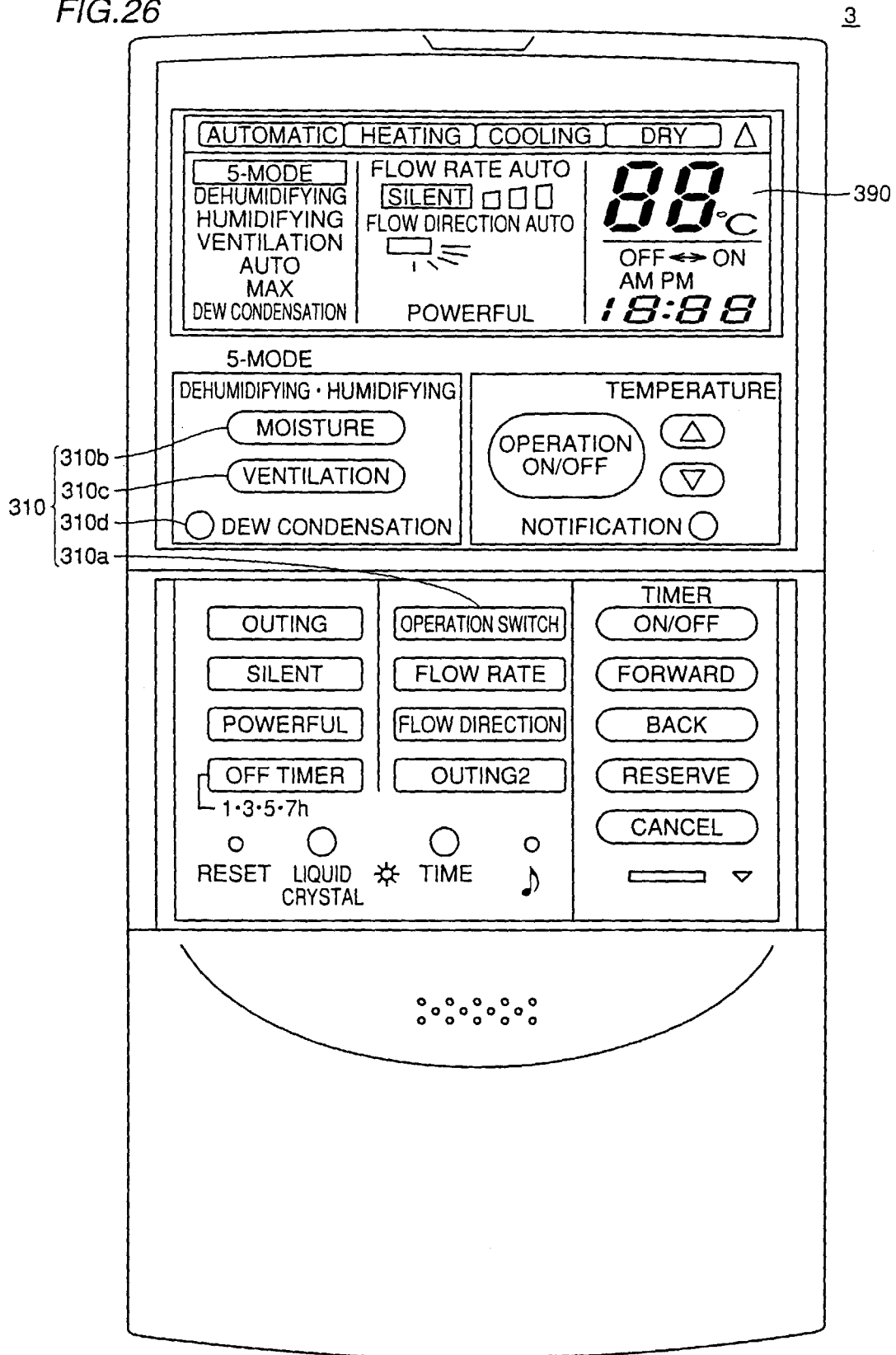


FIG.27

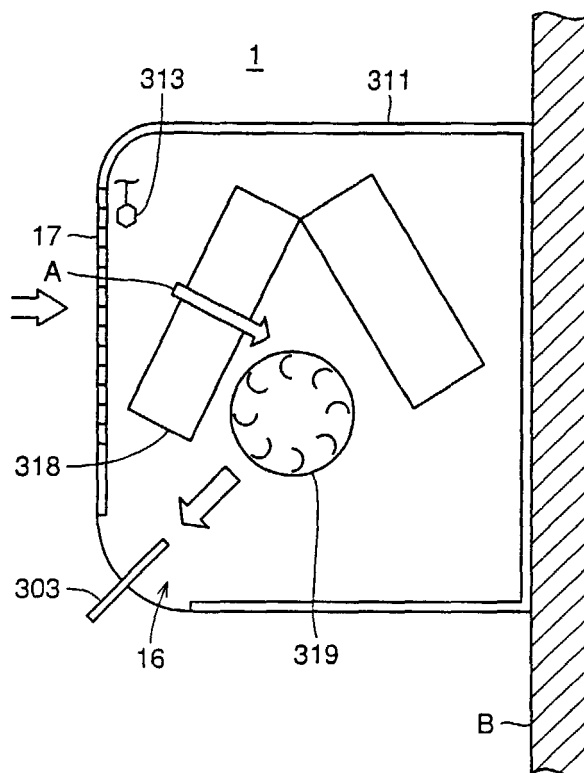


FIG.28

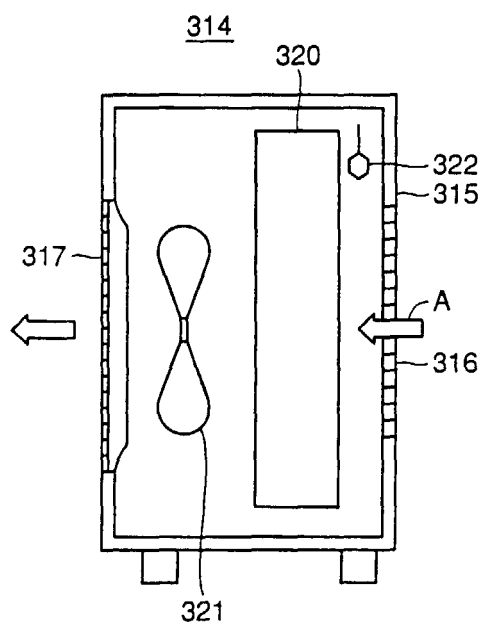


FIG.29

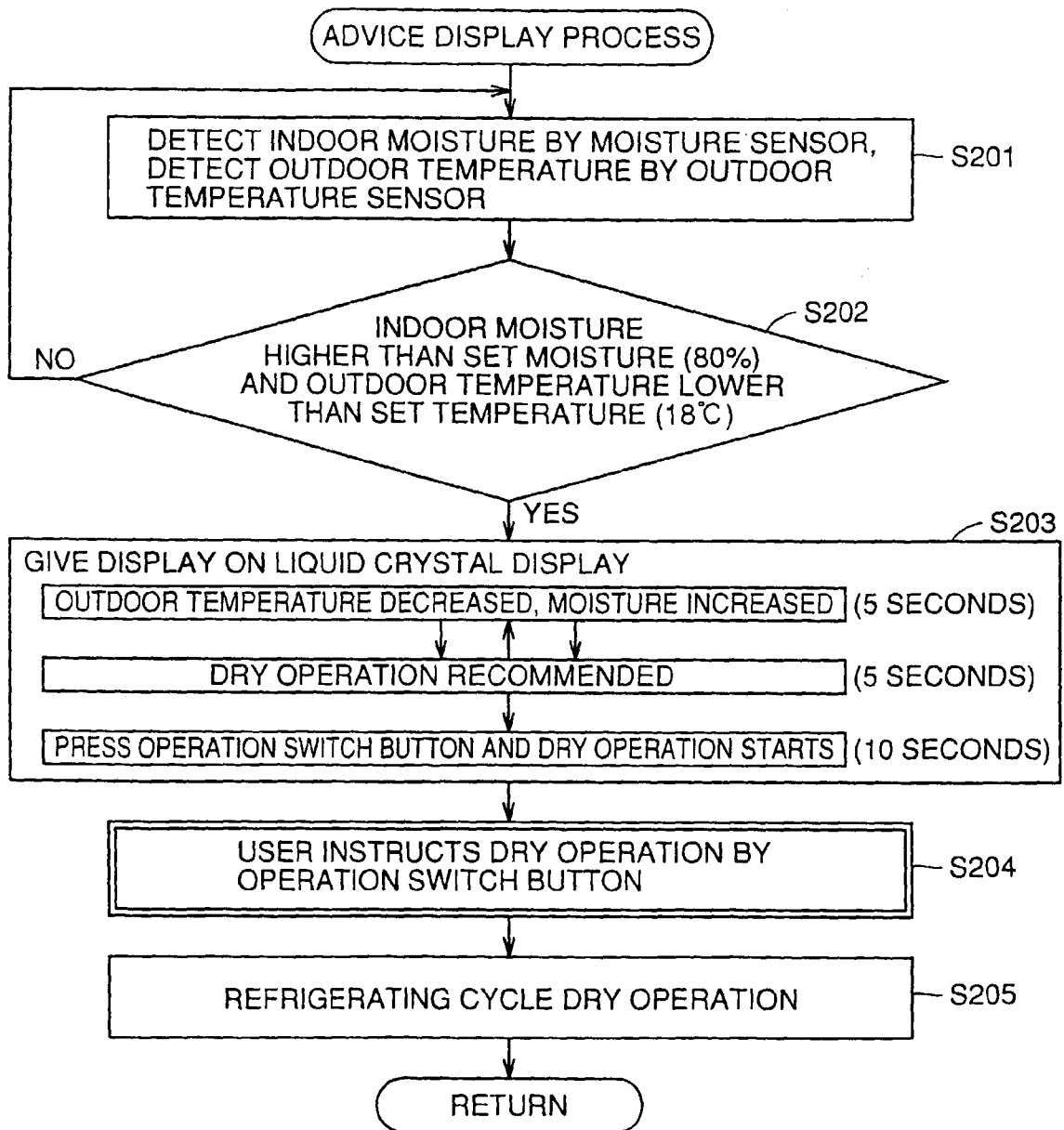


FIG.30

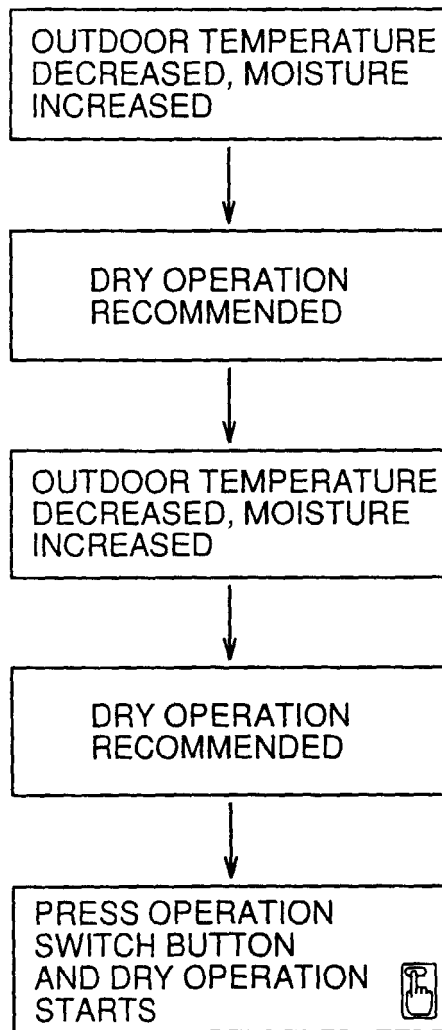


FIG.31

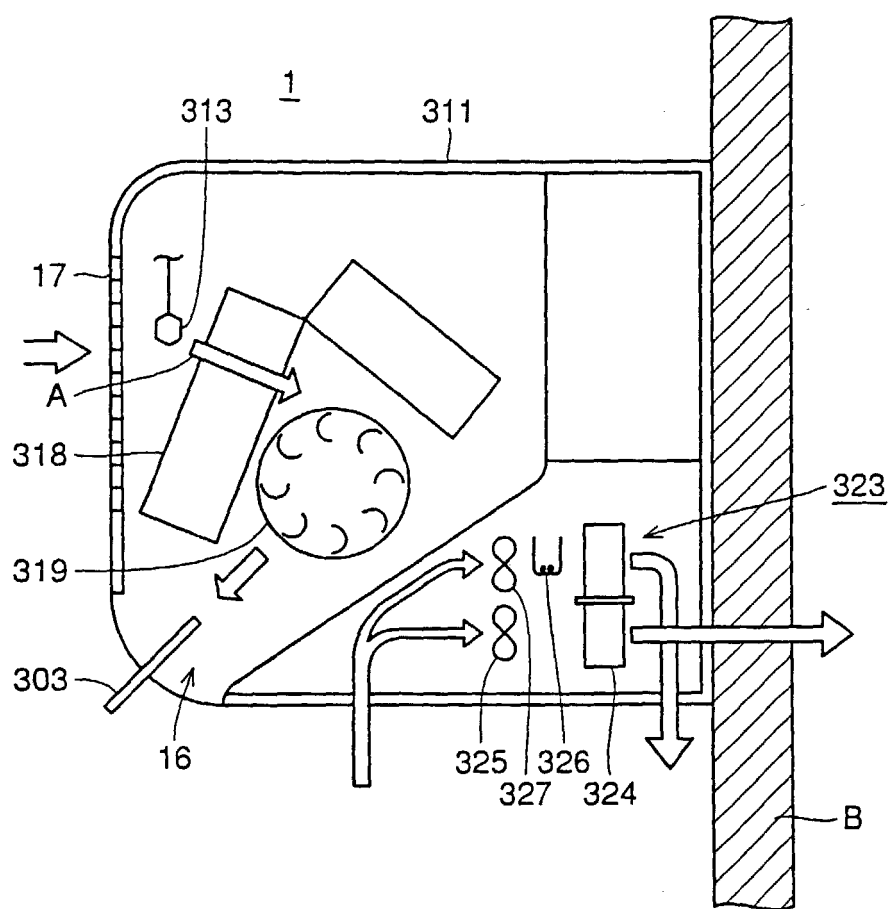


FIG.32

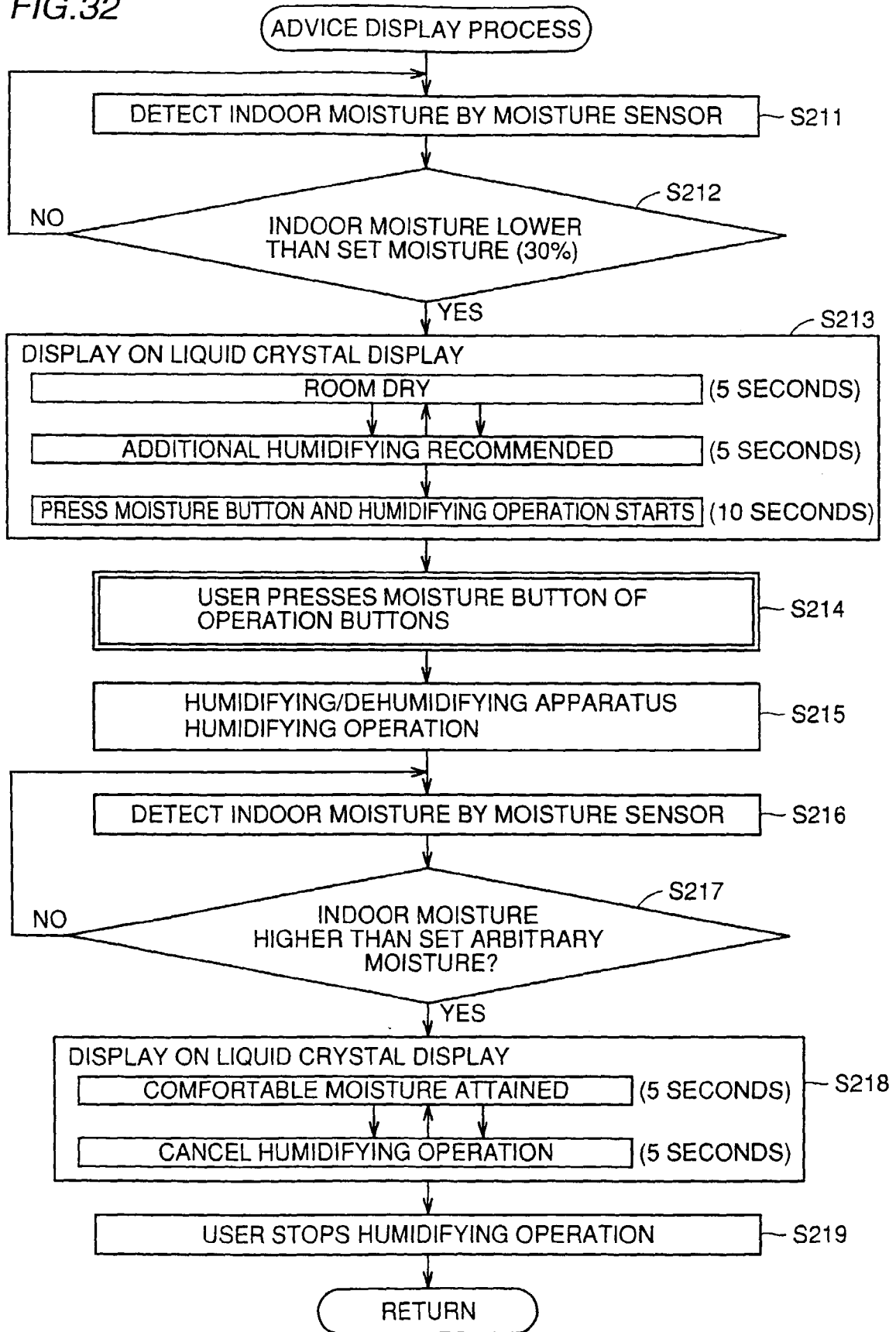


FIG.33

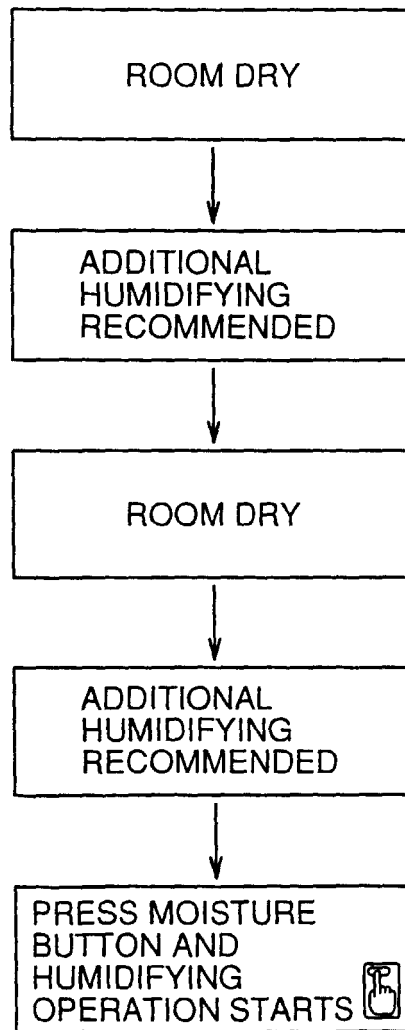


FIG.34

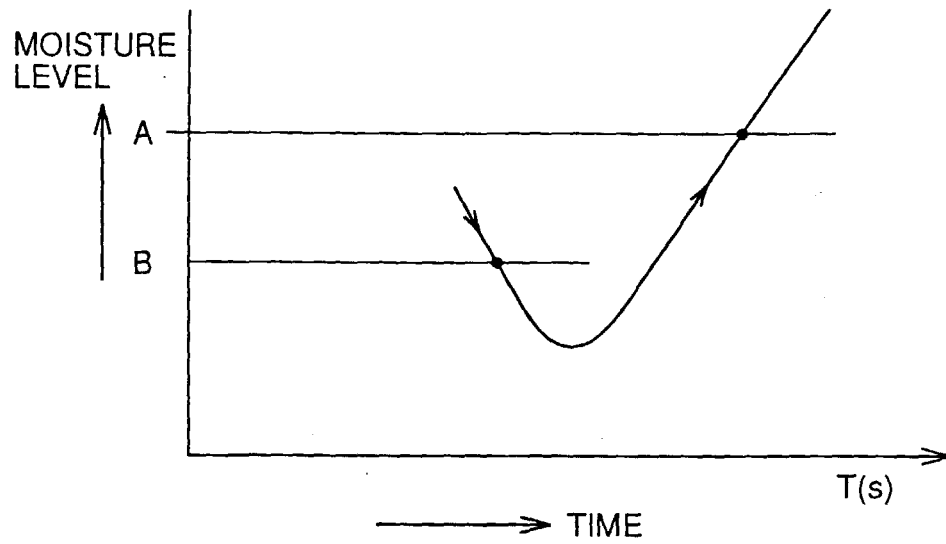


FIG.35

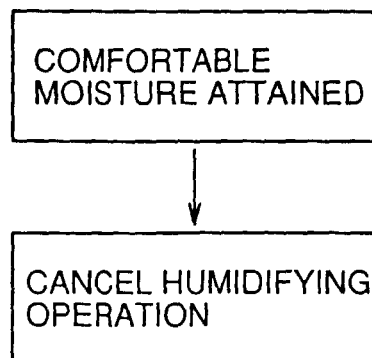


FIG.36

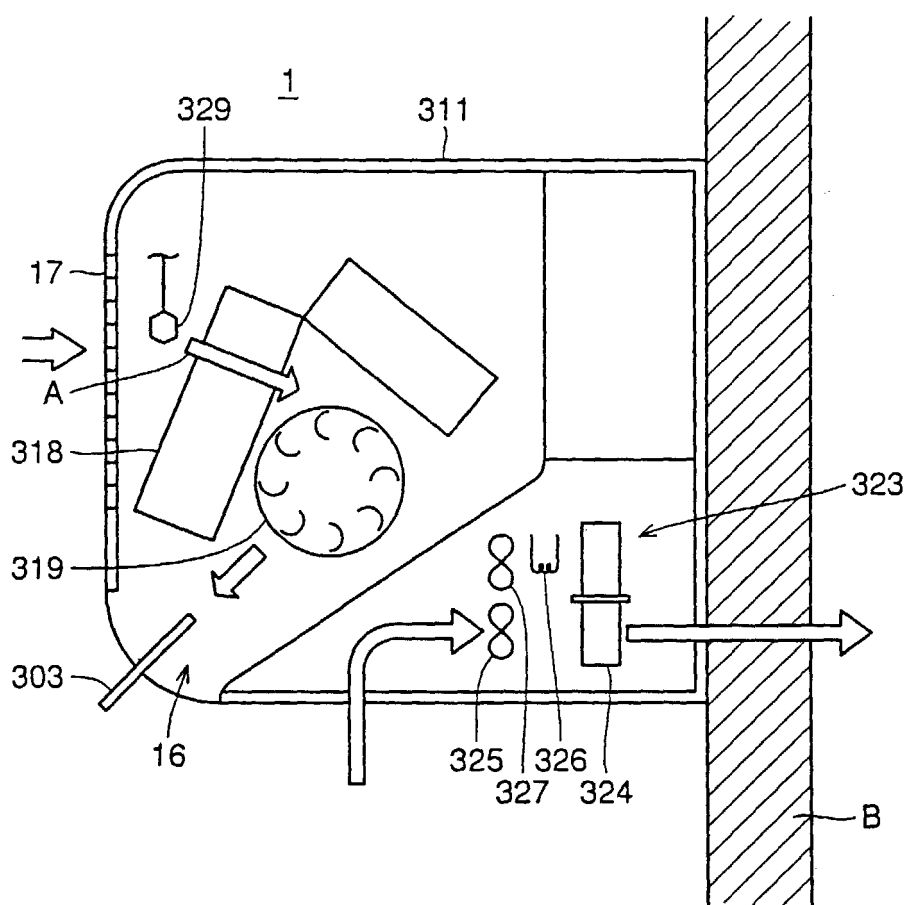


FIG.37

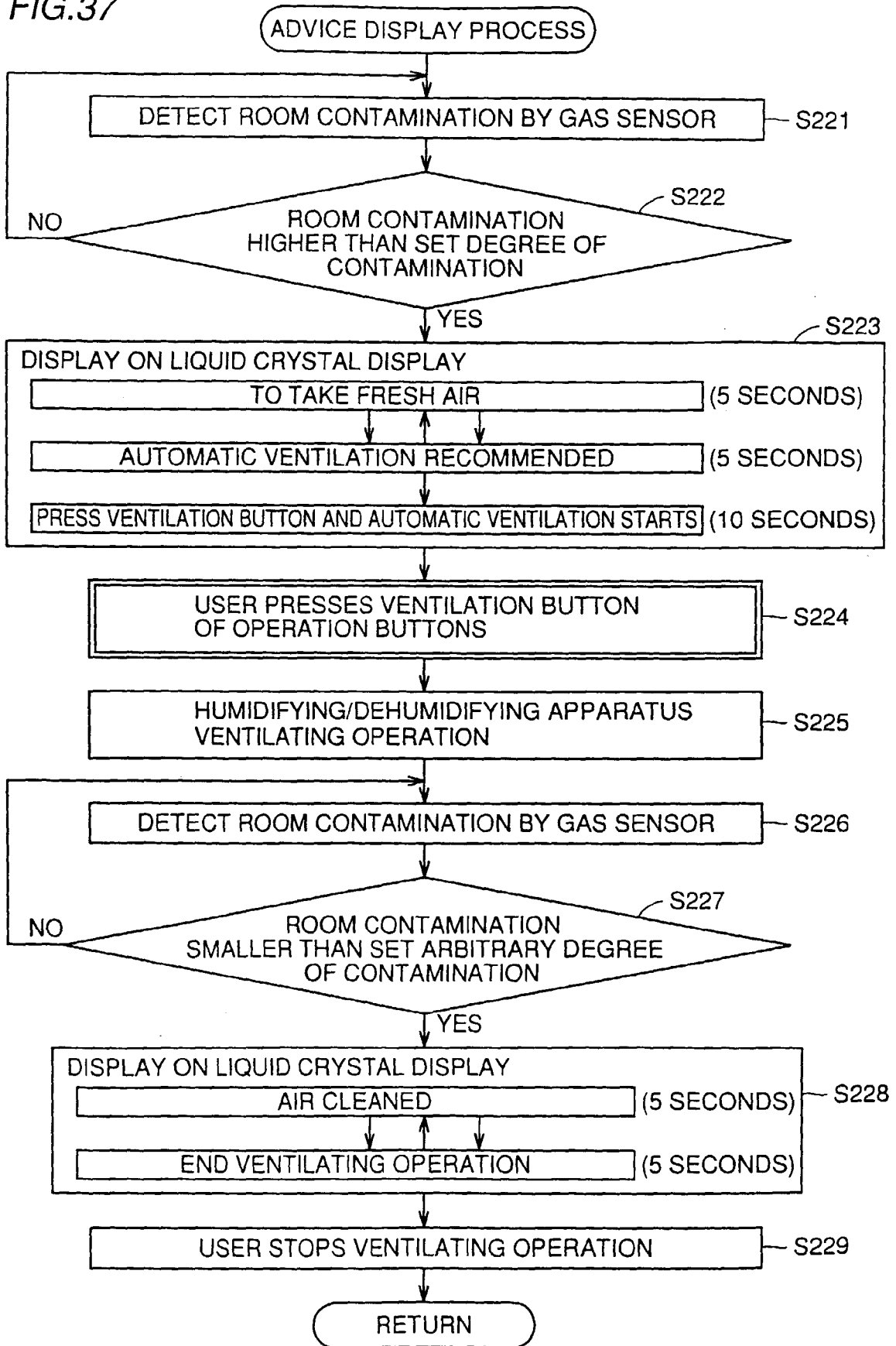


FIG.38

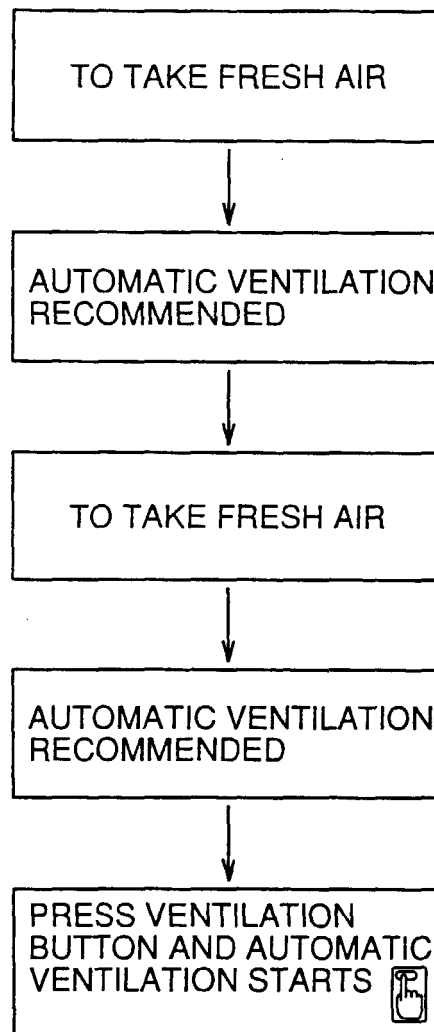


FIG.39

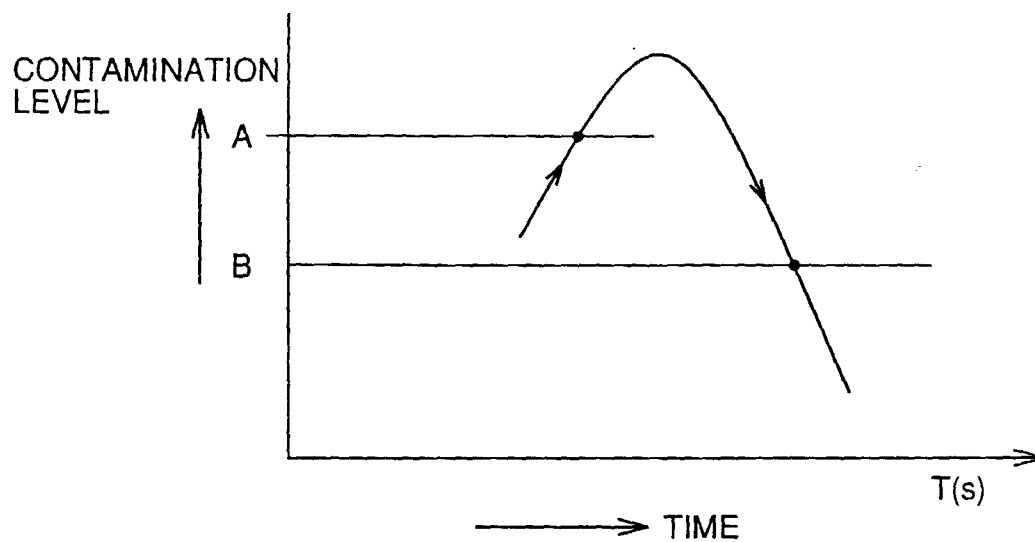


FIG.40

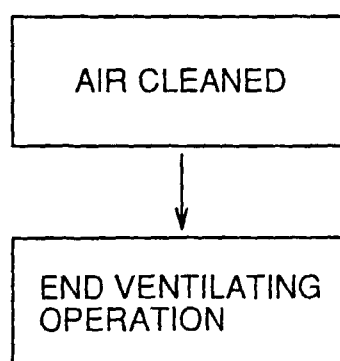


FIG.41

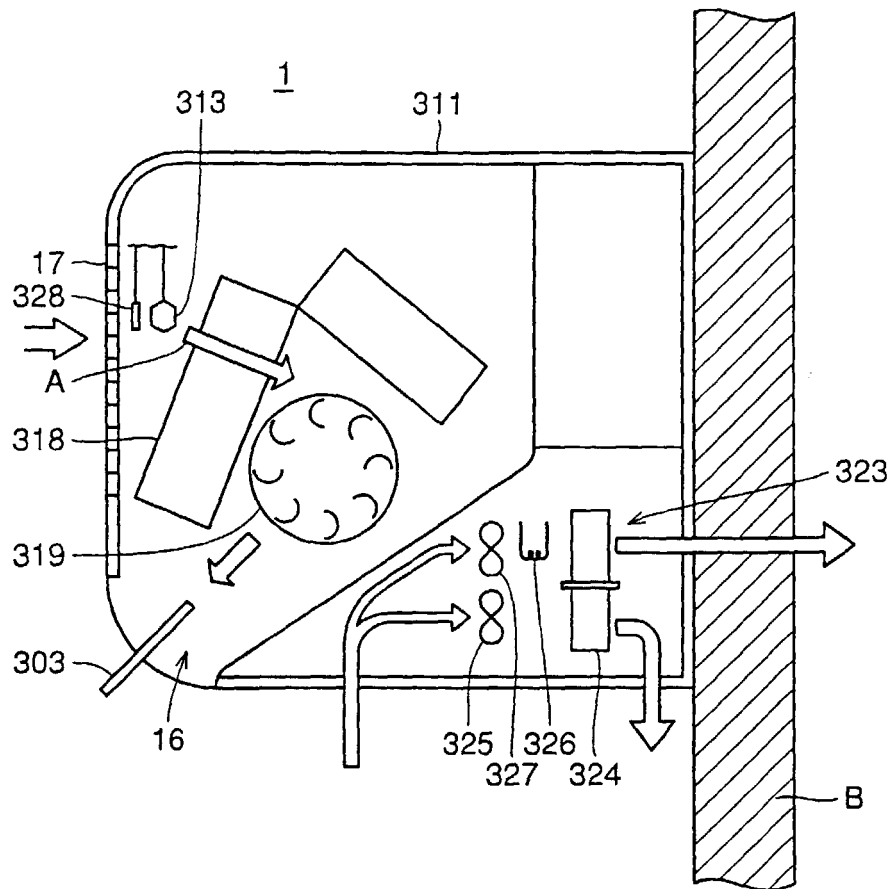


FIG.42

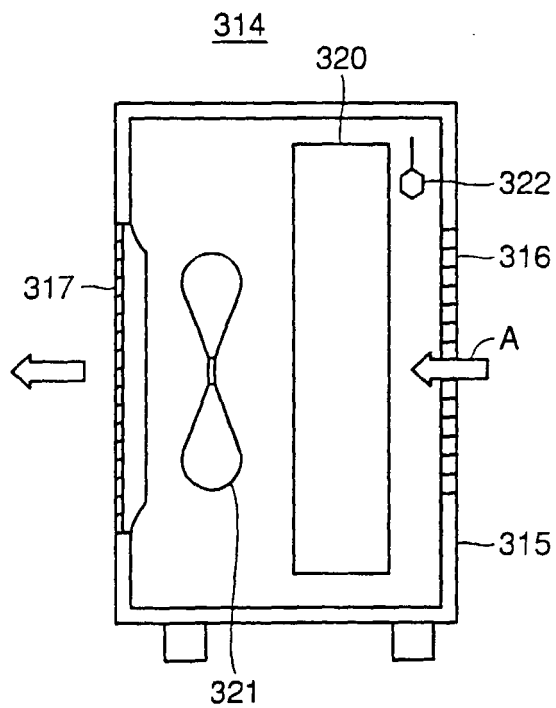


FIG.43

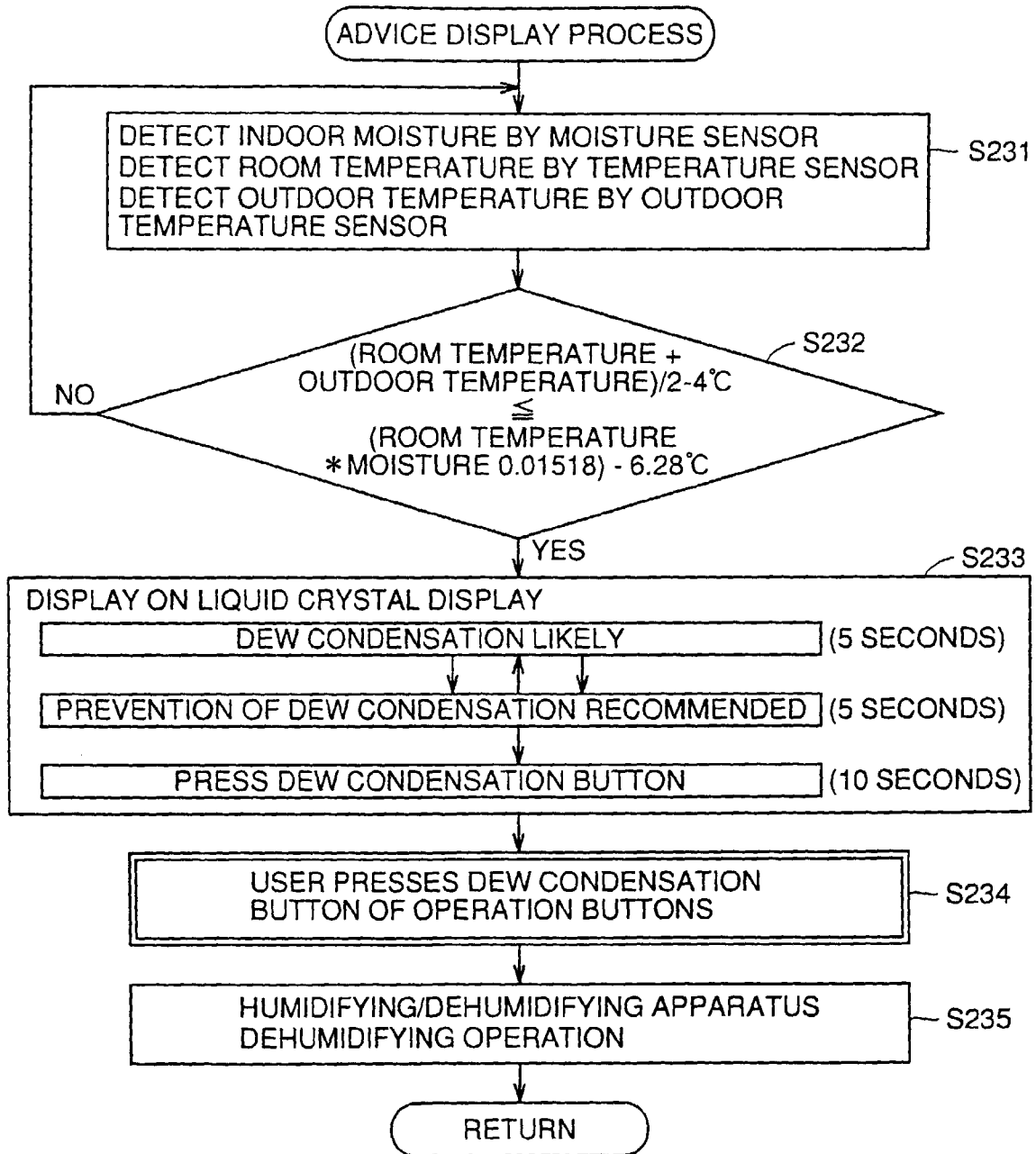


FIG.44

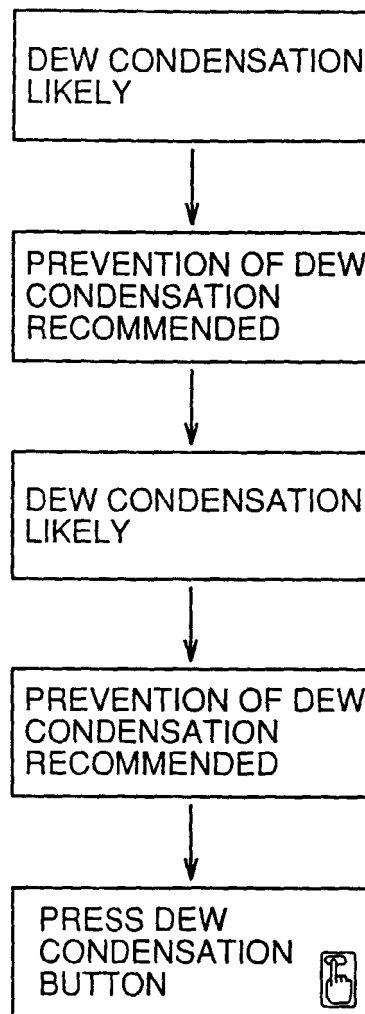


FIG.45

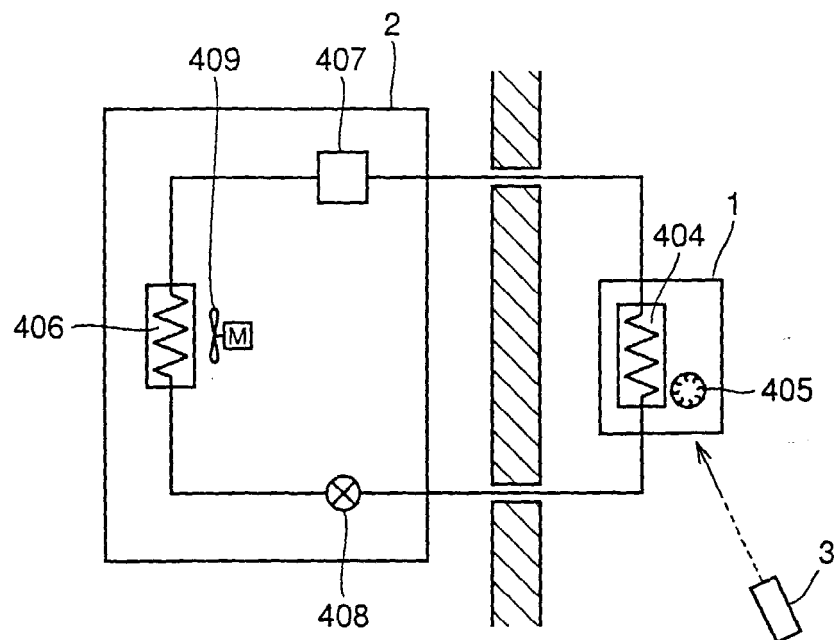


FIG.46

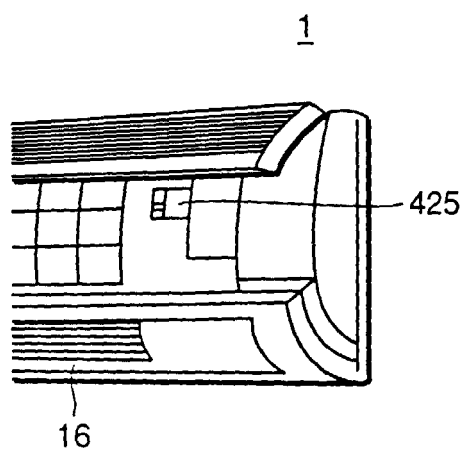


FIG.47

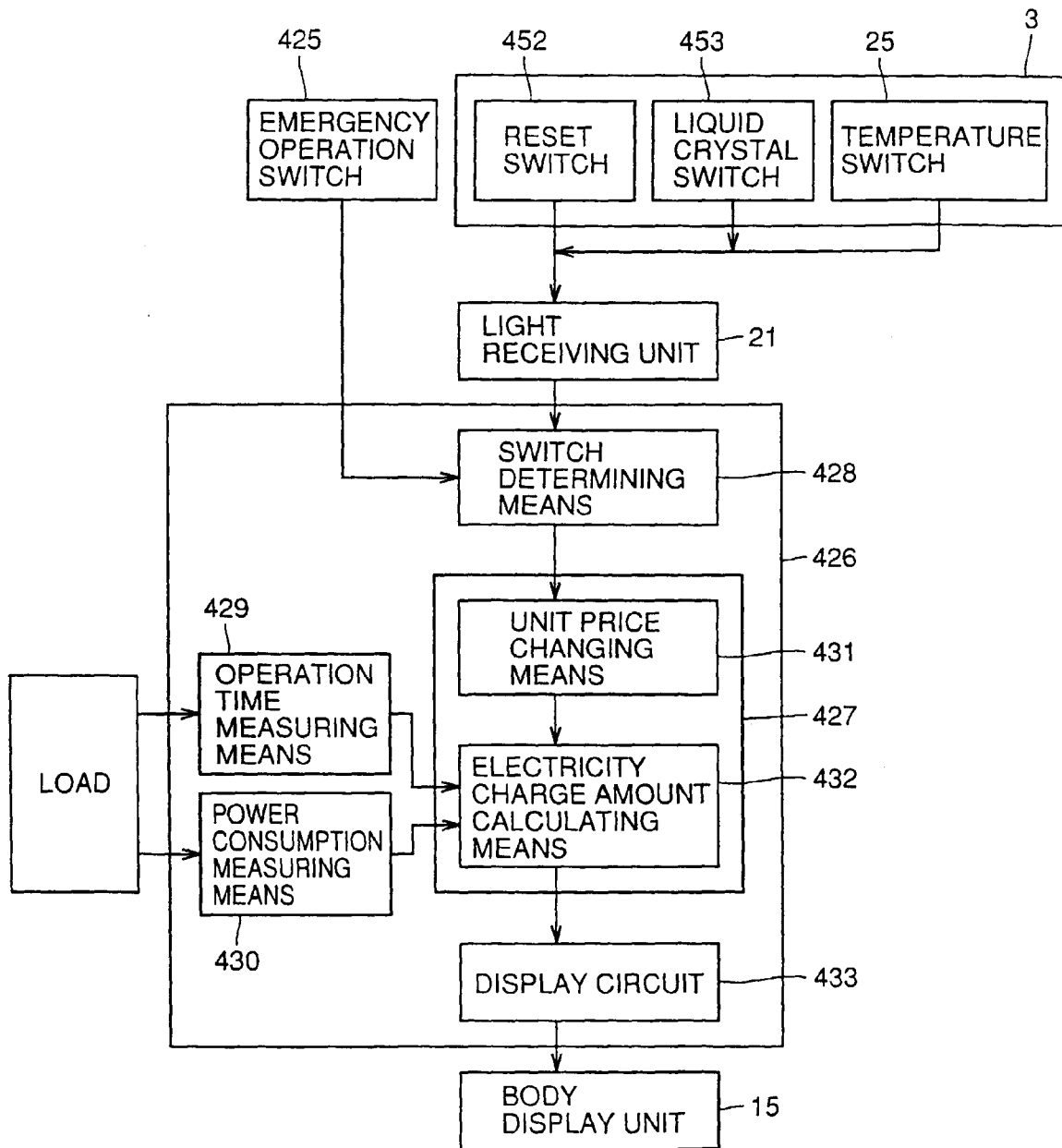


FIG.48

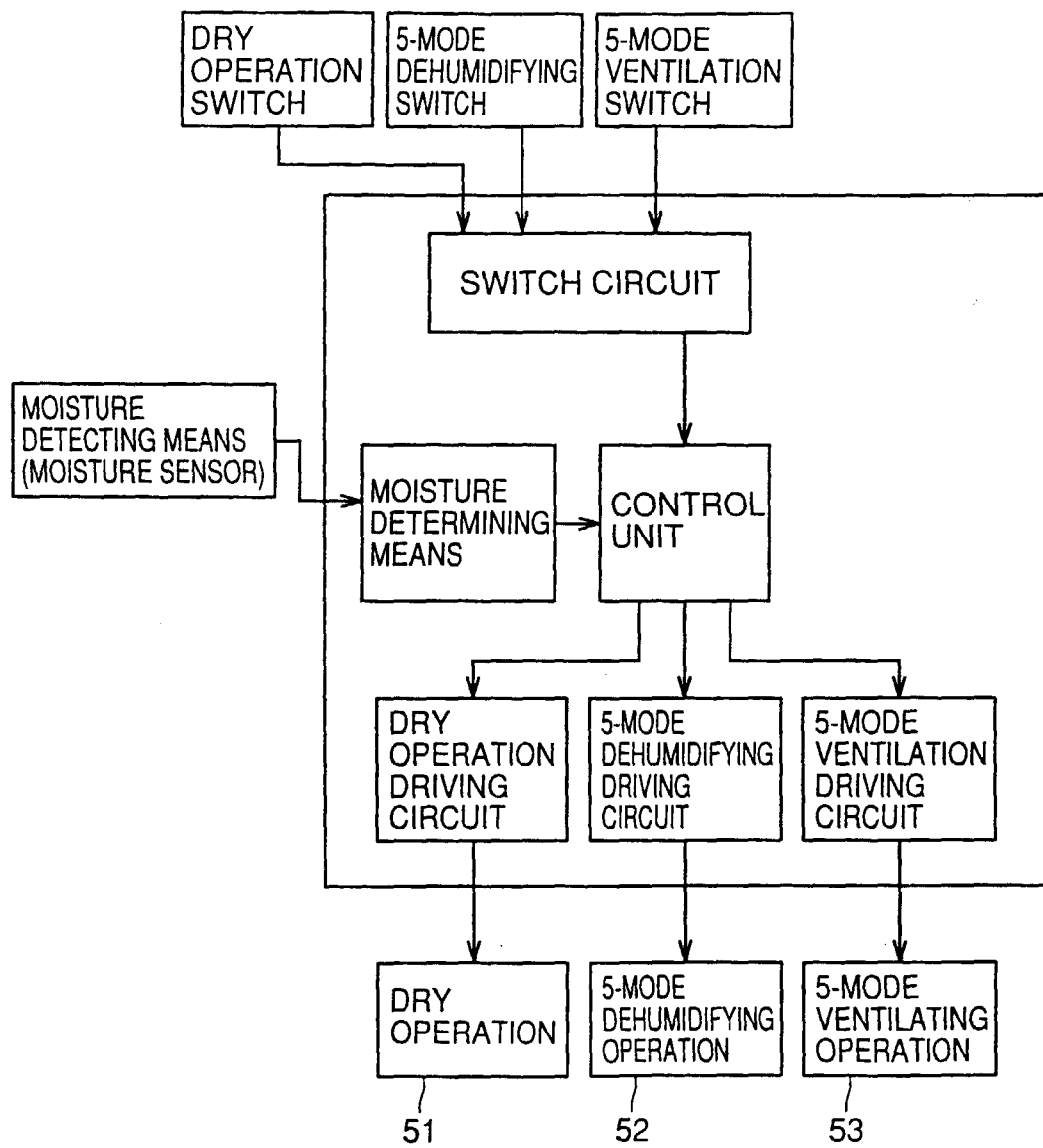


FIG.49

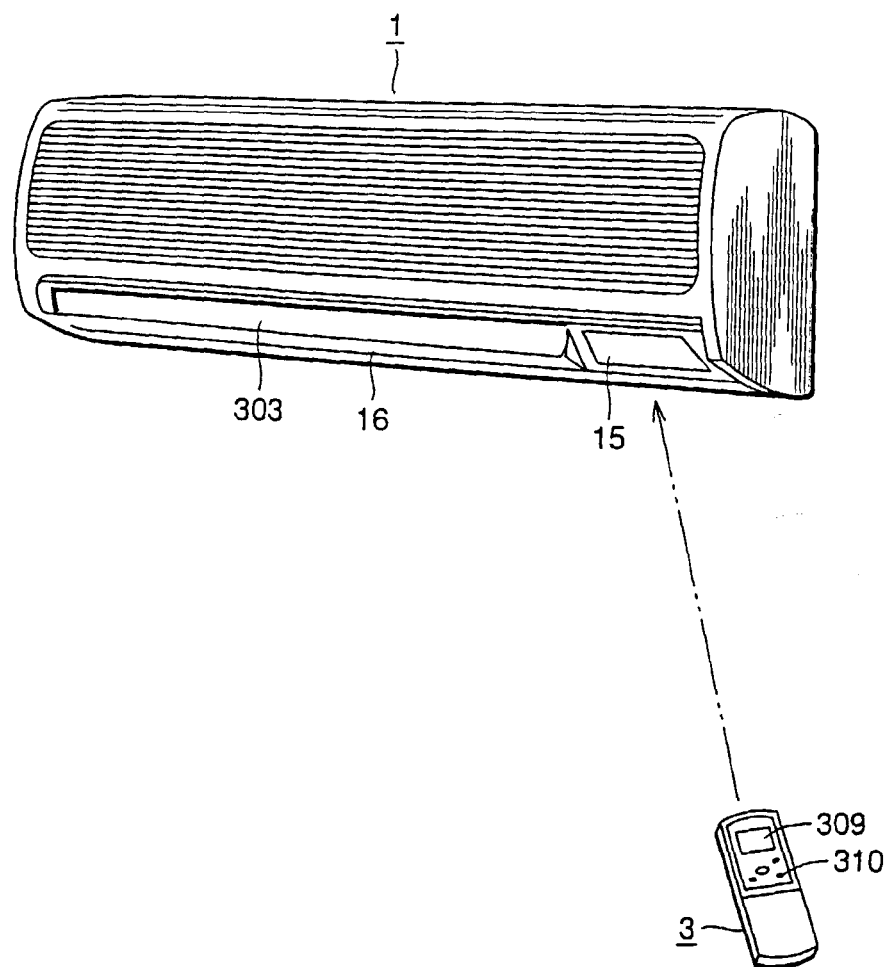


FIG.50

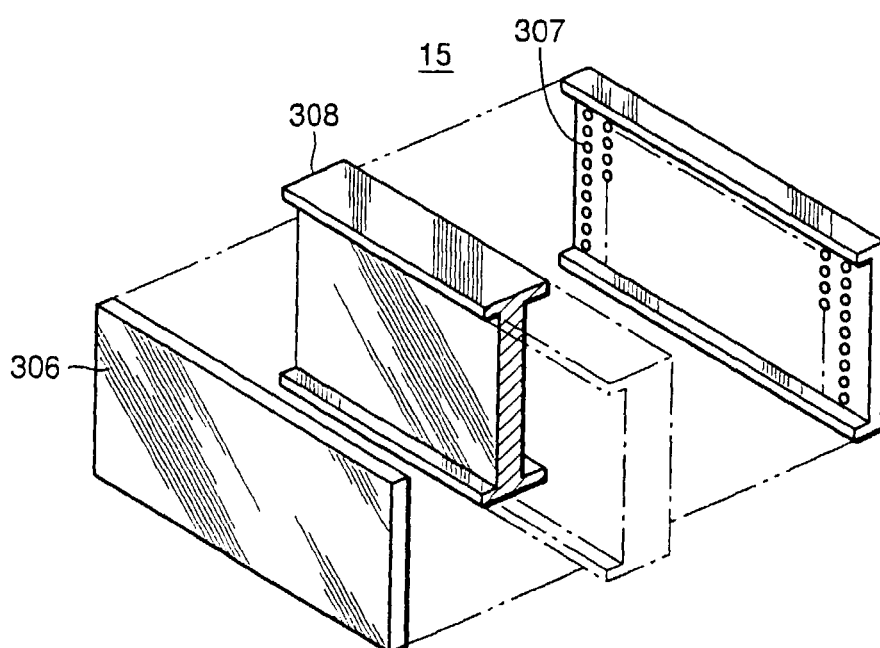


FIG.51

