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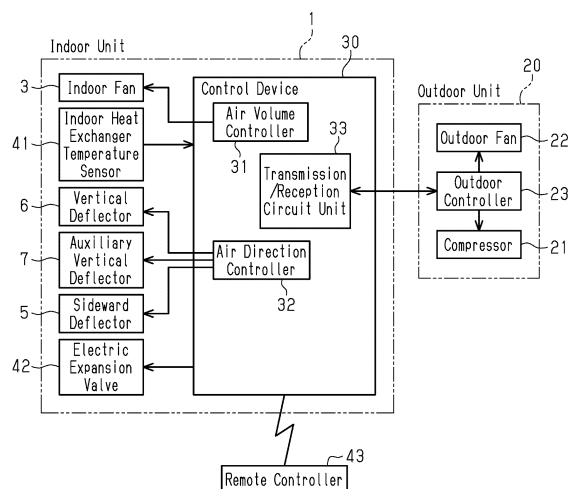
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(54) **AIR CONDITIONER**

(57) This air conditioner includes: an indoor heat exchanger; an indoor fan; an indoor discharge port; an up/down air direction plate; an indoor heat exchanger temperature sensor; and a control device. The control device has an air volume control unit for restricting the air volume of the indoor fan at the start of a heating operation, and an air direction control unit for controlling the up/down air direction of the up/down air direction plate. The air volume control unit controls the air volume of the indoor fan at the start of the heating operation so that the air volume increases as the temperature of the indoor heat exchanger increases. The air direction control unit restricts the position of the up/down air direction plate at the start of the heating operation so that the up/down air volume plate is oriented toward at least an upward direction within a discharge direction adjustment range.

Fig.2



Description

TECHNICAL FIELD

[0001] The present disclosure relates to an air conditioner.

BACKGROUND ART

[0002] Since an air conditioner uses a vapor compression refrigeration cycle, it takes time to initiate a heating operation. Accordingly, at the start of a heating operation, the temperature of an indoor heat exchanger is low. Thus, when an indoor fan is activated, cold air that would be annoying to a person in a room will be blown out. In the same manner as an air conditioning device described in Patent Document 1, conventional air conditioners employ a process that increases the flow rate of the blown-air as the indoor heat exchanger temperature increases to increase the initiation speed of the heating operation while limiting the amount of the blown-out cold air. In the present specification, "start of a heating operation" refers to an operation period from when a heating operation is started to when the heating operation stabilizes as a normal heating operation.

PRIOR ART DOCUMENT

Patent Document

[0003] Patent Document 1: Japanese Patent No. 3080187

SUMMARY OF THE INVENTION

Problems that the Invention is to Solve

[0004] A conventional air conditioning device reduces the blown-airflow rate while the indoor heat exchanger temperature is low at the start of a heating operation. However, cold air is still blown out of an indoor outlet toward a person in a room, which would be annoying.

[0005] The object of the present disclosure is to provide an air conditioner that increases the initiation speed of a heating operation while reducing the amount of cold air blown toward a person in a room at the start of a heating operation.

Means for Solving the Problems

[0006] An air conditioner in accordance with a first aspect includes an indoor heat exchanger, an indoor fan, an indoor outlet, a vertical deflector, an indoor heat-exchanger temperature sensor, and a control device. The indoor fan circulates air, which has undergone heat exchange in the indoor heat exchanger, indoors. The indoor outlet blows out the air, which has undergone heat exchange in the indoor heat exchanger, indoors. The ver-

tical deflector is arranged in the indoor outlet to change an air direction in a vertical direction. The indoor heat-exchanger temperature sensor measures an indoor heat exchanger temperature of the indoor heat exchanger.

5 The control device controls at least an air volume of the indoor fan and the air direction of the vertical deflector. The control device includes an air volume controller, which restricts the air volume of the indoor fan at a start of a heating operation, and an air direction controller, which controls the air direction of the vertical deflector in the vertical direction. The air volume controller executes control to increase the air volume of the indoor fan as the indoor heat exchanger temperature increases at the start of the heating operation. The air direction controller re-
10 stricts a position of the vertical deflector so that the vertical deflector is at least faced upward in a blow-out direction adjustment range at the start of the heating operation.

[0007] The air conditioner controls the vertical deflector so that the vertical deflector of the indoor outlet is at least faced upward in the blow-out direction adjustment range at the start of a heating operation. This reduces an amount of cold air that is blown out toward a person in a room. Further, the air direction of the vertical deflector is controlled in this manner so that the air volume, which is increased in accordance with increases in the indoor heat exchanger temperature, is set to be greater than that of a conventional air conditioner.

[0008] The air conditioner in accordance with a second aspect is configured so that the air volume controller switches and increases the air volume of the indoor fan in a stepped manner as the indoor heat exchanger temperature increases at the start of the heating operation. Switching temperatures are set for the indoor heat exchanger temperature to switch the air volume of the indoor fan in a stepped manner. The switching temperatures are set to be lower when the indoor heat exchanger temperature is decreasing than when the indoor heat exchanger temperature is increasing.

[0009] This air conditioner sets the switching temperatures, which are set for the indoor heat exchanger temperature to switch the air volume in a stepped manner, to be lower when the indoor heat exchanger temperature is decreasing than when the indoor heat exchanger temperature is increasing. This reduces chattering of the indoor heat-exchanger temperature sensor, which detects the indoor heat exchanger temperature, and hunting of the air volume of the indoor fan.

[0010] The air conditioner in accordance with a third aspect is configured so that after the indoor heat exchanger temperature has increased and the air volume of the indoor fan has been set to maximum, the air volume controller and the air direction controller are configured to cancel an air volume restriction of the indoor fan and an air direction restriction of the vertical deflector when the indoor heat exchanger temperature increases further to a preset target temperature.

[0011] In the present specification, "target set temper-

ature" refers to a target temperature of the indoor heat exchanger at which annoying cold air is no longer expected to be blown out at any air volume of the indoor fan and any air direction of the vertical deflector.

[0012] This air conditioner waits until the indoor heat exchanger temperature is increased to a point where one will no longer feel that the blown-out air from the indoor outlet is cold before canceling the air volume restriction of the indoor fan and the air direction restriction of the vertical deflector. This avoids a situation in which a person in a room would be annoyed by blown-out cold air.

[0013] With the air conditioner according to a fourth aspect, the air conditioner is a wall-mounted indoor unit of a separated type air conditioner. The indoor outlet is arranged on a lower part of the wall-mounted indoor unit. The air direction controller restricts the position of the vertical deflector so that the vertical deflector is located at an uppermost position in the blow-out direction adjustment range at the start of the heating operation.

[0014] The air conditioner, which is a wall-mounted indoor unit including the indoor outlet at the lower part, restricts the position of the vertical deflector so that the vertical deflector is located at the uppermost position in the blow-out direction adjustment range at the start of a heating operation. This effectively reduces an amount of blown-out cold air.

[0015] With the air conditioner in accordance with a fifth aspect, the indoor outlet is configured so that when the position of the vertical deflector is set such that the vertical deflector is located downward from the uppermost position in the blow-out direction adjustment range, a blow-out air volume is greater than that when the position of the vertical deflector is set such that the vertical deflector is located at the uppermost position in the blow-out direction adjustment range.

[0016] Typically, when the vertical deflector is shifted downward from the uppermost position in the blow-out direction adjustment range, an indoor outlet of a wall-mounted indoor unit is configured so that the blow-out air volume increases. With an air conditioner including such an indoor outlet, when the air direction restriction of the vertical deflector is canceled, the vertical deflector is shifted downward from the uppermost position in the blow-out direction adjustment range thereby increasing the blow-out air volume. This may decrease the indoor heat exchanger temperature and the temperature of the blown-out air. However, with the air conditioner in accordance with the present disclosure, the air direction restriction is canceled after the indoor heat exchanger temperature has been sufficiently increased. Thus, cold air will not be blown out toward a person in a room due to the indoor heat exchanger temperature being insufficient.

[0017] Therefore, the air conditioner in accordance with the fifth aspect is readily applicable to a typical air conditioner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a cross-sectional view showing a wall-mounted indoor unit of an air conditioner in accordance with one embodiment.

Fig. 2 is a functional block diagram of the air conditioner.

Fig. 3 is a flowchart illustrating an action in a blow-out air control at the start of a heating operation of the air conditioner.

Fig. 4 is a diagram illustrating a relationship of an indoor heat exchanger temperature and an air volume of an indoor fan in the blow-out air control at the start of the heating operation of the air conditioner.

MODE FOR CARRYING OUT THE INVENTION

[0019] An air conditioner in accordance with one embodiment of the present disclosure will now be described. The scope of the disclosure is defined not by the detailed description, but by the claims and their equivalents, and all variations within the scope of the claims and their equivalents are to be construed as being included in the disclosure.

[0020] The air conditioner in accordance with the present embodiment includes a wall-mounted indoor unit 1 shown in Fig. 1 and an outdoor unit 20 (refer to Fig. 2) and performs heat-pump type cooling and heating operations.

[0021] The wall-mounted indoor unit 1 is entirely elongated in one direction and mounted on a wall surface of a room so that its longitudinal direction is horizontal. As shown in Fig. 1, the wall-mounted indoor unit 1 includes a casing 2, an indoor fan 3 accommodated in the casing 2, an indoor heat exchanger 4, sideward deflectors 5, a vertical deflector 6, an auxiliary vertical deflector 7, and the like.

[0022] The casing 2 includes a substantially box-shaped casing base 11 and a front panel 12. The casing base 11 is open at the front, and the front panel 12 covers the open front portion of the casing base 11. The casing base 11 includes an upper surface, in which an indoor inlet 13 is formed, and a lower surface, in which an indoor outlet 14 is formed. The indoor inlet 13 is a grid-like opening elongated in a sideward direction, and the indoor outlet 14 is a rectangular opening elongated in the sideward direction. When performing an air conditioning operation (cooling operation or heating operation), the indoor fan 3, which is arranged in an air flow path from the indoor inlet 13 to the indoor outlet 14, is driven to draw in air through the indoor inlet 13 so that the air performs heat exchange (i.e., becomes heated or cooled) in the indoor heat exchanger 4 and is then blown out of the indoor outlet 14 into the room.

[0023] The sideward deflectors 5 are arranged at an

inner side of the indoor outlet 14 to adjust an air direction of the air blown out of the indoor outlet 14 in the sideward direction.

[0024] The vertical deflector 6 adjusts the air direction of the air blown out of the indoor outlet 14 in a vertical direction. The vertical deflector 6 includes a pivot center C1 at an intermediate position of the indoor outlet 14 in the vertical direction. The vertical deflector 6 indicated by the solid lines in Fig. 1 is located at the uppermost position in a blow-out direction adjustment range of the vertical deflector 6. Further, the vertical deflector 6 indicated by the double-dashed lines in Fig. 1 is located at the lowermost position in the blow-out direction adjustment range of the vertical deflector 6. The uppermost position in the blow-out direction adjustment range corresponds to a position at which the vertical deflector 6 is practically horizontal in the same manner as a typical wall-mounted indoor unit. Further, in response to an operation instruction of a user during a cooling operation or a heating operation, the vertical deflector 6 is configured to be swung by a drive motor (not shown) between the solid line position and the double-dashed line position and held at any position between the solid line position and the double-dashed line position.

[0025] The auxiliary vertical deflector 7 is arranged along an upper structural portion of the indoor outlet 14 to prevent water from collecting on the inner surface of the vertical deflector 6 during a cooling operation. The auxiliary vertical deflector 7 is configured to adjust the air direction of the blown-out air between a solid line position and a double-dashed line position in Fig. 1 about a pivot center C2. The auxiliary vertical deflector 7 is automatically controlled to be held at an optimal position in cooperation with the position of the vertical deflector 6 in the blow-out direction adjustment range during a cooling operation. However, during a heating operation, the auxiliary vertical deflector 7 is held at the uppermost position (solid line in Fig. 1) in a blow-out direction adjustment range. The description of the present embodiment is related to actions at the start of a heating operation. Thus, actions of the auxiliary vertical deflector 7 during a cooling operation will not be described.

[0026] Further, when a cooling operation and a heating operation are stopped, the vertical deflector 6 and the auxiliary vertical deflector 7 are each configured to be pivoted to a position located further upward from the uppermost position in the corresponding blow-out direction adjustment range so that the vertical deflector 6 and the auxiliary vertical deflector 7 are in contact with the upper structural portion of the indoor outlet 14 (that is, closed positions) to close the indoor outlet 14. In this manner, the vertical deflector 6 also serves as a cover member of the indoor outlet 14.

[0027] In the same manner as a typical wall-mounted indoor unit, an air flow resistance of the indoor outlet 14 becomes maximized when the vertical deflector 6 is at the uppermost position in the blow-out direction adjustment range. The air flow resistance of the indoor outlet

14 decreases at positions downward from the uppermost position and becomes minimized at a middle position between the uppermost position and the lowermost position. This effect is caused by the bending state of the air flow path and changes in the dimensions of the space between the two deflectors where air flows. Therefore, when the vertical deflector 6 is at an intermediate position in the blow-out direction adjustment range, the volume of blown-out air from the indoor outlet 14 is increased as compared to when the vertical deflector 6 is at the uppermost position in the blow-out direction adjustment range.

[0028] A block diagram of Fig. 2 illustrating a control function of the air conditioner will now be described.

[0029] As shown in Fig. 2, the wall-mounted indoor unit 1 incorporates a control device 30 that entirely controls the operation of the air conditioner. The control device 30 is configured by a memory that stores predetermined control programs, a processor that runs on the control programs to perform various controls, and the like. Further, the control device 30 includes an air volume controller 31 and an air direction controller 32. The air volume controller 31 restricts the air volume produced by the indoor fan 3 at the start of a heating operation. The air direction controller 32 controls the vertical air direction with the vertical deflector 6 at the start of a heating operation. The control device 30 further includes a transmission/reception circuit unit 33, which performs communication with the outdoor unit 20, and the like.

[0030] The control device 30 is connected to the indoor fan 3 and an indoor heat-exchanger temperature sensor 41. The indoor fan 3 is an indoor circulation fan that circulates the air, which has undergone heat exchange in the indoor heat exchanger 4, indoors. The indoor fan 3 includes a drive motor, of which rotational speed is controlled based on an instruction from the air volume controller 31 for control of the air volume.

[0031] The indoor heat-exchanger temperature sensor 41 is attached to the indoor heat exchanger 4 at a position that allows for detection of an average temperature of the indoor heat exchanger 4 as an indoor heat exchanger temperature T_r . The indoor heat exchanger temperature T_r detected by the indoor heat-exchanger temperature sensor 41 is transmitted to the control device 30 and used as reference data for the air volume control of the indoor fan 3 by the air volume controller 31 and the air direction control of the vertical deflector 6 by the air direction controller 32.

[0032] Further, the control device 30 is connected to drive units of the vertical deflector 6, the auxiliary vertical deflector 7, and the sideward deflector 5 so that the deflectors are controlled by the air direction controller 32. In addition, the control device 30 is connected to an electric expansion valve 42 that controls a refrigerant to the indoor heat exchanger 4. An opening degree of the electric expansion valve 42 is controlled by an instruction from the control device 30.

[0033] Also, the wall-mounted indoor unit 1 includes a

remote controller 43 as an accessory. The remote controller 43 functions as an operation unit of the air conditioner and includes an operation switch, an operation mode selection portion, a setting portion, an air volume setting portion, a display, and the like. The operation switch starts and ends operation of the air conditioner. The setting portion sets a set temperature for the indoor air. The air volume setting portion sets the air volume of the indoor fan during a normal heating operation. The display shows the indoor temperature or the air volume of the indoor fan. The remote controller 43 is configured to transmit operating information, which is selected or set, to the control device 30 through wireless communication.

[0034] The outdoor unit 20 includes a compressor 21, an outdoor fan 22, as well as an outdoor controller 23 that controls these devices. Further, the outdoor unit 20 includes a four-way switching valve (not shown) that switches a refrigerant circuit between a cooling cycle and a heating cycle. The switching of the four-way switching valve is controlled by the outdoor controller 23. Also, the control device 30 of the wall-mounted indoor unit 1 is electrically connected to the outdoor controller 23 via the transmit/receive circuit unit 33, and operating information from the remote controller 43 received by the control device 30 is also transmitted to the outdoor controller 23.

[0035] With reference to Figs. 3 and 4, the air volume control of the indoor fan 3 and the air direction control of the vertical deflector 6 at the start of a heating operation, that is, a blow-out air control at the start of a heating operation will now be described as an operation of the air conditioner. Specifically, the air direction of the vertical deflector 6 and the air volume of the indoor fan 3 will be controlled in accordance with the flowchart, which is described later, and instructions from the remote controller 43 will be ignored until the indoor heat exchanger temperature T_r reaches a predetermined target set temperature T_t .

[0036] When a heating operation start instruction is output from the remote controller 43 (step S1), the refrigerant circuit is switched to heating cycle to start operating the compressor 21 and the outdoor fan 22. This starts a heating operation of the air conditioner. In this case, the vertical deflector 6 and the auxiliary vertical deflector 7 arranged in the indoor outlet 14 open from the closed positions, which close the indoor outlet 14, and are pivoted to the uppermost positions in the blow-out direction adjustment range. Then, the vertical deflector 6 is held at this position until the air direction restriction is canceled (step S2). The auxiliary vertical deflector 7 is held at the uppermost position in the blow-out direction adjustment range during a heating operation and does not perform any other specific controls in the blow-out air control at the start of a heating operation.

[0037] The indoor heat exchanger 4 is not heated when the heating operation has just started. Thus, the indoor heat exchanger temperature T_r is lower than a first switching temperature T_1 shown in Fig. 4. That is, the air

volume of the indoor fan 3 is restricted in a fan operation prohibition zone indicated in Fig. 4. Thus, when the indoor heat exchanger temperature T_r is lower than the first switching temperature T_1 , the compressor 21 is operated and the indoor fan 3 is stopped (step S3).

[0038] Subsequently, when the indoor heat exchanger temperature T_r increases to the first switching temperature T_1 as time elapses (YES in step S4), the restriction on the air volume of the indoor fan 3 is switched to a minimum air volume zone indicated in Fig. 4. This operates the indoor fan 3 to generate the minimum air volume (step S5). When step S4 is NO, the control device 30 returns to step S3.

[0039] Then, when the indoor heat exchanger temperature T_r increases to a second switching temperature T_2 as time elapses (YES in step S6), the restriction on the air volume of the indoor fan 3 is switched to an intermediate air volume zone indicated in Fig. 4. This operates the indoor fan 3 to generate an intermediate air volume (step S7). When step S6 is NO, the control device 30 returns to step S5.

[0040] Next, when the indoor heat exchanger temperature T_r increases to a third switching temperature T_3 as time elapses further (YES in step S8), the restriction on the volume of the indoor fan 3 is switched to a maximum air volume zone indicated in Fig. 4. This operates the indoor fan 3 to generate the maximum air volume (step S9). When step S8 is NO, the control device 30 returns to step S7.

[0041] In this manner, when the indoor heat exchanger temperature T_r increases further to the target set temperature T_t as time elapses (YES in step S10), it is assumed that the temperature of the blown-out air has been increased to a point where cold air that would be annoying to a person in a room will not be blown out. Thus, the restriction on the air direction of the vertical deflector 6 and the restriction on the air volume of the indoor fan 3 are canceled (step S11). This ends the blow-out air control at the start of a heating operation. In this manner, the heating operation stabilizes and becomes normal after the indoor heat exchanger temperature T_r reaches the target set temperature T_t . Specifically, when the restriction on the air direction of the vertical deflector 6 and the restriction on the air volume of the indoor fan 3 are canceled, the indoor fan 3 is operated at the air volume set by the remote controller 43 and the vertical deflector 6 is moved to the position set by the remote controller 43 for heating operation.

[0042] Here, the restriction on the air direction of the vertical deflector 6 is canceled when the indoor heat exchanger temperature T_r becomes equal to the target set temperature T_t , which is higher than the third switching temperature T_3 , instead of when the indoor heat exchanger temperature T_r becomes equal to the third switching temperature T_3 . This is because when the vertical deflector 6 is shifted to a position downward from the uppermost position in the blow-out direction adjustment range, the volume of the blown-out air will increase

and the indoor heat exchanger temperature T_r may decrease in accordance with the increase. In the same manner, the restriction on the air volume of the indoor fan 3 is canceled when the indoor heat exchanger temperature T_r becomes equal to the target set temperature T_t , which is higher than the third switching temperature T_3 , instead of when the indoor heat exchanger temperature T_r becomes equal to the third switching temperature T_3 in order to increase the initiation speed of the heating operation as soon as possible.

[0043] In the blow-out air control at the start of a heating operation, the switching temperatures T_1 , T_2 , and T_3 , which are set for the indoor heat exchanger temperature T_r indicated in Fig. 4, are set to be lower when the indoor heat exchanger temperature T_r is decreasing than when the indoor heat exchanger temperature T_r is increasing. This is to avoid chattering of the indoor heat-exchanger temperature sensor 41 and hunting of the air volume of the indoor fan 3.

Advantages

[0044] The air conditioner in accordance with the present embodiment is configured as above so that following advantages are obtained.

(1) At the start of a heating operation, the position of the vertical deflector 6 is restricted so that the vertical deflector 6 of the indoor outlet 14 is at least faced upward in the blow-out direction adjustment range. This reduces an amount of cold air that is blown toward a person in a room.

(2) Further, since the air direction of the vertical deflector 6 is controlled in this manner, the air volume of the indoor fan 3 in the blow-out air control at the start of a heating operation can be greater than that of a conventional air conditioner.

(3) In the blow-out air control at the start of a heating operation, in which the air volume of the indoor fan 3 is increased as the indoor heat exchanger temperature T_r increases, the switching temperatures (T_1 , T_2 , and T_3) are set for the indoor heat exchanger temperature T_r to change the air volume in a stepped manner. Specifically, the switching temperatures (T_1 , T_2 , and T_3) are set to be lower when the indoor heat exchanger temperature T_r is decreasing than when the indoor heat exchanger temperature T_r is increasing. This reduces chattering of the indoor heat-exchanger temperature sensor 41, which detects the indoor heat exchanger temperature T_r , and hunting of the air volume of the indoor fan 3.

(4) The restriction on the air volume of the indoor fan 3 and the restriction on the air direction of the vertical deflector 6 are canceled after the indoor heat exchanger temperature T_r is increased to a point where one will no longer feel that the blown-out air from the indoor outlet 14 is cold. This avoids situations in which a person in a room will be annoyed by blown-

out cold air.

(5) The indoor outlet 14 is arranged on the lower part of the wall-mounted indoor unit 1. At the start of a heating operation, the position of the vertical deflector is restricted so that the vertical deflector 6 is located at the uppermost position in the blow-out direction adjustment range. This effectively reduces an amount of blown-out cold air.

(6) When the position of the vertical deflector 6 is shifted to an intermediate position located downward from the uppermost position in the blow-out direction adjustment range, the blow-out air volume will be increased. In the present air conditioner, the air direction restriction is canceled after the indoor heat exchanger temperature T_r has been sufficiently increased. Thus, cold air will not be blown toward a person in a room due to the indoor heat exchanger temperature T_r being insufficient. The present embodiment is readily applicable to a typical air conditioner.

Modified Examples

[0045] The description related with the above embodiment exemplifies, without any intention to limit, an applicable form of an air conditioner according to the present disclosure. Also, at least two modifications can be combined as long as the modifications are technically consistent with each other.

[0046] In the above embodiment, the vertical deflector 6 is located at the uppermost position in the blow-out direction adjustment range at the start of a heating operation. However, the vertical deflector 6 may be located at a position upward from the middle position instead of the uppermost position in the blow-out direction adjustment range. In this manner, the blown-out air from the indoor outlet 14 will form a circulating air current at the upper part of a room and reduce cold air that is blown toward a person in the room.

[0047] In the above embodiment, the auxiliary vertical deflector 7 is arranged in the indoor outlet 14. However, the auxiliary vertical deflector 7 may be omitted.

[0048] In the above embodiment, the sideward deflector 5 is arranged at the inner side of the indoor outlet 14. However, the sideward deflector 5 may be omitted.

[0049] In the above embodiment, the vertical deflector 6 also serves as a cover member of the indoor outlet 14. The vertical deflector 6 does not have to be a dual-purpose member and may be a member that only changes the air direction.

[0050] In the above embodiment, the air volume of the indoor fan 3 is switched in three stages, namely, the minimum air volume, the intermediate air volume, and the maximum air volume. The air volume of the indoor fan 3 may be switched in two stages or four or more stages.

[0051] It should be understood that the above-described embodiment may be modified in many other specific forms within the scope and equivalence of the ap-

pending claims.

Claims

1. An air conditioner, comprising:

an indoor heat exchanger (4);
 an indoor fan (3) that circulates air, which has undergone heat exchange in the indoor heat exchanger (4), indoors;
 an indoor outlet (14) that blows out the air, which has undergone heat exchange in the indoor heat exchanger (4), indoors;
 a vertical deflector (6) that is arranged in the indoor outlet (14) to change an air direction in a vertical direction;
 an indoor heat-exchanger temperature sensor (41) that measures an indoor heat exchanger temperature (T_r) of the indoor heat exchanger (4); and
 a control device (30) that controls at least an air volume of the indoor fan (3) and the air direction of the vertical deflector (6), wherein
 the control device (30) includes an air volume controller (31), which restricts the air volume of the indoor fan (3) at a start of a heating operation, and an air direction controller (32), which controls the air direction of the vertical deflector (6) in the vertical direction,
 the air volume controller (31) executes control to increase the air volume of the indoor fan (3) as the indoor heat exchanger temperature (T_r) increases at the start of the heating operation, and
 the air direction controller (32) restricts a position of the vertical deflector so that the vertical deflector (6) is at least faced upward in a blow-out direction adjustment range at the start of the heating operation.

2. The air conditioner according to claim 1, wherein the air volume controller (31) switches and increases the air volume of the indoor fan (3) in a stepped manner as the indoor heat exchanger temperature (T_r) increases at the start of the heating operation, switching temperatures (T_1 , T_2 , and T_3) are set for the indoor heat exchanger temperature (T_r) to switch the air volume of the indoor fan (3) in a stepped manner, and
 the switching temperatures (T_1 , T_2 , and T_3) are set to be lower when the indoor heat exchanger temperature (T_r) is decreasing than when the indoor heat exchanger temperature (T_r) is increasing.

3. The air conditioner according to claim 1 or 2, wherein after the indoor heat exchanger temperature (T_r) has increased and the air volume of the indoor fan (3)

has been set to maximum, the air volume controller (31) and the air direction controller (32) are configured to cancel an air volume restriction of the indoor fan (3) and an air direction restriction of the vertical deflector (6) when the indoor heat exchanger temperature (T_r) increases further to a preset target temperature (T_t).

4. The air conditioner according to any one of claims 1 to 3, wherein
 the air conditioner is a wall-mounted indoor unit (1) of a separated type air conditioner,
 the indoor outlet (14) is arranged on a lower part of the wall-mounted indoor unit (1), and
 the air direction controller (32) restricts the position of the vertical deflector (6) so that the vertical deflector (6) is located at an uppermost position in the blow-out direction adjustment range at the start of the heating operation.

5. The air conditioner according to claim 4, wherein the indoor outlet (14) is configured so that when the position of the vertical deflector (6) is set such that the vertical deflector (6) is located downward from the uppermost position in the blow-out direction adjustment range, a blow-out air volume is greater than that when the position of the vertical deflector (6) is set such that the vertical deflector (6) is located at the uppermost position in the blow-out direction adjustment range.

Fig.1

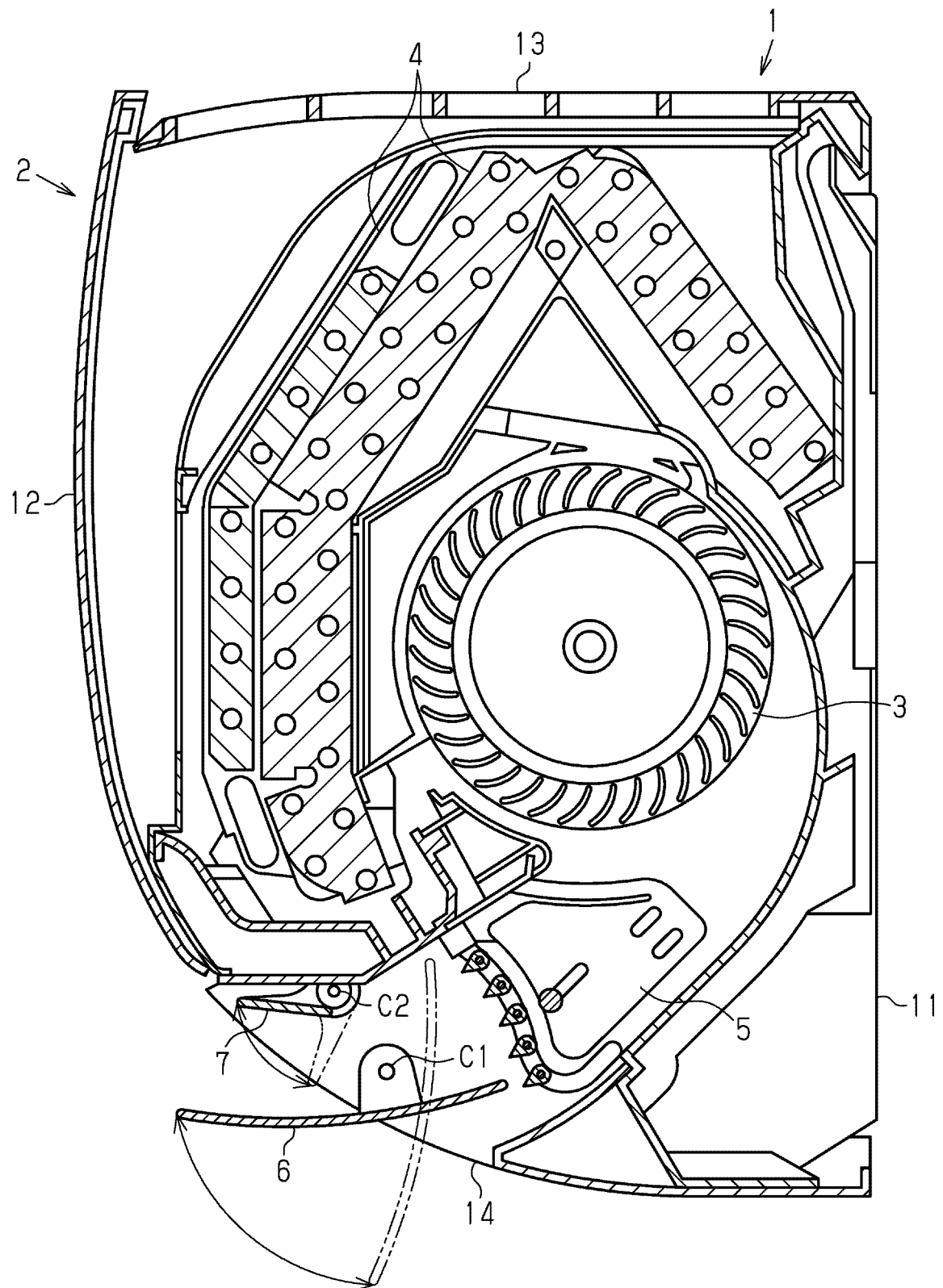


Fig.2

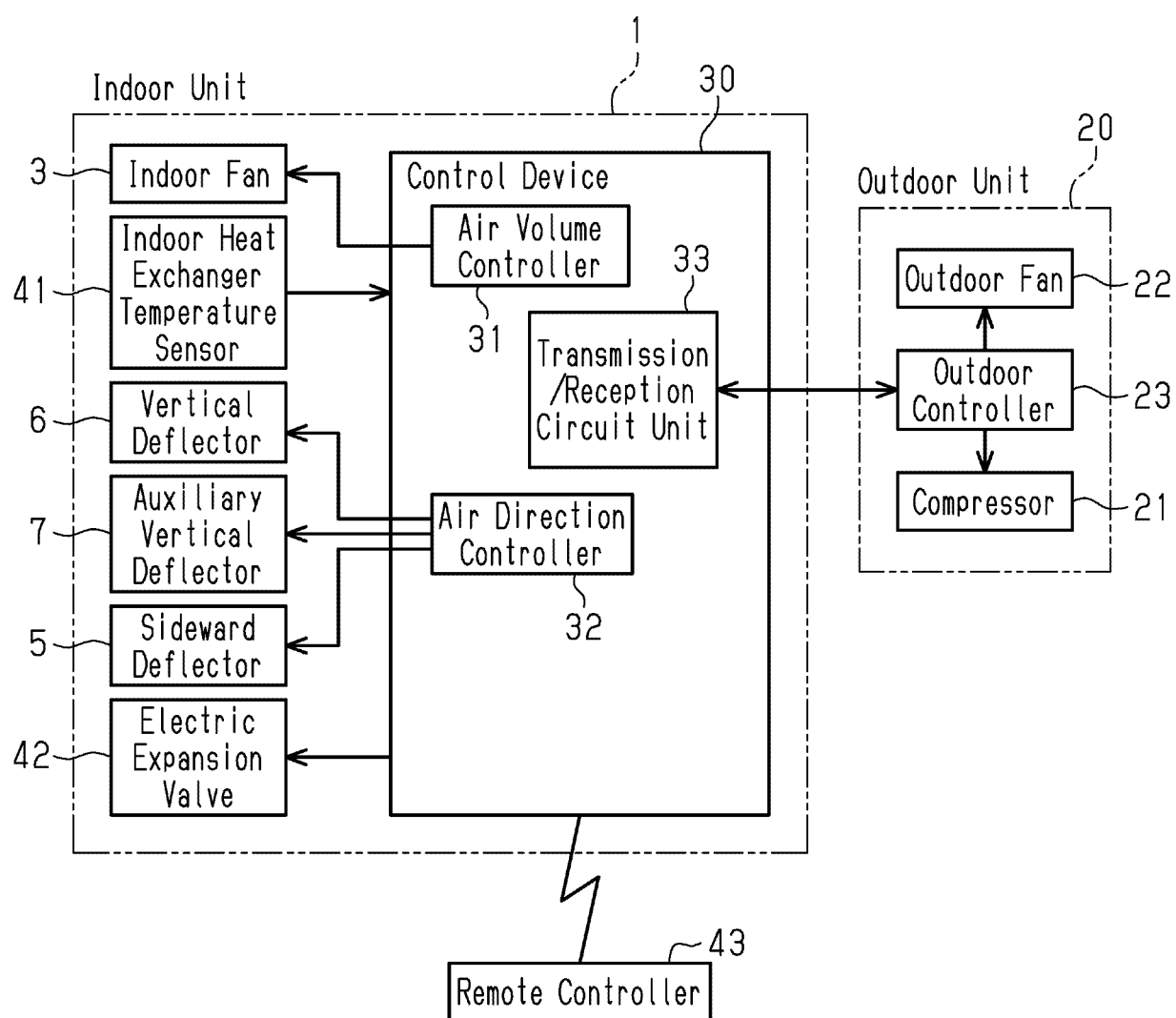


Fig.3

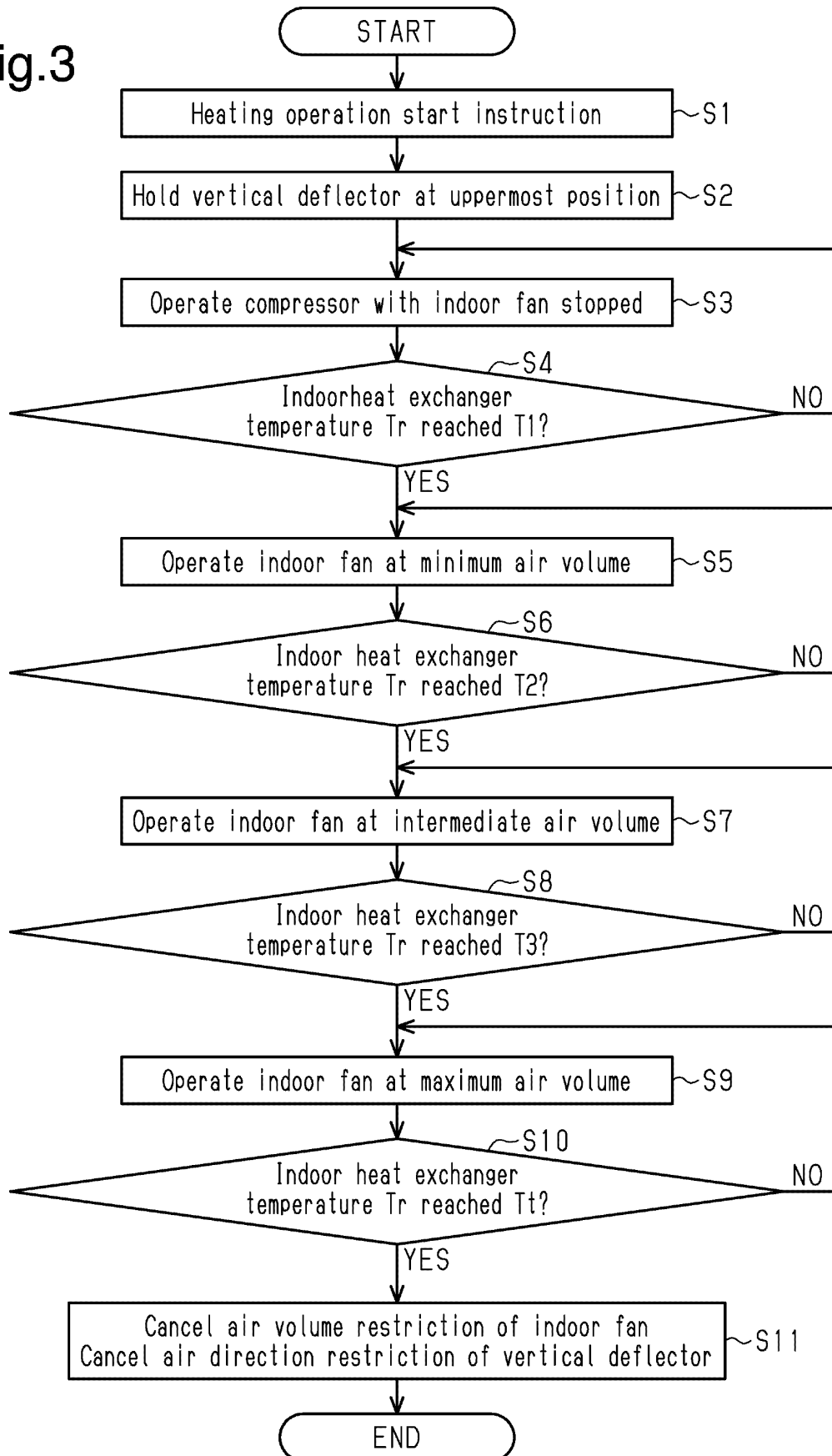
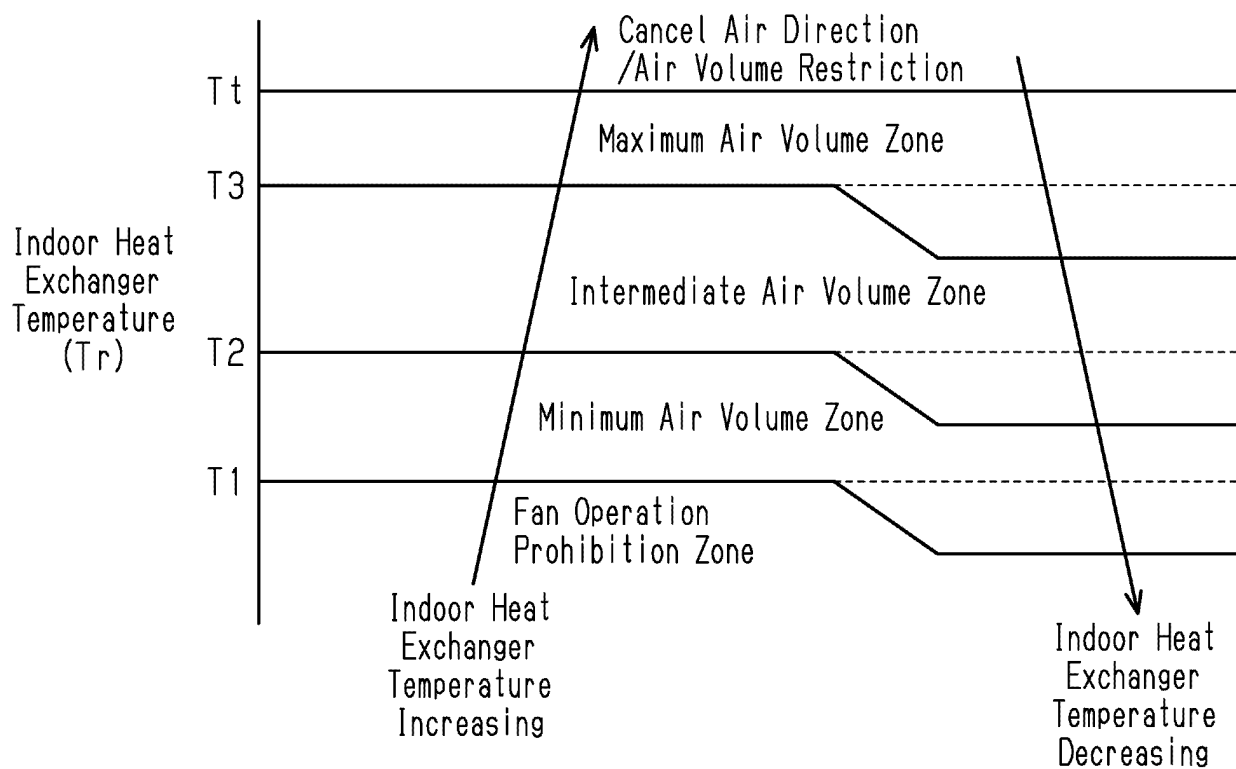


Fig.4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/036229

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F24F11/81 (2018.01) i, F24F11/79 (2018.01) i, F25B1/00 (2006.01) i,
F24F140/20 (2018.01) n

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. F24F11/81, F24F11/79, F25B1/00, F24F140/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

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 2008-292034 A (PANASONIC CORPORATION) 04 December 2008, paragraphs [0015]-[0018], [0098]-[0109], fig. 1, 2, 18 (Family: none)	1-2, 4-5 3
Y A	JP 5-87391 A (TOSHIBA CORPORATION) 06 April 1993, paragraphs [0008]-[0024], fig. 1, 2 (Family: none)	1-2, 4-5 3
Y	JP 2016-90113 A (DAIKIN INDUSTRIES, LTD.) 23 May 2016, paragraphs [0019]-[0031], [0076], [0077], fig. 1, 2, 9 (Family: none)	4-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

20.11.2018

Date of mailing of the international search report

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Name and mailing address of the ISA/

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Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/036229

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2007-303731 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 22 November 2007, paragraphs [0034], [0035], fig. 4, 5 (Family: none)	5
A	JP 2002-340384 A (FUJITSU GENERAL LIMITED) 27 November 2002, entire text, all drawings (Family: none)	1-5
A	JP 2007-315641 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 06 December 2007, entire text, all drawings (Family: none)	1-5
A	JP 11-264599 A (FUJITSU GENERAL LIMITED) 28 September 1999, entire text, all drawings (Family: none)	1-5
A	JP 2002-174450 A (DAIKIN INDUSTRIES, LTD.) 21 June 2002, entire text, all drawings (Family: none)	1-5
A	JP 2016-38135 A (MITSUBISHI ELECTRIC CORPORATION) 22 March 2016, entire text, all drawings (Family: none)	1-5
A	JP 9-318144 A (SANYO ELECTRIC CO., LTD.) 12 December 1997, entire text, all drawings (Family: none)	1-5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3080187 B [0003]