



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

(43) Date of publication:
18.07.2001 Bulletin 2001/29

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

(21) Application number: **00944343.3**

(86) International application number:
PCT/JP00/04557

(22) Date of filing: **10.07.2000**

(87) International publication number:
WO 01/07838 (01.02.2001 Gazette 2001/05)

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **27.07.1999 JP 21208999**

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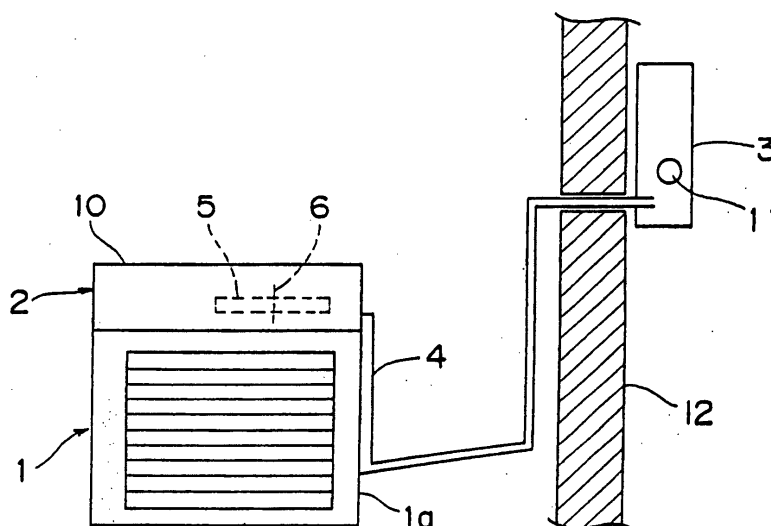
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(54) **AIR CONDITIONER WITH HUMIDIFYING FUNCTION**

(57) A humidifier (2) for adsorbing moisture of outside air to an adsorbent and desorbing the moisture from the adsorbent and then supplying the moisture to an indoor unit (1) is disposed on top of the outdoor unit (1). In the humidifier (2), a humidifying rotor (5) serving as the adsorbent is so disposed that a shaft (6) thereof is generally vertical, by which the humidifier (2) is made low in height. Humidified-air transportation piping (4) for transporting humidified air from the humidifier (2) to an

indoor unit (3) extends from the humidifier (2) downward along a side face (1a) of the outdoor unit (1), and further extends upward from a lower part of the side face (1a) of the outdoor unit (1) so as to be connected to the indoor unit (3). As a result, there can be provided an air conditioner having humidifying function which allows the humidifier to be installed without enlarging the floor space of the outdoor unit and which allows a trap for treating water in the humidified-air transportation piping to be easily installed.

Fig. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner having a humidifying function of humidifying a room by utilizing the moisture of outdoor air.

BACKGROUND ART

[0002] As an air conditioner having the humidifying function, there has been available one in which the moisture of outside air adsorbed to an adsorbent is desorbed from the adsorbent and supplied to a room as shown in Fig. 2 (Japanese Patent Laid-Open Publication HEI 8-128681). This air conditioner having humidifying function, as shown in Fig. 2, is equipped with an outdoor unit 20 having an outdoor heat exchanger 21, an outdoor fan 22 and a humidifier 23, and an indoor unit 30 having an indoor heat exchanger 31 and an indoor fan 32, where the humidifier 23 of the outdoor unit 20 and the indoor unit 30 are connected to each other by humidified-air transportation piping 25.

[0003] In the thus structured air conditioner having humidifying function, after part of outside air sucked in by the outdoor fan 22 is passed through the humidifier 23 so that the moisture of the outside air is adsorbed to the adsorbent of the humidifier 23, room air sent from the indoor unit 30 through room-air transportation piping 24 is humidified by using the moisture desorbed from the adsorbent. Then, the humidified air is transported to the indoor unit 30 side through the humidified-air transportation piping 25, by which the room air is humidified.

[0004] However, in this air conditioner having humidifying function, because the humidifier 23 is disposed within the outdoor unit 20 in a horizontal array with the outdoor heat exchanger 21 and the outdoor fan 22, there is a problem that the floor space of the outdoor unit increases. Also in this air conditioner having humidifying function, because the humidifier is placed at a low position within the indoor unit from structural reasons, there is a problem that the humidified-air transportation piping 25 is difficult to be provided with a trap for treating inside condensed water.

DISCLOSURE OF THE INVENTION

[0005] It is therefore an object of the present invention to provide an air conditioner having humidifying function which allows a humidifier to be installed without enlarging the floor space of the outdoor unit, and which allows a trap for treating water inside the humidified-air transportation piping to be easily installed.

[0006] In order to achieve the above object, there is provided an air conditioner having humidifying function equipped with a humidifier for adsorbing moisture of outside air to an adsorbent and desorbing the moisture from the adsorbent and then supplying the moisture to an in-

door unit, wherein:

the humidifier is disposed on top of the outdoor unit; and

the adsorbent of the humidifier is a humidifying rotor which is so disposed that its axis is aligned generally vertical.

[0007] In this air conditioner having humidifying function, by disposing the humidifier on top of the outdoor unit, it is no longer necessary to dispose the humidifier within the outdoor unit in a horizontal array with an outdoor heat exchanger and an outdoor fan, so that the floor space of the outdoor unit does not become large. Also, by disposing the humidifying rotor (for example, disc shaped), which is the adsorbent of the humidifier, so that its axis is aligned generally vertical, the humidifier itself can be made lower in height, compared with a humidifying rotor which is so positioned that its axis is horizontal. Therefore, the humidifier can be compactly installed to the outdoor unit without enlarging the floor space of the outdoor unit.

[0008] In one embodiment of the present invention, the air conditioner further comprises humidified-air transportation piping which extends from the humidifier downward along a side face of the outdoor unit and further extends upward from a lower part of the side face of the outdoor unit so as to be connected to the indoor unit.

[0009] In the air conditioner having humidifying function of this embodiment, since the humidified-air transportation piping extends from the humidifier downward along the side face of the outdoor unit and further extends upward from a lower part of the side face of the outdoor unit so as to be connected to the indoor unit, it becomes possible to set the lowermost point of the humidified-air transportation piping at a lower position at least in a lower part of the side face of the outdoor unit. Thus, a trap for treating condensed water generated inside the humidified-air transportation piping can be easily installed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a schematic diagram of an air conditioner having humidifying function according to an embodiment of the present invention; and

Fig. 2 is a schematic diagram of an air conditioner having humidifying function according to the prior art.

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] Hereinbelow, the air conditioner having humidifying function according to the present invention is described in detail by way of an embodiment thereof illus-

trated in the accompanying drawings.

[0012] Fig. 1 is a schematic diagram of an air conditioner having humidifying function according to an embodiment of the invention, where reference numeral 1 denotes an outdoor unit, 2 denotes a humidifier installed on top of the outdoor unit 1, and 3 denotes an indoor unit connected to the outdoor unit 1 through inter-unit piping (not shown) and humidified-air transportation piping 4. The humidified-air transportation piping 4 extends from the humidifier 2 downward along a side face 1a of the outdoor unit 1, and extends upward from a lower part of the side face 1a of the outdoor unit 1, so as to be connected to the indoor unit 3.

[0013] The humidifier 2 has a disc-shaped humidifying rotor 5, and the humidifying rotor 5 has a body made of zeolite or the like as an adsorbent and is so structured as to let air easily pass therethrough. A shaft 6 is fixed to the body of the humidifying rotor 5 so as to pass through the center of the disc shape. The disc-shaped humidifying rotor 5 is disposed within a casing 10 of the humidifier 2 so that the shaft 6 becomes generally vertical. Otherwise, the humidifying rotor 5 may be formed into polygonal or other shapes without being limited to disc shape.

[0014] In the thus structured air conditioner having humidifying function, for example during the heating operation, the moisture of outside air taken in from outdoors is adsorbed to the adsorbent of the humidifying rotor 5 while the humidifying rotor 5 is maintained rotating about the shaft 6, and further the adsorbed moisture is desorbed from the humidifying rotor 5. In this way, moisture is taken in from outside air by the humidifying rotor 5 operating to adsorb and desorb the moisture selectively, and air humidified by the intake moisture is supplied to the indoor unit 3 via the humidified-air transportation piping 4 passing through a wall 12. Then, the humidified air is blown into an air flow path (not shown) inside the indoor unit 3. The humidified air is blown into the room by using an air flow of the indoor fan 11 of the indoor unit 3.

[0015] Thus, since the humidifier 2 is placed on top of the outdoor unit 1, the humidifier no longer needs to be placed within the outdoor unit 1 in a horizontal array with unshown outdoor heat exchanger or outdoor fan, so that the floor space of the outdoor unit 1 does not become large. Also, when the humidifying rotor 5 is positioned with both side faces generally horizontal by positioning the humidifying rotor 5 of the humidifier 2 with its shaft 6 generally vertical, the humidifier itself can be made lower in height, compared with a humidifying rotor which is so positioned that its shaft is horizontal (i.e., both side faces are generally vertical). Therefore, the humidifier 2 can be compactly installed to the outdoor unit 1 without enlarging the floor space of the outdoor unit 1.

[0016] Further, by disposing the humidifier 2 on top of the outdoor unit 1, the humidified-air transportation piping 4 is allowed to extend from the humidifier 2 downward along the side face 1a of the outdoor unit and further

extend upward from a lower part of the side face 1a of the outdoor unit 1 so as to be connected to the indoor unit 3. By doing so, it becomes possible to set the lowermost point of the humidified-air transportation piping 4 at a low position at least in a lower part of the side face 1a of the outdoor unit 1. As a result, a trap for discharging condensed water generated inside the humidified-air transportation piping 4 (including condensed water derived from the humidifier 2 and the indoor unit 3 side) can be easily installed.

[0017] In the above embodiment, the humidifier 2 is installed on top of the outdoor unit 1. However, the humidifier may also be provided as one which is positioned on an upper side within the outdoor unit and moreover integrated with the outdoor unit.

[0018] As apparent from the above description, according to the air conditioner having humidifying function of the invention, by the arrangement that the humidifier is disposed on top of the outdoor unit while the humidifying rotor serving as an adsorbent of the humidifier is so positioned that its axis is aligned generally vertical, the humidifier itself can be made low in height, allowing the humidifier to be installed to the outdoor unit more compactly, compared with a humidifying rotor which is so positioned that its axis is horizontal.

[0019] Also, since the humidified-air transportation piping that interconnects the humidifier and the indoor unit extends from the humidifier downward along a side face of the outdoor unit and further extends upward from a lower part of the side face of the outdoor unit so as to be connected to the indoor unit, it becomes possible to set the lowermost point of the humidified-air transportation piping at a low position at least in a lower part of the side face of the outdoor unit, so that the trap for treating condensed water generated inside the humidified-air transportation piping can be easily installed.

Claims

1. An air conditioner having humidifying function equipped with a humidifier (2) for adsorbing moisture of outside air to an adsorbent and desorbing the moisture from the adsorbent and then supplying the moisture to an indoor unit (3), wherein:

the humidifier (2) is disposed on top of the outdoor unit (1); and

the adsorbent of the humidifier (2) is a humidifying rotor (5) which is so disposed that its axis is aligned generally vertical.

2. The air conditioner having humidifying function according to Claim 1, further comprising:

humidified-air transportation piping (4) which extends from the humidifier (2) downward along a side face of the outdoor unit (1) and further extends upward from a lower part of the side face of the out-

door unit (1) so as to be connected to the indoor unit
(3).

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Fig. 1

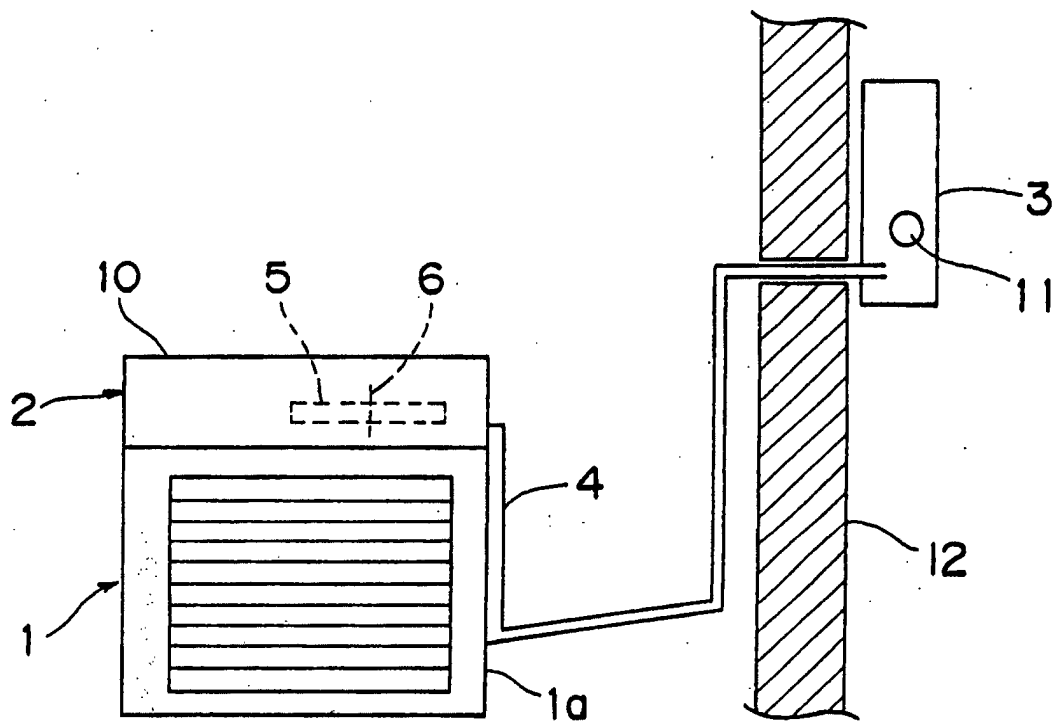
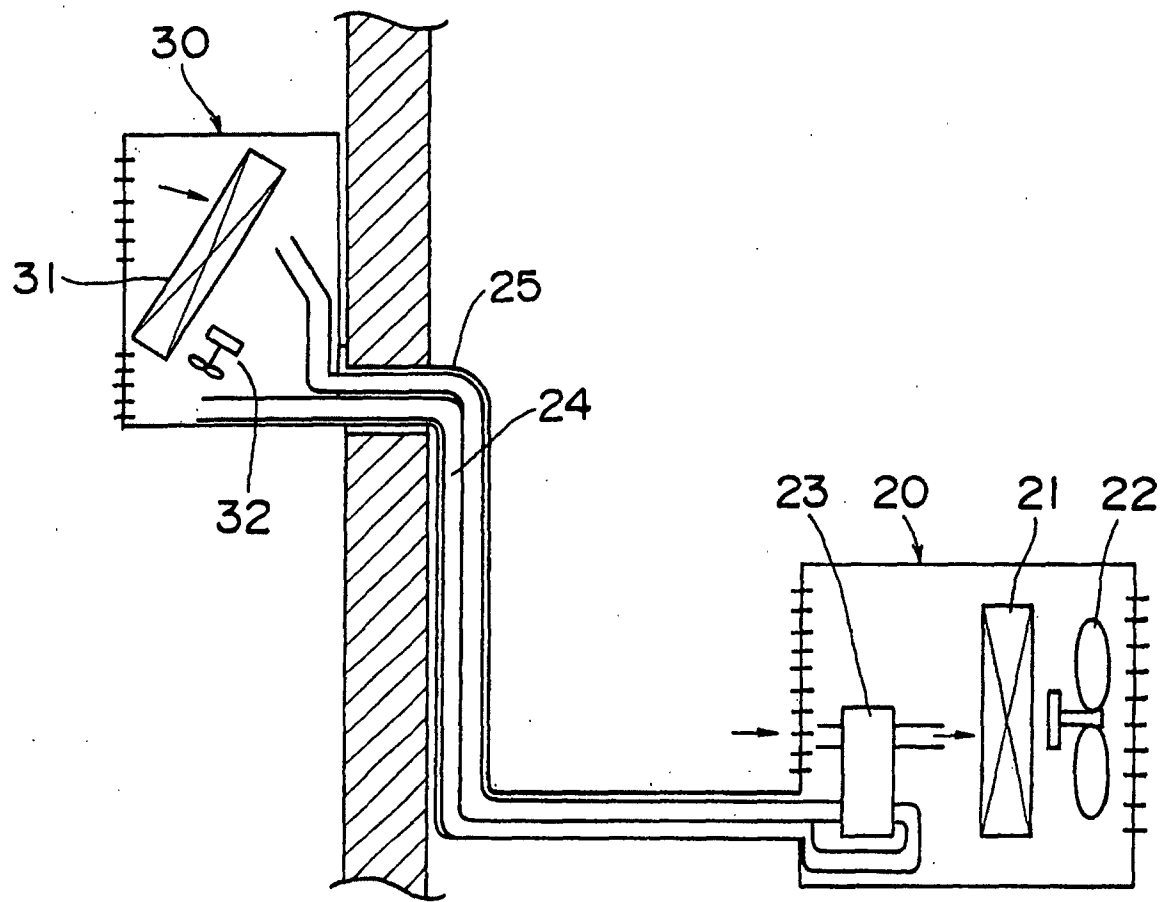


Fig.2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/04557

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ F24F6/00 331		
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. ⁷ F24F6/00 331		
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 1994-2000 Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000		
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.
A	JP, 8-128681, A (Sharp Corporation), 21 May, 1996 (21.05.96) (Family: none)	1, 2
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 13 September, 2000 (13.09.00)		Date of mailing of the international search report 26 September, 2000 (26.09.00)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)