



(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 158(3) EPC

(43) Date of publication:  
**11.08.2004 Bulletin 2004/33**

(51) Int Cl.7: **F24F 1/00**, F24F 1/02,  
F24F 6/00

(21) Application number: **02768098.2**

(86) International application number:  
**PCT/JP2002/009986**

(22) Date of filing: **26.09.2002**

(87) International publication number:  
**WO 2003/036179 (01.05.2003 Gazette 2003/18)**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
IE IT LI LU MC NL PT SE SK TR**

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(30) Priority: **26.10.2001 JP 2001328983**

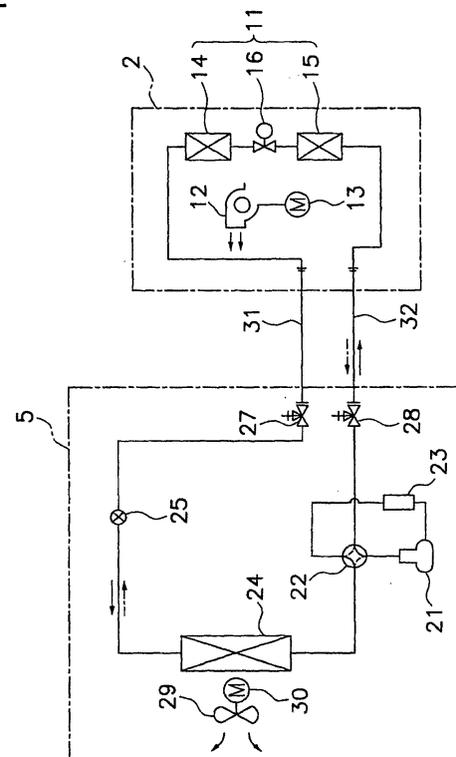
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(54) **AIR CONDITIONER**

(57) The invention provides an air conditioner that can accomplish humidification with a minimal number of additional parts. The air conditioner is provided with a first heat exchanging section, a second heat exchanging section, a pressure adjusting mechanism, and a humidifying means. The first heat exchanging section and the second heat exchanging section are connected together in series and both are configured to function as either an evaporator or a condenser with respect to the refrigerant passing through the inside thereof. The pressure adjusting mechanism serves to connect the first heat exchanging section and second heat exchanging section together in series and is capable of adjusting the pressure of the refrigerant such that one of the heat exchanging sections functions as an evaporator and the other heat exchanging section functions as a condenser. The humidifying means serves to direct condensation water adhered to the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section so that the conditioned air is humidified after it exchanges heat with the second heat exchanging section.

Fig. 2



## Description

### Technical Field

**[0001]** The present invention relates to an air conditioner configured to draw in indoor air by means of an indoor fan, exchange heat between the refrigerant passing through the inside of an indoor heat exchanger and the indoor air passing over the outside surface of the indoor heat exchanger, and discharge the thereby conditioned air into the indoor area.

### Background Art

**[0002]** Split-type air conditioners generally have an outdoor unit in which an outdoor heat exchanger is arranged and an indoor unit in which an indoor heat exchanger is arranged and the outdoor heat exchanger and indoor heat exchanger are connected by refrigerant pipes. The air conditioner is run in cooling mode or heating mode by controlling the system such that the heat exchangers function as a condenser and an evaporator, or vice versa.

**[0003]** An outdoor fan installed inside the outdoor unit functions to create an air flow that draws in outside air so that heat is exchanged between the air and the refrigerant passing through the inside of the outdoor heat exchanger.

**[0004]** Similarly, an indoor fan installed inside the indoor unit functions to create an air flow inside the indoor unit casing that draws in indoor air so that heat is exchanged between the air and the refrigerant passing through the inside of the indoor heat exchanger.

**[0005]** When air conditioners are run in heating mode, the relative humidity of the indoor area sometimes decreases greatly because the temperature of the indoor area is generally raised without replenishing moisture. Therefore, the idea of providing an air conditioner with a humidifier unit to dispense humidified air into the indoor area has been proposed. The humidifier unit is provided with, for example, a rotatably supported humidifying rotor made of a porous moisture-adsorbing material, such as zeolite, shaped into a circular disk like form. The material of the humidifying rotor is characterized by the ability to adsorb moisture from the air and release the moisture when it is heated. The humidifier unit is also provided with the following: a moisture intake fan configured to draw in outside air and create an air flow that causes the outside air to pass through a portion of the humidifying rotor so as to adsorb moisture from the air onto the humidifying rotor; and a humidifying fan configured to create an air flow for carrying humidified air containing moisture released from the humidifying rotor to the indoor unit. The air flow created by the moisture intake fan and the air flow created by the humidifying fan are configured such that they pass through the humidifying rotor at different positions relative to the rotational direction of the humidifying rotor, and a heating device

configured to heat the humidifying rotor is arranged at the position where the air flow created by the humidifying fan passes through the humidifying rotor.

**[0006]** Moisture contained in the air flow created by the moisture intake fan is adsorbed by the moisture-adsorbing material of the humidifying rotor. The humidifying rotor is rotationally driven by a motor and configured such that the portion thereof that is heated by the heating device can release the adsorbed moisture and disperse the moisture into the air flow created by the humidifying fan.

**[0007]** Air conditioners installed with such a humidifier unit are more expensive overall because many parts are added to constitute the humidifier unit. This kind of humidifier unit is also provided with a heating device for releasing the moisture adsorbed onto the humidifying rotor. The coefficient of performance (COP) of this kind of heating device is approximately "1," i.e., the energy consumption is large, and thus the electric power consumption of the air conditioner is considerably higher during humidifying mode than during a normal air conditioning mode.

**[0008]** The indoor air conditioning unit that serves to blow the humidified air into the indoor area is provided with evenly arranged humidified air discharge vents to increase the humidity of the entire indoor area. Consequently, the following possibilities exist: that spaces not occupied by people will be unnecessarily humidified, that the humidifying effect felt by the human occupants will decline, and that wall surfaces, windows and other places where condensation occurs readily will be humidified, resulting in excessive condensation and mold.

**[0009]** The object of the present invention is to provide an air conditioner having a minimal number of additional parts that is capable of humidifying the air dispensed into the indoor area.

### Disclosure of the Invention

**[0010]** The air conditioner of claim 1 of the present invention is an air conditioner configured to draw in indoor air by means of an indoor fan, exchange heat between the refrigerant passing through the inside of an indoor heat exchanger and the indoor air passing over the outside surface of the indoor heat exchanger, and discharge the thereby conditioned air into the indoor area. The indoor heat exchanger is provided with a first heat exchanging section, a second heat exchanging section, a pressure adjusting mechanism, and a humidifying means. The pressure adjusting mechanism connects the first heat exchanging section and second heat exchanging section together in series and is capable of adjusting the pressure of the refrigerant such that one of the heat exchanging sections functions as an evaporator and the other heat exchanging section functions as a condenser. When the pressure adjusting mechanism is adjusted such that the first heat exchanging section functions as an evaporator and the second heat ex-

changing section functions as a condenser, the humidifying means guides the condensation water adhered to the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section so that the conditioned air is humidified after it exchanges heat with the second heat exchanging section.

**[0011]** Thus, by controlling the pressure adjusting mechanism such that the first heat exchanging section of the indoor heat exchanger functions as an evaporator and the second heat exchanging section functions as a condenser and guiding the condensation water adhered to the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section, the water is evaporated by both the warm air that has exchanged heat with the second heat exchanging section and the refrigerant flowing through the inside of the second heat exchanging section and, as a result, the warm air is humidified. Therefore, the conditioned air can be humidified after it exchanges heat in the second heat exchanging section and humidified conditioned air can be delivered into the indoor area. In a normal air conditioner, the indoor heat exchanger is an essential component. Some air conditioners are provided with an operating mode called "reheated dry mode" in order to prevent the temperature of the air blown into the indoor area from becoming too low during dehumidifying mode. In reheated dry mode, a portion of the indoor heat exchanger is made to function as an evaporator for dehumidification and the other portion is made to function as a condenser for heating the air. By establishing an operating mode in which a refrigerant flow is opposite direction to the refrigerant flow in reheated dry mode, it is possible to operate this kind of air conditioner such that it humidifies the air without adding any new parts.

**[0012]** The air conditioner of claim 2 of the present invention is an air conditioner in accordance with claim 1, wherein the first heat exchanging section and second heat exchanging section are provided with a heat transfer pipe through the inside of which refrigerant passes and a plurality of heat radiating fins mounted to the heat transfer pipe in such a manner as to be parallel to the air flow passing over the outside surfaces of the first and second heat exchanging sections, the outside surface of the heat radiating fins forming a guide surface configured to guide condensation water from the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section.

**[0013]** Thus, the condensation water adhered to the outside surface of the first heat exchanging section can be efficiently guided to the vicinity of the outside surface of the second heat exchanging section by the heat radiating fins of the indoor heat exchanger.

**[0014]** The air conditioner of claim 3 of the present invention is an air conditioner in accordance with claim 1 or 2, further provided with a dry air discharging means

configured to discharge air that has passed through the first heat exchanging section outdoors when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser.

**[0015]** Thus, the humidified air exiting the indoor heat exchanger can be delivered to the indoor area and the dry air can be discharged outdoors, thereby increasing the humidifying effect.

**[0016]** The air conditioner of claim 4 of the present invention is an air conditioner in accordance with claim 1 or 2, further provided with the following: a warm humidified air guiding means configured to discharge conditioned air that has been humidified by the second heat exchanging section into the indoor area as a warm humidified air flow when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser; and a dry air guiding means configured to discharge post-heat-exchange conditioned air other than the air that has been humidified by the second heat exchanging section into the indoor area as a dry air flow that is separate from the warm humidified air flow when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser.

**[0017]** Thus, for example, warm humidified air is directed to the lower region of the center portion of the indoor area where human occupants exist and dry air is directed toward the peripheral portions where wall surfaces and window panes exist. As a result, the humidifying efficiency can be improved such that the humidifying effect felt by the human occupants is increased and wall surfaces, windows and other places are prevented from developing condensation easily.

**[0018]** The air conditioner of claim 5 of the present invention is an air conditioner in accordance with claim 4, wherein the warm humidified air guiding means and the dry air guiding means comprise vertical flaps configured to set the warm humidified air flow to a prescribed horizontal angle and to set the dry air flow to a different horizontal angle.

**[0019]** For example, when a person exists in front of the air conditioner, the vertical flaps are adjusted such that the warm humidified air flow is directed in the straight forward direction of the air conditioner and the dry air flow is directed so as to spread to the left and right from the air conditioner. As a result, humidified air can be delivered efficiently to the place occupied by the person and the delivery of excess humidity to wall surfaces, window panes, and other places where moisture condenses easily can be avoided.

**[0020]** The air conditioner of claim 6 of the present invention is an air conditioner in accordance with claim 4, wherein the warm humidified air guiding means and

the dry air guiding means comprise horizontal flaps configured to set the warm humidified air flow such that it passes through a low region of the indoor area and to set the dry air flow such that it passes through a higher region than the region passed through by the warm humidified air flow.

**[0021]** Thus, the dry air flow includes cool dry air that has passed through the first heat exchanging section and the lower region of the indoor area can be humidified by pushing the warm humidified air downward. As a result, the humidifying effect with respect to a human occupant in a position close to the floor surface can be increased and effective humidification can be accomplished when the air conditioner is run while a human occupant is in bed.

**[0022]** The air conditioner of claim 7 of the present invention is an air conditioner in accordance with claim 6, wherein: the second heat exchanging section is provided with a warm humidified air producing section configured to produce humidified air using condensation water delivered from the first heat exchanging section and a warm dry air producing section that does not receive condensation water from the first heat exchanging section; and the horizontal flaps are configured such that the warm humidified air produced by the warm humidified air producing section is discharged as a warm humidified air flow that passes through a low region of the indoor area, the cool dry air produced by the first heat exchanging section is discharged as a cool dry air flow that passes through a region higher than the region passed through by the warm humidified air producing section, and the warm dry air produced by the warm dry air producing section is discharged as a warm dry air flow that passes through a region even higher than the region passed through by the cool dry air flow.

**[0023]** Thus, since the cool dry air flow can push the warm humidified air flow down in an effective manner, the humidifying effect with respect to the low region of the indoor area can be increased.

**[0024]** The air conditioner of claim 8 of the present invention is an air conditioner in accordance with claim 6, wherein: the second heat exchanging section is provided with a warm humidified air producing section configured to produce humidified air using condensation water delivered from the first heat exchanging section and a warm dry air producing section that does not receive condensation water from the first heat exchanging section; and the horizontal flaps are configured such that warm humidified air produced by the warm humidified air producing section is discharged as a warm humidified air flow that passes through a low region of the indoor area and slightly warm dry air formed by mixing the cool dry air produced by the first heat exchanging section and the warm dry air produced by the warm dry air producing section is discharged as a slightly warm dry air flow that passes through a region higher than the region passed through by the warm humidified air flow.

**[0025]** Thus, since the cool dry air and the warm dry

air are mixed and discharged as a slightly warm dry air flow, the temperature difference between the warm humidified air and the slightly warm dry air is small, making it less noticeable when one makes contact with the slightly warm dry air. Also, since the slightly warm dry air flow can push the warm humidified air flow down, the humidifying effect in the low region of the indoor area can be increased.

## 10 Brief Descriptions of the Drawings

### [0026]

15 Figure 1 is a perspective view showing the external appearance and configuration of the air conditioner. Figure 2 is a diagram illustrating the refrigerant circuit.

Figure 3 is a schematic view of the indoor heat exchanger.

20 Figure 4 is a cross sectional view of an indoor unit implementing the second embodiment.

Figure 5 is a cross sectional view of an indoor unit implementing the second embodiment.

25 Figure 6 is a cross sectional view of an indoor unit implementing the third embodiment.

Figure 7 is a diagram illustrating the humidification control.

30 Figure 8 is a cross sectional view of an indoor unit implementing the fourth embodiment.

Figure 9 is a diagram illustrating the humidification control.

## Preferred Embodiments of the Invention

### 35 [External Appearance and Configuration of the Air Conditioner]

**[0027]** Figure 1 shows the external appearance of an air conditioner that implements one embodiment of the present invention.

40 **[0028]** The air conditioner 1 includes an indoor unit 2 mounted to a wall surface or the like of an indoor area and an outdoor unit 3 installed outdoors. The outdoor unit 3 has an outdoor air conditioning unit 5 that encloses an outdoor heat exchanger and an outdoor fan.

**[0029]** An indoor heat exchanger is enclosed inside the indoor unit 2 and is connected to the outdoor heat exchanger enclosed inside the outdoor unit 3 by a refrigerant pipe 6 so as to form a refrigerant circuit.

### 50 [General Configuration of the Refrigerant Circuit]

**[0030]** Figure 2 shows an example of the refrigerant circuit used in the air conditioner 1.

55 **[0031]** An indoor heat exchanger 11 is provided inside the indoor unit 2. The indoor heat exchanger 11 serves to exchange heat with the air that contacts it and is made up of a heat transfer pipe that has been folded back a

plurality of times at the longwise ends of the indoor heat exchanger 11 and a plurality of fins through which the heat transfer pipe is inserted. The indoor heat exchanger 11 has a first heat exchanging section 14 and a second heat exchanging section 15 that are connected in series by a reversible valve 16 made of an electric powered expansion valve.

**[0032]** During normal air conditioning modes, the reversible valve 16 is opened so that both the first heat exchanging section 14 and the second heat exchanging section 15 function as either a condenser or an evaporator. By controlling the reversible valve 16 such that it reduces the pressure, one of the heat exchanging sections (14 or 15) can be made to function as a condenser and the other heat exchanging section can be made to function as an evaporator. Instead of using a reversible valve 16, it is also possible to use a capillary and an ON-OFF valve connected in parallel.

**[0033]** Also inside the indoor unit 2 is provided a cross flow fan 12 that serves to draw in indoor air and discharge the air back into the indoor area after the air has exchanged heat with the indoor heat exchanger 11. The cross flow fan 12 is cylindrical in shape and its outer circumferential face is provided with vanes that are oriented parallel to the rotational axis. The cross flow fan 12 produces an air flow in a direction perpendicular to the rotational axis. The cross flow fan 12 is rotationally driven by a fan motor 13 provided inside the indoor unit 2.

**[0034]** The outdoor air conditioning unit 5 is provided with a compressor 21, a four-way selector valve 22 connected to the discharge side of the compressor 21, an accumulator 23 connected to the intake side of the compressor 21, an outdoor heat exchanger 24 connected to the four-way selector valve 22, and a pressure reducer 25 (electric powered expansion valve) connected to the outdoor heat exchanger 24. The pressure reducer 25 is connected to an onsite pipe 31 through a liquid shut-off valve 27 and to one end of the indoor heat exchanger 11 through the onsite pipe 31. The pressure reducer 22 is connected to an onsite pipe 32 through a gas shut-off valve 28 and to the other end of the indoor heat exchanger 11 through the onsite pipe 32. The onsite pipes correspond to the refrigerant pipe 6 shown in Figure 1.

**[0035]** A propeller fan 29 is provided inside the outdoor air conditioning unit 5 to discharge air to the outside after the air has exchanged heat in the outdoor heat exchanger 24. The propeller fan 29 is rotationally driven by a fan motor 30.

[Indoor Heat Exchanger - First Embodiment]

**[0036]** The schematic view of Figure 3 shows the refrigerant passages of the indoor heat exchanger 11.

**[0037]** The indoor heat exchanger 11 has a first segment 11A positioned in an upper portion of the front of the indoor unit 2, a second segment 11B positioned in a middle portion of the front of the indoor unit 2, a third

segment 11C positioned in a lower portion of the front of the indoor unit 2, a fourth segment 11D positioned in an upper portion of the back of the indoor unit 2, and a fifth segment 11E positioned in a lower portion of the back of the indoor unit 2.

**[0038]** The first segment 11A has a plurality of heat transfer pipes 121 connected end to end and arranged lengthwise in the horizontal direction, a plurality of first fins 111 having through holes through which the heat transfer pipes 121 pass, a plurality of heat transfer pipes 122 connected end to end and arranged lengthwise in the horizontal direction, and a plurality of second fins 112 having through holes through which the heat transfer pipes 122 pass. One end of the heat transfer pipes 121 is connected to a liquid refrigerant pipe A and the other end is connected to the heat transfer pipes 122. The heat transfer pipes 122 form a refrigerant passage that branches into two sections from the end that connects to the heat transfer pipes 121, and the two sections join back together at the other end of the heat transfer pipes 122 and connect to a pipe B on one side of the reversible valve 16.

**[0039]** The second segment 11B has a plurality of heat transfer pipes 123 connected end to end and arranged lengthwise in the horizontal direction and a plurality of third fins 113 having through holes through which the heat transfer pipes 123 pass. One end of the heat transfer pipes 123 is connected to a pipe C on the other side of the reversible valve 16, intermediate portions of the heat transfer pipes 123 are connected to the fifth segment 11E by crossover pipes D, E, and the other end of the heat transfer pipes 123 is connected to the gaseous refrigerant pipe F.

**[0040]** The third segment 11 C has a plurality of heat transfer pipes 124 connected end to end and arranged lengthwise in the horizontal direction and a plurality of fourth fins 114 having through holes through which the heat transfer pipes 124 pass. One end of the heat transfer pipes 124 is connected to the pipe C on the other side of the reversible valve 16 and the other end is connected to the gaseous refrigerant pipe F.

**[0041]** The fourth segment 11D has a plurality of heat transfer pipes 125 connected end to end and arranged lengthwise in the horizontal direction and a plurality of fifth fins 115 having through holes through which the heat transfer pipes 125 pass. One end of the heat transfer pipes 125 is connected to the pipe C on the other side of the reversible valve 16 and the other end is connected to the gaseous refrigerant pipe F.

**[0042]** The fifth segment 11E has a plurality of heat transfer pipes 126 connected end to end and arranged lengthwise in the horizontal direction and a plurality of sixth fins 116 having through holes through which the heat transfer pipes 126 pass. One end of the heat transfer pipes 126 is connected to the crossover pipe D and the other end is connected to the crossover pipe E.

**[0043]** The third segment 11C is provided with a thermometer 131 for detecting the temperature of the refrigerant

ant passing through the inside of the heat transfer pipe 124.

**[0044]** The second fins 112 of the first segment 11 A, the third fins 113 of the second segment 11 B, and the fourth fins 114 of the third segment 11C can be made by bending the same member. It is also possible to make all of the second fins 112 of the first segment 11A, the third fins 113 of the second segment 11B, the fourth fins 114 of the third segment 11C, the fifth fins 115 of the fourth segment 11D, and the sixth fins 126 of the fifth segment 11E by bending the same member. In either case, the fins are designed such that when the first segment 11A functions as an evaporator, the condensation water that adheres to the first fins 111, second fins 112, and heat transfer pipes 121, 122 of the first segment 11A is guided along the outside surfaces of the first fins 111 and the second fins 112 to the outside surfaces of the third fins 113 of the second segment 11B and the fourth fins 114 of the third segment 11C.

**[0045]** In this indoor heat exchanger 11, the first segment 11A constitutes the first heat exchanging section 14 and the second segment 11 B, third segment 11 C, fourth segment 11D, and fifth segment 11E constitute the second heat exchanging section 15.

**[0046]** With an indoor heat exchanger 11 thus configured, by opening the reversible valve 16 and setting the four-way selector valve 22 to the position indicated by the solid lines in the figure, both the first heat exchanging section 14 and the second heat exchanging section 15 can be made to function as condensers and the air conditioner can be run in heating mode. By opening the reversible valve 16 and setting the four-way selector valve 22 to the position indicated by the dotted lines in the figure, both the first heat exchanging section 14 and the second heat exchanging section 15 can be made to function as evaporators and the air conditioner can be run in cooling mode.

**[0047]** When the four-way selector valve 22 is in the position indicated with dotted lines, the first heat exchanging section 14 of the indoor heat exchanger 11 can be made to function as a condenser and the second heat exchanging section 15 can be made to function as an evaporator by putting the reversible valve 16 in a pressure-reducing state. In this way, moisture contained in the indoor air can be removed in the second heat exchanging section 15 and the air can be warmed in the first heat exchanging section 14 so that the indoor temperature does not become too low. This type of operation is called "reheated dry mode."

**[0048]** Meanwhile, when the four-way selector valve 22 is in the position indicated with solid lines, the first heat exchanging section 14 of the indoor heat exchanger 11 can be made to function as an evaporator and the second heat exchanging section 15 can be made to function as a condenser by putting the reversible valve 16 in a pressure-reducing state. In such a case, the condensation water that adheres to the outside surfaces of the first segment 11A is guided over the outside surfaces

of the first fins 111 and second fins 112 of the first segment 11A (which constitutes the first heat exchanging section 14) to the second segment 11B and third segment 11C of the second heat exchanging section 15. Thus, the condensation water that adheres to the outside surfaces of the first segment 11A is guided to the second segment 11B and the third segment 11 C and heated, thereby being converted into water vapor for humidifying the indoor air.

**[0049]** Although this indoor heat exchanger 11 is provided with first to fifth segments 11A to 11E with the first segment 11A constituting the first heat exchanging section 14 and the second to fifth segments 11B to 11E constituting the second heat exchanging section 15, the positioning and shapes of the first heat exchanging section 14 and the second heat exchanging section 15 are not limited to those described heretofore. Below, other embodiments illustrating different indoor unit 2 configurations for achieving humidification will be described.

[Second Embodiment]

**[0050]** The second embodiment uses an indoor heat exchanger 11 having a first segment 151, a second segment 152, a third segment 153, a fourth segment 154, and fifth segment 155. The first segment 151 is positioned in an upper portion of the front of the indoor unit 2, the second segment 152 is positioned in a middle portion of the front of the indoor unit 2, and the third segment 153 is positioned in a lower portion of the front of the indoor unit 2. The fourth segment 154 is positioned in an upper rearward portion of the indoor unit 2 and the fifth segment 155 is positioned further rearward than the fourth segment 154. The upper edge of the fifth segment 155 is so arranged as to be separated from the upper portion of the fourth segment 154 so that the flow of air that enters from above can be divided into an air flow that passes through the fourth segment 154 and an air flow that passes through the fifth segment 155. Meanwhile, the bottom edge of the fifth segment 155 is so arranged as to be closely adjacent to or touching against a middle portion of the fourth segment 154 so that condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 155 will be guided to the fourth segment 154.

**[0051]** Thus, in this indoor heat exchanger 11, the fifth segment 155 constitutes the first heat exchanging section 14 (see Figure 2) and the first to fourth segments 151 to 154 constitute the second heat exchanging section 15 (see Figure 2). The refrigerant passages of the first to fourth segments 151 to 154 is connected to the refrigerant passage of the fifth segment 155 by an electric powered expansion valve or the like serving as a reversible valve (not shown).

**[0052]** The indoor unit 2 is provided with an upper intake opening 171 and a front intake opening 172 for drawing indoor air into the main casing where the internal mechanisms are housed and a dust filter 173 for re-

moving contaminants from the air drawn in through the upper intake opening 171 and front intake opening 172.

**[0053]** The inside of the indoor unit 2 is also provided with a first drain pan 174 that is positioned below the first segment 151, second segment 152, and third segment 153 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments. The inside of the indoor unit 2 is further provided with a second drain pan 175 that is positioned below the fourth segment 154 and fifth segment 155 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments.

**[0054]** A cross flow fan 12 is provided in a middle portion of the indoor unit 2 and serves to produce an air flow that draws in air from the indoor area and delivers air that has exchanged heat in the indoor heat exchanger 11 to the indoor area. An air discharge vent 176 is provided on a lower portion of the front of the indoor unit 2 to discharge air to the indoor area after the air has exchanged heat in the indoor heat exchanger 11.

**[0055]** The indoor unit 2 is further provided with a cool dry air exhaust passage 162 that is positioned rearward of the fifth segment 155 of the indoor heat exchanger 11 and serves to discharge cool dry air to outdoors. Inside the cool dry air exhaust passage 162 are provided an exhaust fan 163 configured to produce an air flow for exhausting to the outside air that has passed through the fifth segment 155 of the indoor heat exchanger 11 and a fan motor 164 for driving the exhaust fan. A damper 161 capable of shutting off the air flow produced by the exhaust fan 163 is installed in the indoor unit side end portion of the cool dry air exhaust passage 162. The damper 161 is driven by a motor, solenoid, or other driving means (not shown) and configured such that it can achieve the shut-off position shown in Figure 4 the open position shown in Figure 5.

**[0056]** During normal operation without humidification, the damper 161 is put into the shut-off position as shown in Figure 4. The indoor air introduced from the front intake opening 172 passes through the dust filter 173, while passing through the second segment 152 and third segment 153 of the indoor heat exchanger 11 exchanges heat with the refrigerant passing through the insides of these segments, and exits into the indoor area through the air discharge vent 176. The indoor air introduced from the upper intake opening 171 passes through the dust filter 173, passes through the first segment 151 and fourth segment 154 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the insides of these segments, and exits into the indoor area through the air discharge vent 176. A portion of the indoor air introduced from the upper intake opening 171 passes through the dust filter 173, passes through the fifth segment 155 of the indoor heat exchanger 11 from the rear side thereof and then through the fourth segment 154 while exchanging heat with the refrigerant passing through the insides of these segments, and exits into the indoor area through the air

discharge vent 176.

**[0057]** When humidification is executed, the damper is put into the open state shown in Figure 5 and the reversible valve is controlled to a pressure-reducing state such that the fifth segment 155 of the indoor heat exchanger 11 functions as an evaporator and the first to fourth segments 151 to 154 function as a condenser. Meanwhile, the fan motor 164 drives the exhaust fan 163 provided in the cool dry air exhaust passage 162 such that a portion of the air drawn into the indoor unit 2 is discharged to the outdoor area.

**[0058]** Then, by rotationally driving the cross flow fan 12, the indoor air introduced from the front intake opening 172 is made to pass through the dust filter 173 exchange heat with the refrigerant passing through the insides of these segments while passing through the second segment 152 and third segment 153 of the indoor heat exchanger 11, and exit into the indoor area through the air discharge vent 176, as shown in Figure 5. Also, the indoor air introduced from the upper intake opening 171 is made to pass through the dust filter 173, pass through the first segment 151 and fourth segment 154 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the insides of these segments, and exit into the indoor area through the air discharge vent 176.

**[0059]** Due to the air flow produced by the exhaust fan 163 provided inside the cool dry air exhaust passage 162, a portion of the indoor air introduced from the upper intake opening 171 passes through the fifth segment 155 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the inside of the fifth segment 155, passes into the cool dry air exhaust passage 162, and is discharged outdoors.

**[0060]** Since the fifth segment 155 of the indoor heat exchanger 11 is functioning as an evaporator, moisture contained in the indoor air drawn thereto condenses on the outside surfaces of the heat transfer pipes and fins of the fifth segment 155. As a result, air that has passed through the fifth segment 155 has been dehumidified and turned into cool dry air.

**[0061]** The fifth segment 155 of the indoor heat exchanger 11 is arranged close to or touching against the middle portion of the fourth segment 154 and the condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 155 is guided along the outside surface of the fins such that it arrives at the outside surface of the fourth segment 154. Since the fourth segment 154 of the indoor heat exchanger 11 is functioning as a condenser, both the indoor air drawn thereto through the upper intake opening 171 and the condensation water guided thereto from the fifth segment 155 are heated, thereby producing humidified air. Thus, moisture contained in the indoor air can be extracted by the fifth segment 155 of the indoor heat exchanger 11 and used to humidify the air that passes through the fourth segment 154.

**[0062]** The humidifying efficiency can be increased

because the cool dry air exiting the fifth segment 155 of the indoor heat exchanger 11 is discharged outdoors by the cool dry air exhaust passage 162.

[Third Embodiment]

**[0063]** The third embodiment uses an indoor heat exchanger 11 having a first segment 181, a second segment 182, a third segment 183, a fourth segment 184, and fifth segment 185, as shown in Figure 6.

**[0064]** The first segment 181 is positioned in an upper portion of the front of the indoor unit 2, the second segment 182 is positioned in a middle portion of the front of the indoor unit 2, and the third segment 183 is positioned in a lower portion of the front of the indoor unit 2. The fourth segment 184 and fifth segment 185 are positioned in an upper rearward portion of the indoor unit 2. The fifth segment 185 is arranged generally above the fourth segment 184 and the lower edge portion of the fifth segment 185 overlaps the upper edge portion of the fourth segment 184 such that condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 185 is guided to the fourth segment 184.

**[0065]** Thus, in this indoor heat exchanger 11, the fifth segment 185 constitutes the first heat exchanging section 14 (see Figure 2) and the first to fourth segments 181 to 184 constitute the second heat exchanging section 15 (see Figure 2). The refrigerant passages of the first to fourth segments 181 to 184 is connected to the refrigerant passage of the fifth segment 185 by an electric powered expansion valve or the like serving as a reversible valve (not shown).

**[0066]** The indoor unit 2 is provided with an upper intake opening 171 and a front intake opening 172 for drawing indoor air into the main casing where the internal mechanisms are housed and a dust filter 173 for removing contaminants from the air drawn in through the upper intake opening 171 and front intake opening 172.

**[0067]** The inside of the indoor unit 2 is also provided with a first drain pan 174 that is positioned below the first segment 181, second segment 182, and third segment 183 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments. The inside of the indoor unit 2 is further provided with a second drain pan 175 that is positioned below the fourth segment 184 and fifth segment 185 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments.

**[0068]** A cross flow fan 12 is provided in a middle portion of the indoor unit 2 and serves to produce an air flow that draws in air from the indoor area and delivers air that has exchanged heat in the indoor heat exchanger 11 to the indoor area. An air discharge vent 176 is provided on a lower portion of the front of the indoor unit 2 to discharge air to the indoor area after the air has exchanged heat in the indoor heat exchanger 11. The air discharge vent 176 is provided with first vertical flaps

191 arranged in such a position that the mixed dry air from the first to third segments 181 to 183 and the fifth segment 185 of the indoor heat exchanger 11 will pass there-through and a second vertical flap 192 arranged in such a position that the warm humidified air from the fourth segment 184 will pass there-through.

**[0069]** The first vertical flap 191 and the second vertical flap 192 can change independently the discharge direction the right and left of the passing air respectively, during normal operation without humidification, the first vertical flap 191 and the second vertical flap 192 are set up so that it may become the same air discharge direction that desired by the user or determined automatically by the device. When the reversible valve provided in the indoor heat exchanger 11 is opened, all of the first to fifth segments 181 to 185 function in the same manner: as either evaporators or condensers. In this state, the air conditioner can be run in either a normal heating or a normal cooling mode (or dry mode).

**[0070]** When humidification is executed, the reversible valve is controlled to a pressure-reducing state such that the fifth segment 185 of the indoor heat exchanger 11 functions as an evaporator and the first to fourth segments 181 to 184 function as condensers.

**[0071]** Then, by rotationally driving the cross flow fan 12, the indoor air introduced from the front intake opening 172 is made to pass through the dust filter 173, pass through the second segment 182 and third segment 183 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the insides of these segments, and exit into the indoor area through the air discharge vent 176, as shown in Figure 6. Also, the indoor air introduced from the upper intake opening 171 is made to pass through the dust filter 173, pass through the first segment 181 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the inside of the first segment, and exit into the indoor area through the air discharge vent 176.

**[0072]** A portion of the indoor air introduced from the upper intake opening 171 passes through the fifth segment 185 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the inside of the fifth segment 185 and exits into the indoor area through the air discharge vent 176.

**[0073]** Since the fifth segment 185 of the indoor heat exchanger 11 is functioning as an evaporator, moisture contained in the indoor air drawn into the indoor unit condenses on the outside surfaces of the heat transfer pipes and fins of the fifth segment 185. As a result, air that has passed through the fifth segment 185 has been dehumidified and turned into cool dry air.

**[0074]** The fifth segment 185 of the indoor heat exchanger 11 is arranged such that its lower edge portion overlaps the upper edge portion of the fourth segment 184 and the condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 185 is guided along the outside surface of the fins such that it arrives at the outside surface of the

fourth segment 184. Since the fourth segment 184 of the indoor heat exchanger 11 is functioning as a condenser, both the indoor air drawn thereto through the upper intake opening 171 and the condensation water guided thereto from the fifth segment 185 are heated, thereby producing humidified air. Thus, moisture contained in the indoor air can be extracted by the fifth segment 185 of the indoor heat exchanger 11 and used to humidify the air that passes through the fourth segment 184.

**[0075]** The warm dry air exiting the first to third segments 181 to 183 of the indoor heat exchanger 11 mixes with the cool dry air exiting the fifth segment 185 and the resulting mixed dry air is discharged into the indoor area. The air exiting the fourth segment 184 of the indoor heat exchanger 11 is humidified by moisture extracted as condensation water by the fifth segment 185 is discharged into the indoor area as warm humidified air.

**[0076]** Meanwhile, the first vertical flap 191 provided in a position where the mixed dry air will pass there-through and the second vertical flap 192 provided in a position where the warm humidified air will pass there-through can be set to direct the discharged air in different directions.

**[0077]** For example, as shown in Figure 7, the second vertical flap 192 can be set to discharge the warm humidified air to the center region of the indoor area where a human occupant exists and the first vertical flap 191 can be set to discharge the mixed dry air to peripheral regions where wall surfaces and glass windows exist.

**[0078]** In Figure 7, the second vertical flap 192 is set to discharge the warm humidified air W toward a bed B arranged in a middle portion of a room R so that a humidified region WA is created in the middle of the room R. Meanwhile, the first vertical flap 191 is set to discharge the mixed dry air D toward the left and right from the indoor unit 2 so that dry regions DA are created on the outskirts of the room R.

**[0079]** By setting the vertical flaps in this manner, the humidified region WA can be set to the area where human occupants exist to increase the humidifying effect felt by the human occupants and the dry regions DA can be set to the positions where condensation occurs readily, such as wall surfaces and windows, thereby increasing the efficiency of the humidification and suppressing the development of mold.

**[0080]** It is also feasible to design the air conditioner such that the air discharge directions of the first vertical flap 191 and the second vertical flap 192 can be set using a remote control device or are set automatically to such directions that the warm humidified air is directed toward where a person or people exist using a human body sensor installed in the indoor unit 2.

[Fourth Embodiment]

**[0081]** The indoor unit 2 used in the fourth embodiment is substantially the same as the indoor unit 2 used

in the third embodiment. The fourth embodiment uses an indoor heat exchanger 11 having a first segment 181, a second segment 182, a third segment 183, a fourth segment 184, and a fifth segment 185, as shown in Figure 8.

**[0082]** The first segment 181 is positioned in an upper portion of the front of the indoor unit 2, the second segment 182 is positioned in a middle portion of the front of the indoor unit 2, and the third segment 183 is positioned in a lower portion of the front of the indoor unit 2. The fourth segment 184 and fifth segment 185 are positioned in an upper rear portion of the indoor unit 2. The fifth segment 185 is arranged generally above the fourth segment 184 and the lower edge portion of the fifth segment 185 overlaps the upper edge portion of the fourth segment 184 such that condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 185 is guided to the fourth segment 184.

**[0083]** Thus, in this indoor heat exchanger 11, the fifth segment 185 constitutes the first heat exchanging section 14 (see Figure 2) and the first to fourth segments 181 to 184 constitute the second heat exchanging section 15 (see Figure 2). The refrigerant passages of the first to fourth segments 181 to 184 is connected to the refrigerant passage of the fifth segment 185 by an electric powered expansion valve or the like serving as a reversible valve (not shown).

**[0084]** The indoor unit 2 is provided with an upper intake opening 171 and a front intake opening 172 for drawing indoor air into the main casing where the internal mechanisms are housed and a dust filter 173 for removing contaminants from the air drawn in through the upper intake opening 171 and front intake opening 172.

**[0085]** The inside of the indoor unit 2 is also provided with a first drain pan 174 that is positioned below the first segment 181, second segment 182, and third segment 183 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments. The inside of the indoor unit 2 is further provided with a second drain pan 175 that is positioned below the fourth segment 184 and fifth segment 185 of the indoor heat exchanger 11 and serves to catch condensation water that develops on these segments.

**[0086]** A cross flow fan 12 is provided in a middle portion of the indoor unit 2 and serves to produce an air flow that draws air from the indoor area and delivers air that has exchanged heat in the indoor heat exchanger 11 to the indoor area. An air discharge vent 176 is provided on a lower portion of the front of the indoor unit 2 to discharge air to the indoor area after the air has exchanged heat in the indoor heat exchanger 11. The air discharge vent 176 is provided with a first horizontal flap 195 arranged in such a position that the warm dry air from the first to third segments 181 to 183 of the indoor heat exchanger 11 will pass there-through and a second horizontal flap 196 arranged in such a position that the cool dry air from the fifth segment 185 and the warm

humidified air from the fourth segment 184 will pass there-through. The horizontal flaps serve to direct the respective air flows that pass through them to prescribed vertically-positioned areas of the indoor area.

**[0087]** During normal operation without humidification, the first horizontal flap 195 and the second horizontal flap 196 are set to the air discharge directions desired by the user or to air discharge directions determined automatically by the device. When the reversible valve provided in the indoor heat exchanger 11 is opened, all of the first to fifth segments 181 to 185 function in the same manner: as either evaporators or condensers. In this state, the air conditioner can run in either a normal heating or a normal cooling mode (or dry mode).

**[0088]** When humidification is executed, the reversible valve is controlled to a pressure-reducing state such that the fifth segment 185 of the indoor heat exchanger 11 functions as an evaporator and the first to fourth segments 181 to 184 function as condensers.

**[0089]** Then, by rotationally driving the cross flow fan 12, the indoor air introduced from the front intake opening 172 is made to pass through the dust filter 173 exchange heat with the refrigerant passing through the insides of these segments, while passing through the second segment 182 and third segment 183 of the indoor heat exchanger 11 while, and exit into the indoor area through the air discharge vent 176, as shown in Figure 6. Also, the indoor air introduced from the upper intake opening 171 is made to pass through the dust filter 173, pass through the first segment 181 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the inside of the first segment, and exit into the indoor area through the air discharge vent 176.

**[0090]** A portion of the indoor air introduced from the upper intake opening 171 passes through the fifth segment 185 of the indoor heat exchanger 11 while exchanging heat with the refrigerant passing through the inside of the fifth segment 185 and exits into the indoor area through the air discharge vent 176.

**[0091]** Since the fifth segment 185 of the indoor heat exchanger 11 is functioning as an evaporator, moisture contained in the indoor air drawn into the indoor unit condenses on the outside surfaces of the heat transfer pipes and fins of the fifth segment 185. As a result, air that has passed through the fifth segment 185 has been dehumidified and turned into cooled dry air.

**[0092]** The fifth segment 185 of the indoor heat exchanger 11 is arranged such that its lower edge portion overlaps the upper edge portion of the fourth segment 184 and the condensation water adhered to the outside surfaces of the heat transfer pipes and fins of the fifth segment 185 is guided along the outside surface of the fins such that it arrives at the outside surface of the fourth segment 184. Since the fourth segment 184 of the indoor heat exchanger 11 is functioning as a condenser, both the indoor air drawn thereto through the upper intake opening 171 and the condensation water guided thereto from the fifth segment 185 are heated,

thereby producing humidified air. Thus, moisture contained in the indoor air can be extracted by the fifth segment 185 of the indoor heat exchanger 11 and used to humidify the air that passes through the fourth segment 184.

**[0093]** By controlling the first horizontal flap 195 and the second horizontal flap 196, the warm dry air from the first to third segments 181 to 183 of the indoor heat exchanger 11 is mixed with the cool dry air from the fifth segment 185 and discharged to an upper area of the indoor area as slightly warm dry air and the air from the fourth segment 184 is discharged to a lower area of the indoor area, i.e., an area positioned below the area where the slightly warm dry air is discharged.

**[0094]** For example, as shown in Figure 9, when a bed B is installed in a lower area of a room R and humidified air is to be delivered to a person sleeping on the bed B, the first horizontal flap 195 and the second horizontal flap 196 are controlled as previously described such that the warm humidified air is delivered to the lower area of the room R. The slightly warm dry air formed by mixing the warm dry air from the first to third segments 181 to 183 of the indoor heat exchanger 11 with the cool dry air from the fifth segment 185 functions to push the warm humidified air from the fourth segment 184 downward, thereby preventing the warm humidified air from rising to the upper area of the room R. Thus, a humidified region WA can be created with the warm humidified air in a lower area of the room R and a dry region DA can be created with the slightly warm dry air in an upper area of the room R.

**[0095]** With the configuration just described, the position where a human occupant exists can be spot-humidified, thereby increasing the humidifying effect felt by the human occupant and suppressing the occurrence of molding due to unnecessary humidification in other areas.

**[0096]** Instead of having a first horizontal flap 195 and a second horizontal flap 196, it is also possible to have a single horizontal flap or three or more horizontal flaps. So long as the slightly warm dry air and the warm humidified air are delivered to different areas of the room R, there are no limitations on the constituent features used to work the invention.

**[0097]** It is also possible to configure the air conditioner such that it does not mix the warm dry air exiting the first to third segments 181 to 183 of the indoor heat exchanger 11 and the cool dry air exiting the fifth segment 185 but, instead, delivers the warm dry air to an upper area and the cool dry air to a middle area of the room. Such a configuration would enable the warm humidified air to be pressed down more reliably by the cool dry air and enable the warm humidified air to accomplish spot humidification more effectively.

#### Applicability to Industry

**[0098]** With an air conditioner according to claim 1 of

the present invention, when the pressure adjusting mechanism is controlled such that the first heat exchanging section of the indoor heat exchanger functions as an evaporator and the second heat exchanging section functions as a condenser and the condensation water adhered to the outside surface of the first heat exchanging section is guided to the vicinity of the outside surface of the second heat exchanging section, the water is evaporated by both the warm air that has exchanged heat with the second heat exchanging section and the refrigerant flowing through the inside of the second heat exchanging section. As a result, the warm air is humidified and warm humidified air can be delivered to the indoor area.

**[0099]** With an air conditioner according to claim 2 of the present invention, the condensation water adhered to the outside surface of the first heat exchanging section can be efficiently guided to the vicinity of the outside surface of the second heat exchanging section by the heat radiating fins of the indoor heat exchanger.

**[0100]** With an air conditioner according to claim 3 of the present invention, the humidified air exiting the indoor heat exchanger can be delivered to the indoor area and the dry air can be discharged outdoors, thereby increasing the humidifying effect.

**[0101]** With an air conditioner according to claim 4 of the present invention, for example, warm humidified air is directed to a lower region of the center portion of the indoor area where human occupants exist and dry air is directed toward peripheral portions where wall surfaces and window panes exist. As a result, the humidifying efficiency can be improved such that the humidifying effect felt by the human occupants is increased and wall surfaces, windows, and other places are prevented from developing condensation easily.

**[0102]** With an air conditioner according to claim 5 of the present invention, for example, when a human occupant is in front of the air conditioner, the vertical flaps are adjusted such that the warm humidified air flow is directed in the straight forward direction from the air conditioner and the dry air flow is directed so as to spread to the left and right from the air conditioner. As a result, humidified air can be delivered efficiently to the place where the human occupants exist and the delivery of excess humidity to wall surfaces, window panes, and other places where moisture condenses easily can be avoided.

**[0103]** With an air conditioner according to claim 6 of the present invention, the dry air flow includes cool dry air that has passed through the first heat exchanging section and the lower region of the indoor area can be humidified by pushing the warm humidified air downward. As a result, the humidifying effect with respect to a human occupant in a position close to the floor surface can be increased and effective humidification can be accomplished when the air conditioner is run while the human occupant is in bed.

**[0104]** With an air conditioner according to claim 7 of

the present invention, since the cool dry air flow can push the warm humidified air flow down in an effective manner, the humidifying effect with respect to the low region of the indoor area can be increased.

**[0105]** With an air conditioner according to claim 8 of the present invention, since the cool dry air and the warm dry air are mixed and discharged as a slightly warm dry air flow, the temperature difference between the humidified warm air and the slightly warm dry air is small, making it less noticeable when one makes contact with the slightly warm dry air. Also, since the slightly warm dry air flow can push the warm humidified air flow down, the humidifying effect in the low region of the indoor area can be increased.

## Claims

1. An air conditioner configured to draw in indoor air by means of an indoor fan, exchange heat between a refrigerant passing through the inside of an indoor heat exchanger and the indoor air passing over the outside surface of the indoor heat exchanger, and discharge the thereby conditioned air into the indoor area, wherein the indoor heat exchanger is provided with:

a first heat exchanging section,

a second heat exchanging section,

a pressure adjusting mechanism configured to connect the first heat exchanging section and second heat exchanging section together in series and be capable of adjusting the pressure of the refrigerant such that one of the heat exchanging sections functions as an evaporator and the other heat exchanging section functions as a condenser, and

a humidifying means configured such that, when the pressure adjusting mechanism is adjusted such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser, the humidifying means guides the condensation water adhered to the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section so that the conditioned air is humidified so that the conditioned air

exiting the second heat exchanging section is humidified..

2. The air conditioner as recited in claim 1, wherein the first heat exchanging section and second heat exchanging section are provided with a heat trans-

fer pipe through the inside of which refrigerant passes and a plurality of heat radiating fins mounted to the heat transfer pipe in such a manner as to be parallel to the air flow passing over the outside surfaces of the first and second heat exchanging sections, the outside surface of the heat radiating fins forming a guide surface configured to guide condensation water from the outside surface of the first heat exchanging section to the vicinity of the outside surface of the second heat exchanging section.

3. The air conditioner as recited in claim 1 or 2, further provided with a dry air discharging means configured to discharge air that has passed through the first heat exchanging section to outdoors when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser.

4. The air conditioner as recited in claim 1 or 2, further provided with the following: a warm humidified air guiding means configured to discharge conditioned air that has been humidified by the second heat exchanging section into the indoor area as a warm humidified air flow when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser; and a dry air guiding means configured to discharge post-heat-exchange conditioned air other than the air that has been humidified by the second heat exchanging section into the indoor area as a dry air flow that is separate from the warm humidified air flow when the pressure adjusting mechanism is controlled such that the first heat exchanging section functions as an evaporator and the second heat exchanging section functions as a condenser.

5. The air conditioner as recited in claim 4, wherein the warm humidified air guiding means and the dry air guiding means comprise vertical flaps configured to set the warm humidified air flow to a prescribed horizontal angle and to set the dry air flow to a different horizontal angle.

6. The air conditioner as recited in claim 4, wherein the warm humidified air guiding means and the dry air guiding means comprise horizontal flaps configured to set the warm humidified air flow such that it passes through a low region of the indoor area and to set the dry air flow such that it passes through a higher region than the region passed through by the warm humidified air flow.

7. The air conditioner as recited in claim 6, wherein: the second heat exchanging section is provided

with a warm humidified air producing section configured to produce humidified air using condensation water delivered from the first heat exchanging section and a warm dry air producing section that does not receive condensation water from the first heat exchanging section; and the horizontal flaps are configured such that the warm humidified air produced by the warm humidified air producing section is discharged as a warm humidified air flow that passes through a low region of the indoor area, the cool dry air produced by the first heat exchanging section is discharged as a cool dry air flow that passes through a region higher than the region passed through by the warm humidified air flow, and the warm dry air produced by the warm dry air producing section is discharged as a warm dry air flow that passes through a region even higher than the region passed through by the cool dry air flow.

8. The air conditioner as recited in claim 6, wherein: the second heat exchanging section is provided with a warm humidified air producing section configured to produce humidified air using condensation water delivered from the first heat exchanging section and a warm dry air producing section that does not receive condensation water from the first heat exchanging section; and the horizontal flaps are configured such that warm humidified air produced by the warm humidified air producing section is discharged as a warm humidified air flow that passes through a low region of the indoor area and slightly warm dry air formed by mixing the cool dry air produced by the first heat exchanging section and the warm dry air produced by the warm dry air producing section is discharged as a slightly warm dry air flow that passes through a region higher than the region passed through by the warm humidified air flow.

Fig. 1

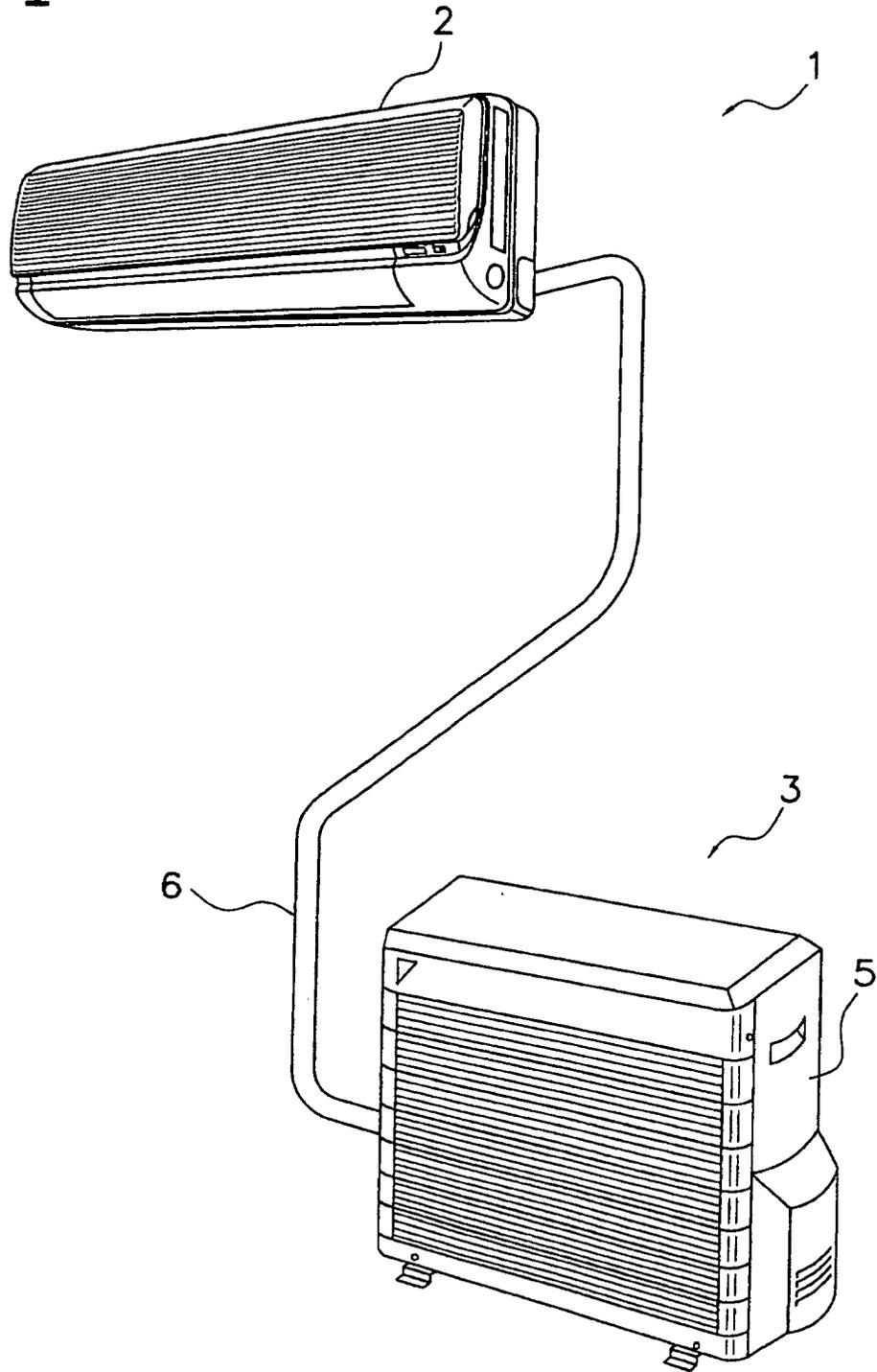


Fig. 2

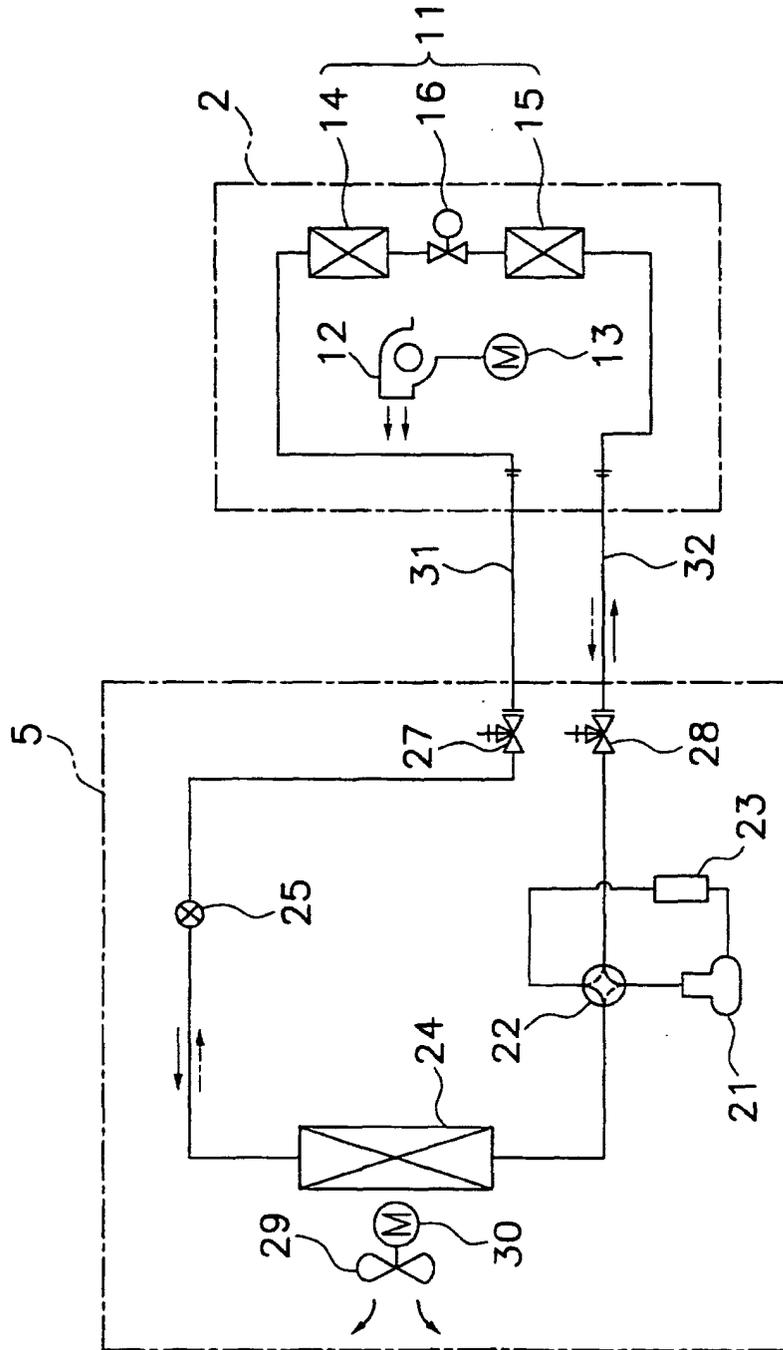


Fig. 3

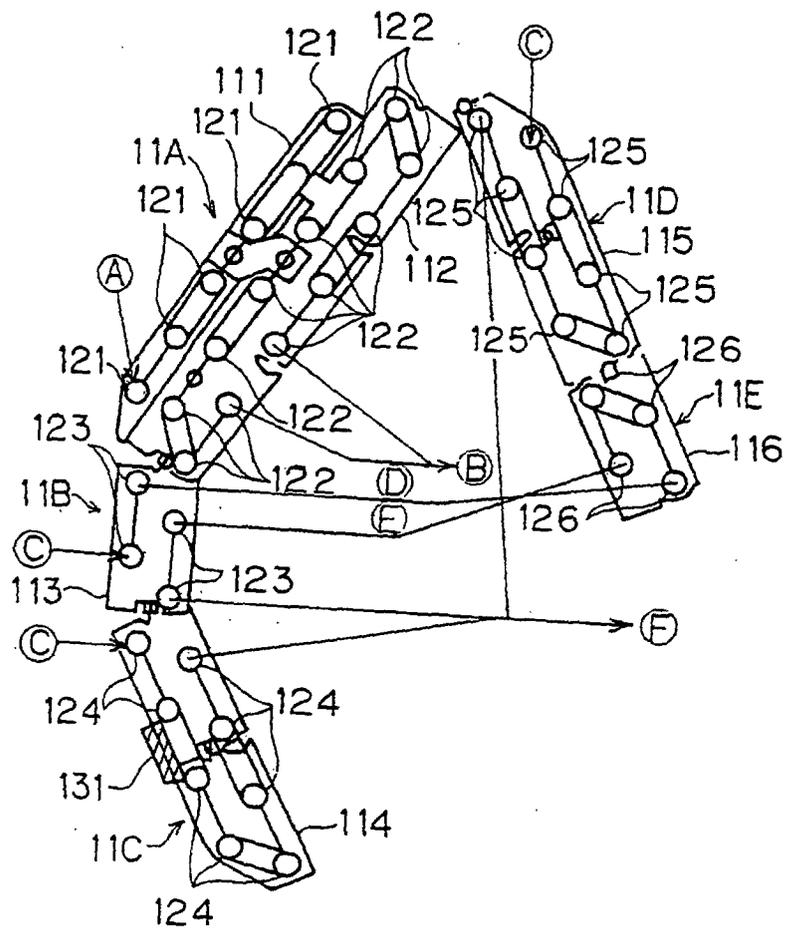




Fig. 5

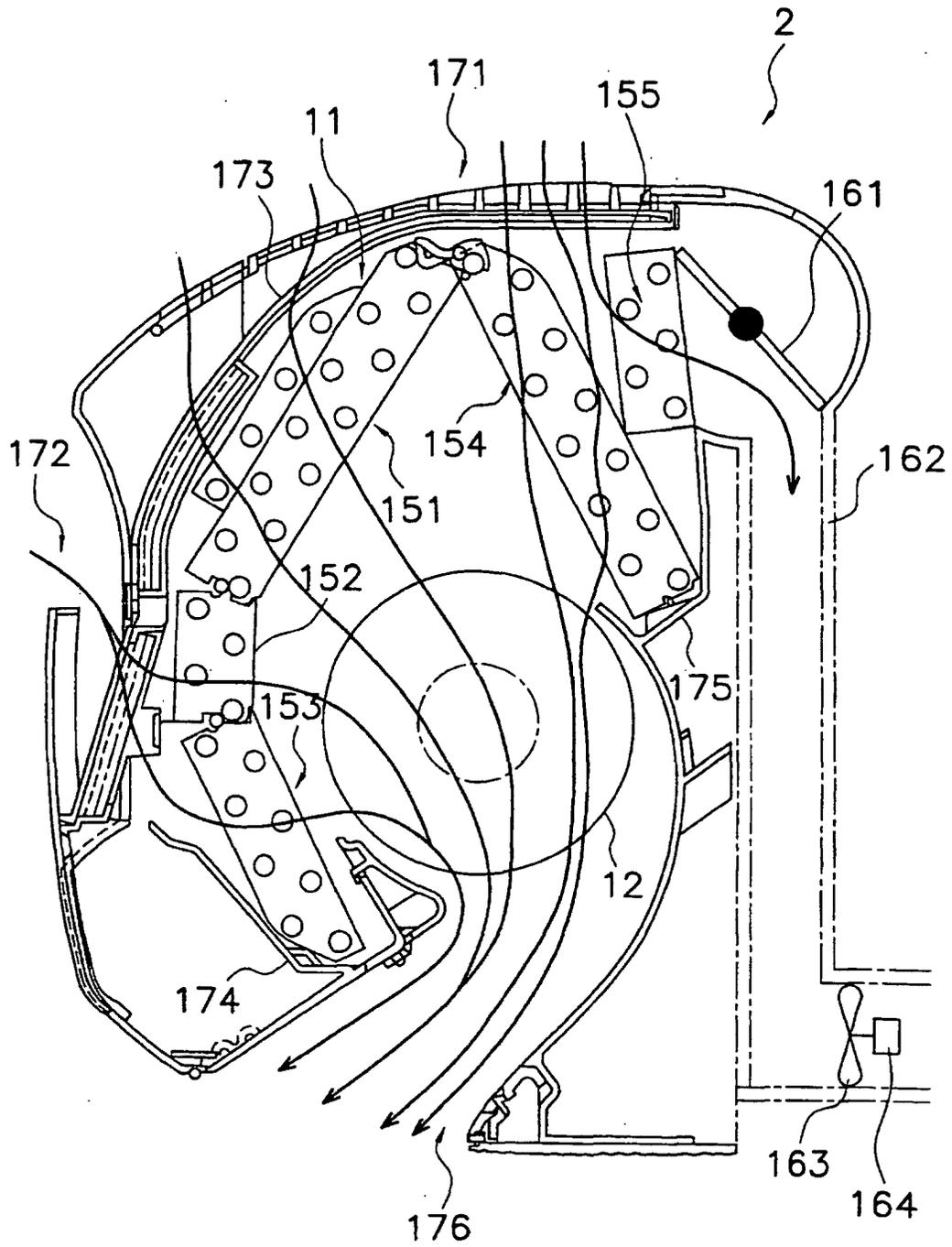


Fig. 6

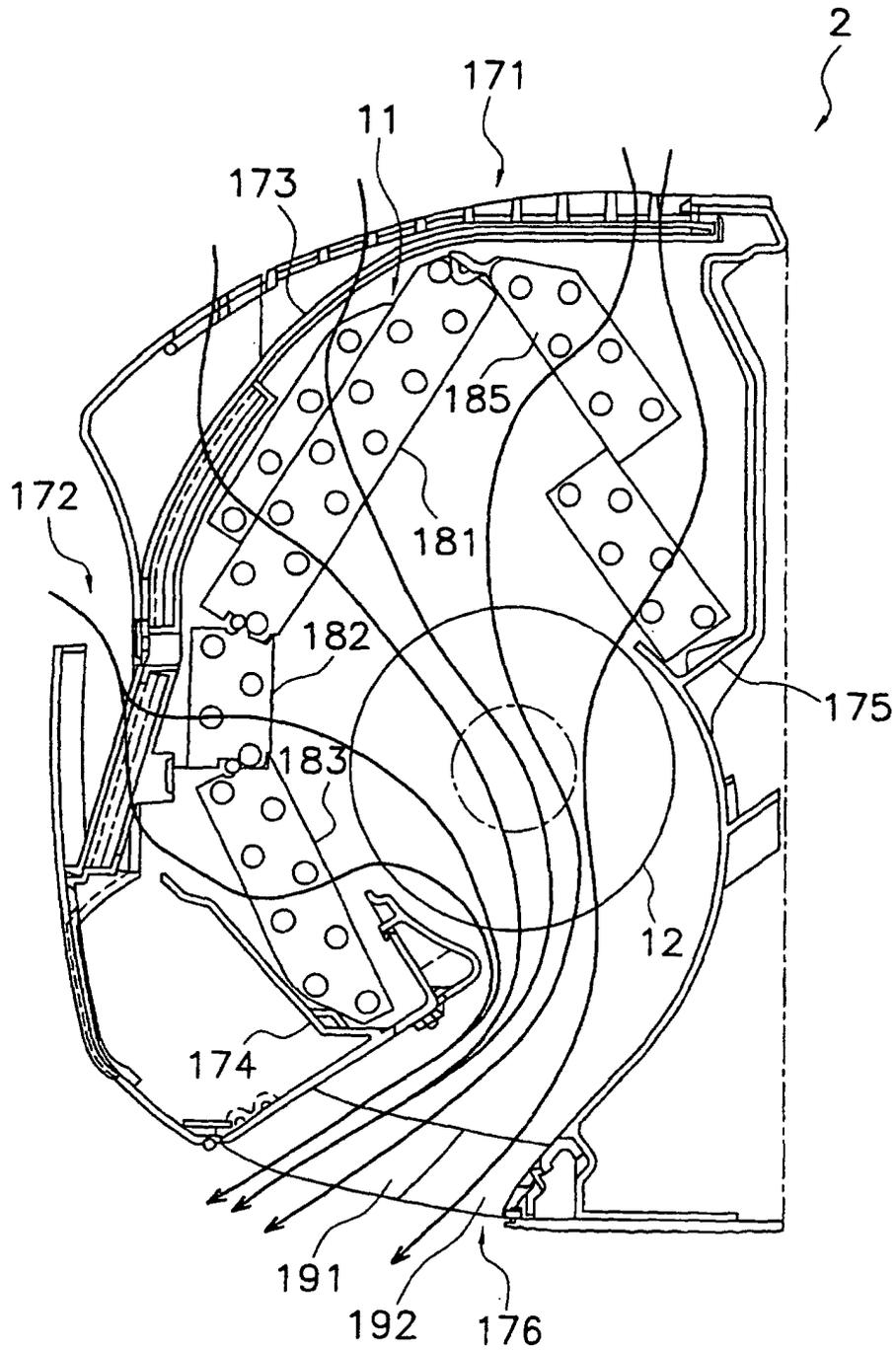


Fig. 7

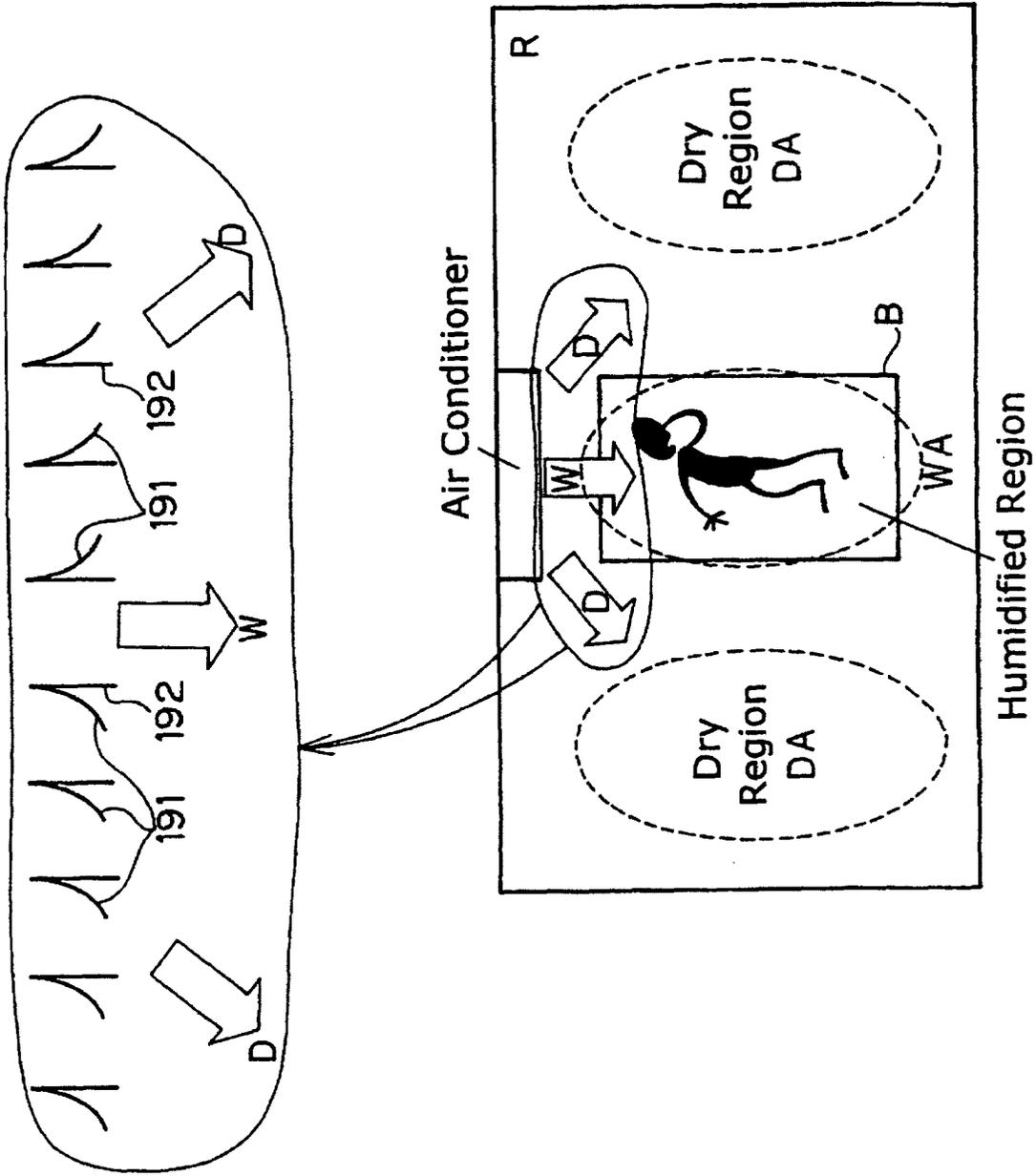


Fig. 8

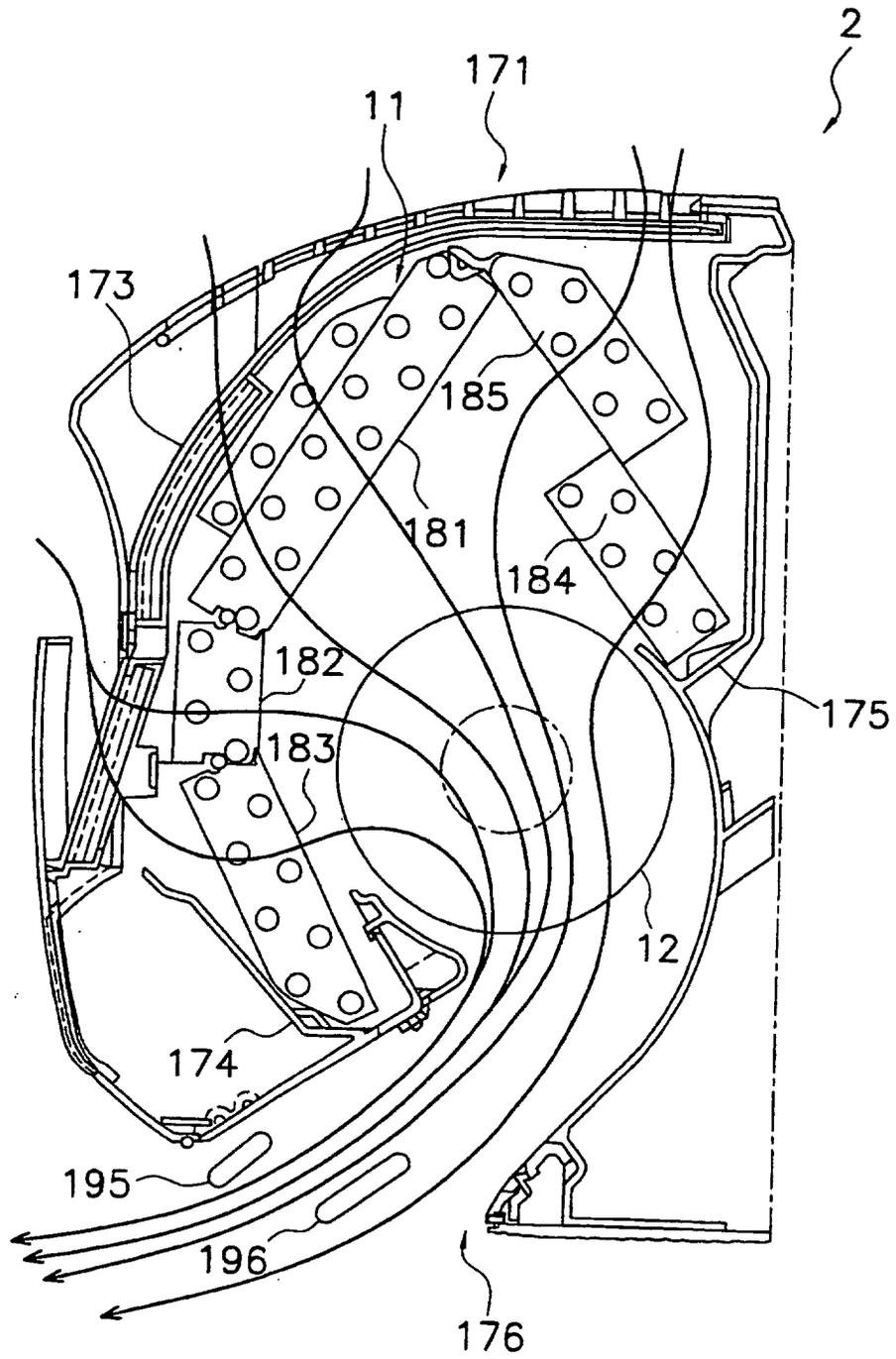
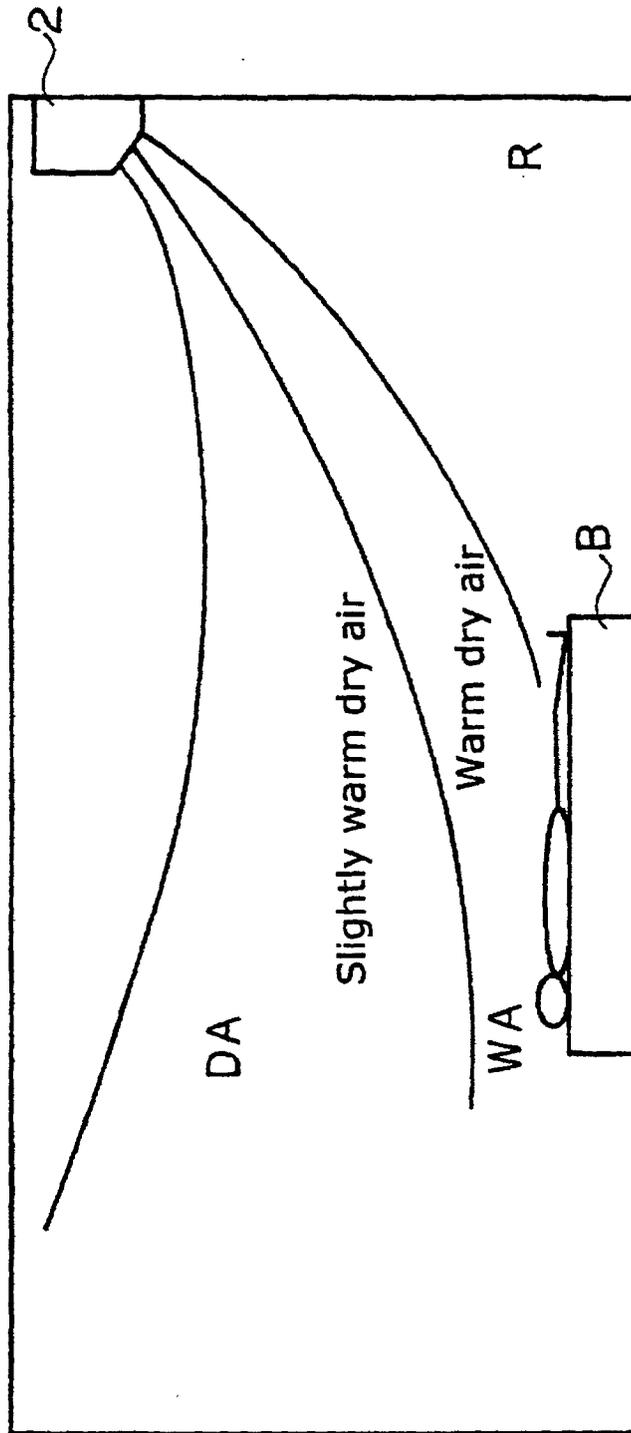


Fig. 9



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/09986

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl <sup>7</sup> F24F1/00, F24F1/02, F24F6/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl <sup>7</sup> F24F1/00, F24F1/02, F24F6/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 8-29012 A (Kubota Corp.), 02 February, 1996 (02.02.96), Full text; all drawings (Family: none)	1-4 5-8
Y A	JP 3-233234 A (Toshiba Corp.), 17 October, 1991 (17.10.91), Full text; all drawings (Family: none)	1-4 5-8
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 141396/1972 (Laid-open No. 95554/1974) (Sanyo Electric Co., Ltd.), 17 August, 1974 (17.08.74), Full text; all drawings (Family: none)	1-4 5-8
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 23 October, 2002 (23.10.02)		Date of mailing of the international search report 05 November, 2002 (05.11.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)