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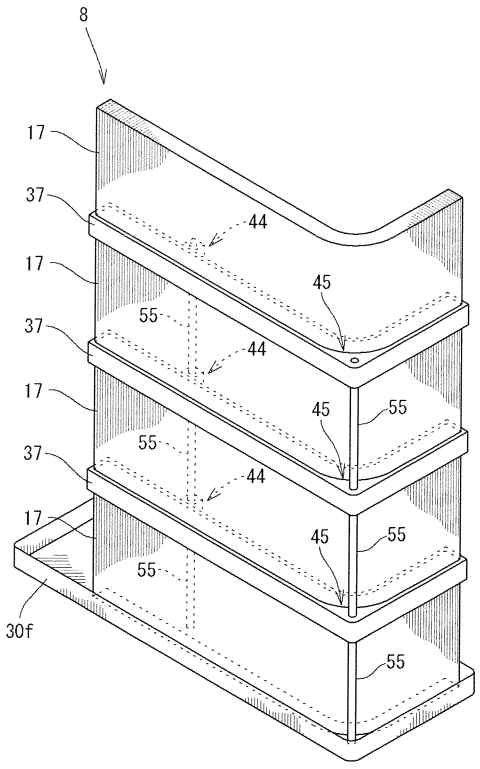
(54) **AIR CONDITIONER**

(57) An air conditioning device capable of preventing drainage water dropped down from a heat exchange portion on the upper side for which a defrosting operation is performed from being frozen again in a heat exchange portion used for a heating operation, so that a decrease in a heating ability can be suppressed is provided. In an air conditioning device including a heat source side heat exchanger (8) formed by providing a plurality of heat exchange portions (17), to which a refrigerant is supplied through different paths from each other, side by side in the up and down direction, and partial defrosting means for, while the heating operation is performed by using a part of the heat exchange portions (17), performing the defrosting operation for the other heat exchange portions (17), a drainage mechanism (37, 30f) for draining drainage water generated in each of the heat exchange portions (17) is provided for each of the heat exchange portions (17).

FIG. 3



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Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioning device. Particularly, the present invention relates to an air conditioning device including a heat source side heat exchanger formed by a plurality of heat exchange portions to which a refrigerant is supplied through different paths from each other, the air conditioning device capable of performing a defrosting operation for each of the heat exchange portions.

BACKGROUND ART

[0002] Conventionally, there is a known air conditioning device capable of performing a cooling operation and a heating operation by switching a flow of a refrigerant by a four way valve. When the heating operation is performed by this air conditioning device under an environment where an external air temperature is low, frost is sometimes attached to a heat exchanger of an outdoor unit. Such attachment of the frost leads to deterioration of heat exchange efficiency. Thus, the air conditioning device is generally provided with defrosting functions for removing the frost.

[0003] As one of the defrosting functions, there is an inverse cycle defrosting operation. This is a method of melting and removing the frost by switching a four way valve to temporarily perform the cooling operation on the indoor side when a temperature of a fin or the like of the heat exchanger of the outdoor unit becomes a predetermined temperature, and supplying a high temperature and high pressure gas refrigerant to the heat exchanger of the outdoor unit. However, while this inverse cycle defrosting operation is performed, the heating operation cannot be performed. Thus, there is a fear that indoor comfort is deteriorated.

[0004] Therefore, various techniques by which a defrosting operation can be performed while continuing a heating operation are proposed. For example, Patent Literature 1 below discloses an air conditioning device including an outdoor heat exchanger formed by providing a plurality of heat exchangers (heat exchange portions), to which a refrigerant is supplied through different paths from each other, side by side in the up and down direction, the air conditioning device capable of, while a heating operation is performed by using a part of the heat exchangers, performing a defrosting operation for the other heat exchangers.

CITATION LIST

[PATENT LITERATURE]

[0005] Patent Literature 1: Japanese Unexamined Patent Publication No. 2009-281698

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0006] In the air conditioning device of Patent Literature 1, the defrosting operation is performed in order from the heat exchanger on the upper side. According to Patent Literature 1, by dropping drainage water generated in the defrosting operation for the heat exchanger on the upper side down to the heat exchanger on the lower side, frost attached to the heat exchanger on the lower side can be melted by heat of the drainage water. Further, according to Patent Literature 1, even when the drainage water whose heat is taken by the heat exchanger on the lower side is frozen again, the re-frozen drainage water (ice) can be melted by the defrosting operation for the heat exchanger on the lower side to be performed after that.

[0007] However, the ice created by freezing the drainage water again is not easily melted unlike the frost. Thus, the ice is not easily reliably removed. In addition, when the ice is to be reliably removed, a long-time defrosting operation is required. Thus, there is a problem that the indoor comfort is highly possibly deteriorated.

[0008] The present invention is achieved in consideration with the situation described above, and an object thereof is to provide an air conditioning device including a heat source side heat exchanger formed by providing a plurality of heat exchange portions, to which a refrigerant is supplied through different paths from each other, side by side in the up and down direction, the air conditioning device capable of, while a heating operation is performed by using a part of the heat exchange portions, performing a defrosting operation for the other heat exchange portions, wherein drainage water dropped down from the heat exchange portion on the upper side can be prevented from being frozen again in the heat exchange portion on the lower side, so that a decrease in a heating ability can be suppressed.

SOLUTION TO PROBLEM

[0009]

(1) In the present invention, an air conditioning device includes a heat source side heat exchanger formed by providing a plurality of heat exchange portions, to which a refrigerant is supplied through different paths from each other, side by side in the up and down direction, and partial defrosting means for, while a heating operation is performed by using a part of the heat exchange portions, performing a defrosting operation for the other heat exchange portions, wherein

a drainage mechanism for draining drainage water generated in each of the heat exchange portions is provided for each of the heat exchange portions.

According to the air conditioning device with the

above configuration, the drainage mechanism is provided for each of the plurality of heat exchange portions. Thus, the drainage water generated in the heat exchange portion on the upper side can be favorably prevented from being dropped down to the heat exchange portion on the lower side and frozen again.

(2) Preferably, the drainage mechanism is provided between the heat exchange portions adjacent to each other in the up and down direction, and includes a drain pan for receiving the drainage water dropped down from the heat exchange portion on the upper side.

According to the above configuration, the drainage water generated in the heat exchange portion on the upper side can be reliably received by the drain pan, so that the drainage water can be prevented from being dropped down to the heat exchange portion on the lower side.

(3) The drain pan may include discharge portions for discharging the received drainage water to an exterior.

According to the above configuration, the drainage water received by the drain pan can be discharged to the exterior by the discharge portions, so that the drainage water can be favorably prevented from being dropped down to the heat exchange portion placed on the lower side thereof.

(4) Preferably, the drain pan is divided into a plurality of water collection regions and includes the discharge portions respectively for the water collection regions.

According to the above configuration, by dividing the drain pan into the plurality of water collection regions, each of the water collection regions can be downsized, so that water slope for guiding the drainage water to the discharge portions can be formed more steeply. Therefore, discharge of the drainage water from the discharge portions can be facilitated.

(5) Preferably, the air conditioning device includes a water guiding structure in which the discharge portions in the plurality of drain pans are connected to each other and the drainage water discharged from the discharge portions are integrated and guided to the lower side.

With such a configuration, discharge routes from the plurality of drain pans can be integrated and simplified.

(6) Preferably, the drain pan forms a heat insulating layer between the upper and lower heat exchange portions.

With such a configuration, heat transfer between the heat exchange portion for which the defrosting operation is performed and the heat exchange portion for performing the heating operation is suppressed, so that a decrease in a defrosting ability and a heating ability can be suppressed.

(7) The partial defrosting means may have a defrosting circuit in which a part of the heat exchange portions used for the heating operation and the other heat exchange portions for which the defrosting operation is performed are connected in series, the refrigerant flows from the other heat exchange portions to the part of the heat exchange portions, and after the refrigerant is condensed and supercooled in the other heat exchange portions, the refrigerant is evaporated in the part of the heat exchange portions.

According to the above configuration, the substantially whole amount of the refrigerant can be supplied to the part of the heat exchange portions used for the heating operation and a utilization side heat exchanger (indoor heat exchanger). Thus, in comparison to a case where a part of a refrigerant discharged from a compressor is used only for a defrosting operation as in the conventional example, the decrease in the heating ability can be suppressed.

ADVANTAGEOUS EFFECTS OF INVENTION

[0010] According to the present invention, the drainage water dropped down from the heat exchange portion on the upper side can be prevented from being frozen again in the heat exchange portion on the lower side, so that the decrease in the heating ability can be suppressed.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

[FIG. 1] FIG. 1 is a perspective view showing an outer appearance of an outdoor unit of an air conditioning device according to one embodiment of the present invention.

[FIG. 2] FIG. 2 is a plan view showing an interior of the outdoor unit.

[FIG.3] FIG. 3 is a perspective view showing an outdoor heat exchanger.

[FIG. 4] FIG. 4 is a plan view of a drain pan.

[FIG. 5] FIG. 5 is a sectional view taken along line V-V in FIG. 4.

[FIG. 6] FIG. 6 is a sectional view taken along line VI-VI in FIG. 4.

[FIG. 7] FIG. 7 is a sectional view taken along line VII-VII in FIG. 4.

[FIG. 8] FIG. 8 is a sectional view taken along line VIII-VIII in FIG. 4.

[FIG. 9] FIG. 9 is a sectional view taken along line IX-IX in FIG. 4.

[FIG. 10] FIG. 10 is a pattern diagram showing a refrigerant circuit of the air conditioning device capable of performing a defrosting operation.

[FIG. 11] FIG. 11 is a P-h diagram displaying a refrigerating cycle of the defrosting operation.

DESCRIPTION OF EMBODIMENTS

[Configuration of Refrigerant Circuit]

[0012] Firstly, one example of a refrigerant circuit to which an air conditioning device according to an embodiment of the present invention can be applied will be described with reference to FIG. 10. FIG. 10 is a pattern diagram showing a refrigerant circuit of an air conditioning device capable of performing a defrosting operation.

[0013] An air conditioning device 1 is a separate type having an outdoor unit 2 and an indoor unit 3, and a refrigerant circuit (main refrigerant circuit) 4 is formed in such a manner that a refrigerant can be circulated between the outdoor unit 2 and the indoor unit 3.

[0014] In the outdoor unit 2, a compressor 6, a four way valve 7, an outdoor heat exchanger (heat source side heat exchanger) 8, an outdoor expansion valve 9, and the like are provided. These parts are connected by a refrigerant pipe 21. Fans 10 are provided in the outdoor unit 2. In the indoor unit 3, an indoor expansion valve 14, an indoor heat exchanger (utilization side heat exchanger) 11, and the like are provided. The four way valve 7 and the indoor heat exchanger 11 are connected by a gas side refrigerant communication pipe 12, and the indoor expansion valve 14 and the outdoor expansion valve 9 are connected by a liquid side refrigerant communication pipe 13.

[0015] In a case where a cooling operation is performed in the air conditioning device 1 with the above configuration, the four way valve 7 is retained in a state shown by dotted lines in FIG. 10. A high temperature and high pressure gas refrigerant discharged from the compressor 6 flows into the outdoor heat exchanger 8 via the four way valve 7 as shown by a dotted arrow, and performs heat exchange with the outdoor air by actuation of the fans 10 so as to be condensed and liquefied. The liquefied refrigerant passes through the outdoor expansion valve 9 in a fully open state, and flows into the indoor unit 3 through the liquid side refrigerant communication pipe 13. In the indoor unit 3, pressure of the refrigerant is reduced to predetermined low pressure by the indoor expansion valve 14, and further, the refrigerant performs the heat exchange with the indoor air in the indoor heat exchanger 11 so as to be evaporated. The indoor air cooled by evaporation of the refrigerant is blown out to an interior by an indoor fan (not shown) so as to cool the interior. The refrigerant evaporated and gasified in the indoor heat exchanger 11 is returned to the outdoor unit 2 through the gas side refrigerant communication pipe 12, and suctioned into the compressor 6 via the four way valve 7.

[0016] On the other hand, in a case where a heating operation is performed, the four way valve 7 is retained in a state shown by solid lines in FIG. 10. A high temperature and high pressure gas refrigerant discharged from the compressor 6 flows into the indoor heat exchanger 11 of the indoor unit 3 via the four way valve 7 as shown by a solid arrow, and performs the heat exchange with the indoor air so as to be condensed and liquefied. The indoor air heated by condensation of the refrigerant is blown out to the interior by the indoor fan so as to heat the interior. The refrigerant liquefied in the indoor heat exchanger 11 is returned to the outdoor unit 2 from the indoor expansion valve 14 in a fully open state through the liquid side refrigerant communication pipe 13. The pressure of the refrigerant returned to the outdoor unit 2 is reduced to predetermined low pressure by the outdoor expansion valve 9, and further, the refrigerant performs the heat exchange with the outdoor air in the outdoor heat exchanger 8 so as to be evaporated. The refrigerant evaporated and gasified in the outdoor heat exchanger 8 is suctioned into the compressor 6 via the four way valve 7.

[0017] In the air conditioning device 1 of the present embodiment, the outdoor heat exchanger 8 is formed by a plurality of heat exchange portions 17a to 17c to which the refrigerant is supplied through different paths from each other. In a case where the heating operation is performed, the refrigerant is divided by a flow division capillary (flow division mechanism) 18 and respectively supplied to the heat exchange portions 17a to 17c. The refrigerant passing through the heat exchange portions 17a to 17c is joined at a header tube 19 and then suctioned into the compressor 6. In the example shown in FIG. 10, three heat exchange portions (first to third heat exchange portions) 17a to 17c are provided, and the refrigerant is divided into three paths by the flow division capillary 18.

[0018] Further, in the air conditioning device 1 of the present embodiment, while the heating operation is performed by using a part of the heat exchange portions, a defrosting operation can be performed for the other heat exchange portions. Therefore, in addition to the main refrigerant circuit 4, the air conditioning device 1 includes a defrosting circuit (partial defrosting means) 50 in which a flow passage of the refrigerant at the time of the heating operation is changed and the defrosting operation is performed for the other heat exchange portions. Hereinafter, this defrosting circuit 50 will be described in detail. It should be noted that in the following description, a flow of the refrigerant will be described based on the flow direction of the refrigerant at the time of the heating operation.

[Configuration of Defrosting Circuit]

[0019] The defrosting circuit 50 is formed by a bypass tube 23, first to seventh solenoid valves 20a to 20c, 22, and 25a to 25c, and the like. Specifically, the first to third solenoid valves (first to third open/close valves) 20a to 20c are respectively provided between the first to third heat exchange portions 17a to 17c and the header tube 19, so as to switch between a mode of permitting the flow of the refrigerant between the heat exchange portions 17a to 17c and the header tube 19 and a mode of inhibiting the flow.

[0020] In the refrigerant pipe 21 flowing between the outdoor expansion valve 9 and the outdoor heat exchanger 8, the fourth solenoid valve (fourth open/close valve) 22 is provided on the upstream side of the flow division capillary 18. Further, the bypass tube 23 branching from the refrigerant pipe 21 is provided on the upstream side of the fourth solenoid valve 22. A downstream side part of this bypass tube 23 is divided into three by a flow divider 26 so as to serve as first to third bypass flow division tubes 24a to 24c. The bypass flow division tubes 24a to 24c are connected to parts between the heat exchange portions 17a to 17c and the header tube 19 on the upstream side of the first to third solenoid valves 20a to 20c. The fifth to seventh solenoid valves (fifth to seventh open/close valves) 25a to 25c are respectively provided in the three bypass flow division tubes 24a to 24c.

[0021] Next, as one example, a case where the defrosting operation is performed for the first heat exchange portion 17a at a right end in FIG. 10 among the three heat exchange portions 17a to 17c and the heating operation is performed by using the second and third heat exchange portions 17b and 17c at the center and a left end will be described. It should be noted that the flow of the refrigerant around the outdoor heat exchanger 8 in a case where the defrosting operation is performed is shown by outlined arrows in FIG. 10. A refrigerating cycle in a case where the defrosting operation is performed is shown on a P-h diagram in FIG. 11.

[0022] Upon performing the defrosting operation for the first heat exchange portion 17a, firstly, the first to seventh solenoid valves are operated as follows.

First solenoid valve 20a: closed
Second solenoid valve 20b: opened
Third solenoid valve 20c: opened
Fourth solenoid valve 22: closed
Fifth solenoid valve 25a: opened
Sixth solenoid valve 25b: closed
Seventh solenoid valve 25c: closed

[0023] An opening degree of the outdoor expansion valve 9 is set to be larger than that of a normal heating operation.

[0024] By closing the fourth solenoid valve 22 as described above, the refrigerant flowing from the indoor heat exchanger 11 to the flow division capillary 18 via the outdoor expansion valve 9 is cut off, so that the refrigerant flows to the bypass tube 23. By opening the fifth solenoid valve 25a in the first bypass flow division tube 24a, closing the sixth and seventh solenoid valves 25b and 25c in the second and third bypass flow division tubes 24b and 24c, and closing the first solenoid valve 20a, the substantially whole amount of the refrigerant flows into the first heat exchange portion 17a from the side of the header tube 19.

[0025] The pressure of the refrigerant flowing into the first heat exchange portion 17a is reduced to some extent in a process of flowing through the outdoor expansion valve 9, the bypass tube 23, and the like (a point a to a point b in FIG. 11), and a temperature of the refrigerant becomes low which is 0°C or more and higher than an external air temperature. For example, in a case where the external air is -10°C, the refrigerant is 5 to 10°C. Thereby, by utilizing heat of the refrigerant, frost attached to the first heat exchange portion 17a can be melted. The melted frost becomes drainage water and is dropped down from the first heat exchange portion 17a, received by drain pans 37 to be described later and a bottom wall 30f (refer to FIG. 3) of the outdoor unit 2, and discharged to an exterior.

[0026] The refrigerant passing through the first heat exchange portion 17a is condensed and supercooled by heat exchange with the frost (the point b to a point c in FIG. 11). The refrigerant flows into the flow division capillary 18, is divided by this flow division capillary 18, and flows into the second and third heat exchange portions 17b and 17c. The pressure of the refrigerant is further reduced in a process of passing through the flow division capillary 18 (the point c to a point d in FIG. 11). That is, the flow division capillary 18 functions as a pressure reduction mechanism. In the second and third heat exchange portions 17b and 17c, the refrigerant is evaporated by heat exchange with the external air, and then suctioned into the compressor 6 through the second and third solenoid valves 20b and 20c and the header tube 19.

[0027] As described above, in the defrosting operation, the first heat exchange portion 17a and the second and third heat exchange portions 17b and 17c are connected in series, the refrigerant is condensed and supercooled by performing the heat exchange between the refrigerant and the frost in the first heat exchange portion 17a, and the refrigerant is evaporated by performing the heat exchange between the refrigerant and the external air in the second and third heat exchange portions 17b and 17c. In this defrosting operation, only the second and third heat exchange portions 17b and 17c can be used for the heating operation. However, the substantially whole amount of the refrigerant can flow into the second and third heat exchange portions 17b and 17c and the indoor heat exchanger 11. Thus, a decrease in a heating ability can be suppressed.

[0028] The defrosting operation for the second heat exchange portion 17b or the third heat exchange portion 17c can be performed by the substantially same procedure as the above description. Specifically, in a case where the defrosting operation is performed for the second heat exchange portion 17b, the first to seventh solenoid valves are operated as follows.

First solenoid valve 20a: opened
Second solenoid valve 20b: closed
Third solenoid valve 20c: opened
Fourth solenoid valve 22: closed
Fifth solenoid valve 25a: closed
Sixth solenoid valve 25b: opened

Seventh solenoid valve 25c: closed

[0029] Thereby, the second heat exchange portion 17b and the first and third heat exchange portions 17a and 17c are connected in series, the refrigerant can be condensed and supercooled by performing the heat exchange between the refrigerant and the frost in the second heat exchange portion 17b, and the refrigerant can be evaporated by performing the heat exchange between the refrigerant and the external air in the first and third heat exchange portions 17a and 17c.

[0030] In a case where the defrosting operation is performed for the third heat exchange portion 17c, the first to seventh solenoid valves are operated as follows.

First solenoid valve 20a: opened
Second solenoid valve 20b: opened
Third solenoid valve 20c: closed
Fourth solenoid valve 22: closed
Fifth solenoid valve 25a: closed
Sixth solenoid valve 25b: closed
Seventh solenoid valve 25c: opened

[0031] Thereby, the third heat exchange portion 17c and the first and second heat exchange portions 17a and 17b are connected in series, the refrigerant can be condensed and supercooled by performing the heat exchange between the refrigerant and the frost in the third heat exchange portion 17c, and the refrigerant can be evaporated by performing the heat exchange between the refrigerant and the external air in the first and second heat exchange portions 17a and 17b.

[Configuration of Outdoor Unit 2]

[0032] Next, a more detailed structure of the outdoor unit 2 will be described.

[0033] FIG. 1 is a perspective view showing the outdoor unit 2 of the air conditioning device 1 according to the embodiment of the present invention, and FIG. 2 is a plan view showing an interior structure of the outdoor unit 2. FIG. 2 shows the outdoor heat exchanger 8, the fans 10, and the compressor 6 among the configuration of the outdoor unit 2 shown in FIG. 10.

[0034] As shown in FIG. 1, the outdoor unit 2 is formed as a so-called trunk type outdoor unit 2, and includes a rectangular parallelepiped casing 31 having front and rear walls 30a and 30b, left and right side walls 30c and 30d, a ceiling wall 30e, and the bottom wall (bottom frame) 30f. Two blow-off ports 32 are formed up and down in a left side part of the front wall 30a, and blow-off grilles 33 are attached to the blow-off ports 32. Suction ports (not shown) through which the external air can be suctioned into the casing 31 are formed on the rear wall 30b and the left side wall 30c of the casing 31.

[0035] As shown in FIG. 2, an interior of the casing 31 is partitioned into a machine chamber S1 and a heat exchange chamber S2 by a partition plate 35. Specifically, in the example shown in the figure, a part on the right side of the partition plate 35 serves as the machine chamber S1, and a part on the left side of the partition plate 35 serves as the heat exchange chamber S2. The partition plate 35 is provided over a part between the front wall 30a and the rear wall 30b, and formed in a curve shape in which a part on the side of the machine chamber S1 is recessed when seen from the top. The partition plate 35 is arranged in such a manner that a rear side part is inclined to the side of the machine chamber S1 (right side). A rear end of the partition plate 35 is coupled to a tube plate 8a provided in an end of the outdoor heat exchanger 8.

[0036] The compressor 6, an accumulator 28, and the like are arranged in the machine chamber S1. Meanwhile, the outdoor heat exchanger 8 and the fans 10 are arranged in the heat exchange chamber S2. The outdoor heat exchanger 8 is formed in a substantially L shape in a plan view along the inner sides of the rear wall 30b and the left side wall 30c of the casing 31 where the suction ports are formed. The fans 10 are respectively arranged at positions corresponding to the upper and lower blow-off ports 32 (refer to FIG. 1) formed on the front wall 30a of the casing 31, and formed in such a manner that the external air suctioned into the heat exchange chamber S2 from the suction ports of the rear wall 30b and the left side wall 30c is blown off from the blow-off ports 32.

[0037] FIG. 3 is a perspective view showing the outdoor heat exchanger 8.

[0038] The outdoor heat exchanger 8 of the present embodiment is formed by the plurality of heat exchange portions 17 to which the refrigerant is supplied through the different paths from each other as described above. The plurality of heat exchange portions 17 is formed in an L shape in a plan view and piled in the up and down direction. In the example shown in FIG. 3, four heat exchange portions 17 are laminated in the up and down direction, and the drain pans (drainage mechanisms) 37 are provided between the heat exchange portions 17. The bottom wall 30f is provided on the lower side of the heat exchange portion 17 of the lowermost part, and this bottom wall 30f functions as a drain pan.

[0039] The outdoor heat exchanger 8 is formed so as to, while the heating operation is performed by a part of the heat exchange portions 17, perform the defrosting operation for the other heat exchange portions 17 as described above. By performing the defrosting operation for the plurality of heat exchange portions 17 one by one in order, the frost attached to all the heat exchange portions 17 can be melted and removed while maintaining indoor heating. The drain pans 37 are arranged on the lower side of the three upper heat exchange portions 17, and the drainage water generated in the defrosting operation for these heat exchange portions is received and drained to the exterior. The drainage water generated in the defrosting operation for the heat exchange portion 17 of the lowermost part is received by the bottom wall 30f as conventionally known, and discharged to the ex-

terior from a discharge port (not shown) formed on this bottom wall 30f.

[0040] By providing the drain pans 37 as described above, the drainage water generated by melting the frost in the heat exchange portion 17 for which the defrosting operation is being performed can be prevented from being dropped down to the heat exchange portion 17 on the lower side performing the heating operation. Therefore, the dropped drainage water is not cooled and frozen again in the heat exchange portion 17 on the lower side, so that the decrease in the heating ability can be suppressed.

[0041] FIG. 4 is a plan view of the drain pan 37, FIG. 5 is a sectional view taken along line V-V in FIG. 4, and FIG. 6 is a sectional view taken along line VI-VI in FIG. 4. FIG. 7 is a sectional view taken along line VII-VII in FIG. 4, FIG. 8 is a sectional view taken along line VIII-VIII in FIG. 4, and FIG. 9 is a sectional view taken along line IX-IX in FIG. 4.

[0042] The drain pan 37 arranged between the upper and lower heat exchange portions 17 is formed into a substantially L shape corresponding to the heat exchange portions 17 in a plan view as shown in FIG. 4. As shown in FIG. 3, a lower surface of the drain pan 37 is mounted on the upper side of the heat exchange portion 17 on the lower side, and the heat exchange portion 17 on the upper side is mounted on an upper surface of the drain pan.

[0043] The drain pan 37 is partitioned into a plurality of water collection regions 42 and 43. Specifically, a partition wall 41 is provided in the substantially center in the width direction of the drain pan 37. The drain pan is partitioned into the two water collection regions 42 and 43 by this partition wall 41. In the present embodiment, the first water collection region 42 including a linear part is formed on the left side of the partition wall 41 in FIG. 4, and the second water collection region 43 including a bent part bent at substantially 90 degrees is formed on the right side of the partition wall 41. First and second discharge portions 44 and 45 for discharging the drainage water to the exterior are respectively provided in the first and second water collection regions 42 and 43.

[0044] As shown in FIGS. 5 to 7, in the first and second water collection regions 42 and 43, the drain pan 37 is formed by a water receiving plate 47 for receiving the drainage water and a pair of support plates 48 provided on both sides in the width direction of this water receiving plate 47, and a space surrounded by an upper surface of the water receiving plate 47 and facing surfaces of the pair of support plates 48 serves as a water receiving space 49. As shown in FIGS. 5 and 6, in the first and second water collection regions 42 and 43, the water receiving plate 47 is inclined so as to be a lower level as coming closer to the first and second discharge portions 44 and 45, and formed so as to guide the drainage water received by the water receiving plate 47 to the first and second discharge portions 44 and 45.

[0045] As shown in FIGS. 2, 4, and 8, the first discharge portion 44 is formed by a first discharge block 51 formed in a substantially square shape in a plan view, the first discharge block protruding toward an interior side part of the outdoor unit 2 from the first water collection region 42 of the drain pan 37, a first vertical flow passage 52 passing through this first discharge block 51 in the up and down direction, and a first sideways flow passage 53 passing through the first discharge block 51 and one of the support plates 48 so as to connect this first vertical flow passage 52 and the first water collection region 42. The drainage water received by the water receiving plate 47 in the first water collection region 42 is guided to the first discharge portion 44 by inclination of the water receiving plate 47, and discharged from the first water collection region 42 via the first sideways flow passage 53 and the first vertical flow passage 52.

[0046] As shown in FIG. 3, the first discharge portions 44 of the drain pans 37 adjacent to each other in the up and down direction are connected to each other by a water guiding pipe 55, and a water guiding pipe 55 extending downward is connected to the first discharge portion 44 of the drain pan 37 of the lowermost part. Therefore, the drainage water discharged from the first discharge portions 44 of the drain pans 37 is discharged by one system via the water guiding pipes 55, and discharged to the exterior through the bottom wall 30f.

[0047] The first discharge portions 44 and the water guiding pipes 55 are arranged in the interior side part of the outdoor unit 2 with respect to the outdoor heat exchanger 8 and on the downstream side of an airflow generated by the fans 10 (shown by an arrow x in FIG. 2). Therefore, the water guiding pipes 55 hardly disturb the airflow passing through the outdoor heat exchanger 8, so that the heat exchange between the external air and the refrigerant flowing through the outdoor heat exchanger 8 can be favorably performed. Since a relatively large air circulation space is formed in the interior side part of the outdoor unit 2 with respect to the outdoor heat exchanger 8, a space for providing the first discharge portions 44 and the water guiding pipes 55 can be easily ensured.

[0048] As shown in FIGS. 2, 4, and 9, the second discharge portion 45 is formed by a second discharge block 57 formed in a substantially triangle shape in a plan view, the second discharge block protruding toward an exterior side part of the outdoor unit 2 from the bent part in the drain pan 37, a second vertical flow passage 58 passing through this second discharge block 57 in the up and down direction, and a second sideways flow passage 59 passing through the second discharge block 57 and one of the support plates 48 so as to connect this second vertical flow passage 58 and the second water collection region 43. The drainage water received by the water receiving plate 47 in the second water collection region 43 is guided to the second discharge portion 45 by inclination of the water receiving plate 47, and discharged from the second water collection region 43 via the second sideways flow passage 59 and the second vertical flow pas-

sage 58.

[0049] As shown in FIG. 3, the second discharge portions 45 of the drain pans 37 adjacent to each other in the up and down direction are connected to each other by a water guiding pipe 55, and a water guiding pipe 55 extending downward is connected to the second discharge portion 45 of the drain pan 37 of the lowermost part. Therefore, the drainage water discharged from the second discharge portions 45 of the drain pans 37 is discharged by one system via the water guiding pipes 55, and discharged to the exterior through the bottom wall 30f.

[0050] The second discharge portion 45 and the water guiding pipe 55 are arranged in the exterior side part of the outdoor unit 2 with respect to the outdoor heat exchanger 8, and as shown in FIG. 2, arranged in a corner part of the outdoor unit 2, that is, a dead space formed between the second water collection region 43 of the drain pan 37 and the casing 31 serving as a constituent part of the outdoor unit 2. Therefore, there is no need for forming a new and exclusive space in the casing 31 for providing the second discharge portion 45 and the water guiding pipe 55.

[0051] Since the drain pan 37 includes the plurality of water collection regions 42 and 43, each of the water collection regions 42 and 43 can be shortened (downsized). Therefore, an inclination angle of the water receiving plate 47 for guiding the drainage water to the discharge portions 44 and 45 can be increased to be as large as possible. With the increase in the inclination angle of the water receiving plate 47, for example, even when the outdoor unit 2 is installed while being slightly inclined in the up and down direction, the drainage water can be reliably guided to the discharge portions 44 and 45.

[0052] As shown in FIG. 7, a heat insulating layer 60 is formed between the heat exchange portions 17 adjacent to each other in the up and down direction by the drain pan 37. That is, a region of the drain pan 37 between the pair of support plates 48, the region excluding the water receiving plate 47 is a space. This space serves as the heat insulating layer 60 and suppresses heat transfer between the upper and lower heat exchange portions 17. Therefore, a heat loss in the heat exchange portions 17 upon performing the heating operation and the defrosting operation can be reduced, so that the operations can be efficiently performed.

[0053] The drain pan 37 can be made of a material of synthetic resin, metal, or the like. However, the drain pan is preferably made of a material having low heat conductivity in order to suppress the heat transfer between the upper and lower heat exchange portions 17. Therefore, the drain pan is preferably made of a synthetic resin material rather than metal. For example, polycarbonate, ABS, PP, and the like can be used as the synthetic resin material. The drain pan 37 can also be made of a transparent or semi-transparent material. Thereby, a state of the drainage water (drained state, frozen state) inside the drain pan 37 can be confirmed from the exterior.

[0054] The drain pan 37 may include heaters 64 for preventing the drainage water from being frozen. For example, as shown in FIG. 7, by providing the heaters 64 in recessed portions 63 formed on outer side surfaces of the pair of support plates 48, the drainage water in the water receiving space 49 can be heated and prevented from being frozen.

[0055] The present invention is not limited to the above embodiment but can be appropriately changed within the scope of the invention described in the claims.

[0056] For example, although the present invention is applied to the sideways blow-off type outdoor unit 2 in the above embodiment, the present invention can also be applied to an upward blow-off type outdoor unit 2. The outdoor heat exchanger 8 is not limited to an L shape in a plan view but may be formed in a U shape in a plan view, a square shape in a plan view, or the like. The present invention can also be applied to an air conditioning device for not performing a cooling operation but exclusive for heating. In this case, the four way valve can be omitted.

[0057] Although the outdoor unit 2 of the above embodiment includes the two fans 10 up and down, the outdoor unit may include one or three or more fans 10. The number of the heat exchange portions 17 (path number) is not particularly limited as long as the number is 2 or more. The defrosting operation may be performed for each one of the heat exchange portions 17 or may be performed for each plurality of heat exchange portions 17 (for example, for two heat exchange portions).

[0058] The defrosting circuit 50 is not limited to the one shown in FIG. 10 but can be appropriately changed. A mode of the defrosting operation is also not limited to the one described in the above embodiment but various conventionally-known modes can be adopted. For example, a known mode in which a part of a high temperature refrigerant discharged from a compressor is supplied to a heat exchange portion for which a defrosting operation is performed and frost attached to the heat exchange portion is melted by heat of the refrigerant (for example, refer to Japanese Unexamined Patent Publication No. 2001-59664 and Japanese Unexamined Patent Publication No. 2009-281698) can be adopted. A known mode in which frost is melted by giving heat of heaters to a heat exchange portion 17 for which a defrosting operation is performed (for example, refer to Japanese Unexamined Patent Publication No. 2009-162393) can also be adopted.

REFERENCE SIGNS LIST

[0059]

1: AIR CONDITIONING DEVICE
2: OUTDOOR UNIT
4: REFRIGERANT CIRCUIT
6: COMPRESSOR

8: OUTDOOR HEAT EXCHANGER
17: HEAT EXCHANGE PORTION
30f: BOTTOM WALL (DRAIN PAN)
37: DRAIN PAN (DRAINAGE MECHANISM)
42: FIRST WATER COLLECTION REGION
43: SECOND WATER COLLECTION REGION
44: FIRST DISCHARGE PORTION
45: SECOND DISCHARGE PORTION
50: DEFROSTING CIRCUIT (PARTIAL DEFROSTING MEANS)
55: WATER GUIDING PIPE (WATER GUIDING STRUCTURE)
60: HEAT INSULATING LAYER

Claims

1. An air conditioning device comprising:

a heat source side heat exchanger (8) formed by providing a plurality of heat exchange portions (17), to which a refrigerant is supplied through different paths from each other, side by side in the up and down direction; and
partial defrosting means for, while a heating operation is performed by using a part of the heat exchange portions (17), performing a defrosting operation for the other heat exchange portions (17), wherein
a drainage mechanism (37, 30f) for draining drainage water generated in each of the heat exchange portions (17) is provided for each of the heat exchange portions (17).

2. The air conditioning device according to claim 1, wherein
the drainage mechanism is provided between the heat exchange portions (17) adjacent to each other in the up and down direction, and includes a drain pan (37) for receiving the drainage water dropped down from the heat exchange portion (17) on the upper side.

3. The air conditioning device according to claim 2, wherein
the drain pan (37) includes discharge portions (44, 45) for discharging the received drainage water to an exterior.

4. The air conditioning device according to claim 3, wherein
the drain pan (37) is divided into a plurality of water collection regions (42, 33) and includes the discharge portions (44, 45) respectively for the water collection regions (42, 33).

5. The air conditioning device according to claim 3 or 4, comprising:

a water guiding structure (55) in which the discharge portions (44, 45) in the plurality of drain pans (37) are connected to each other and the drainage water discharged from the discharge portions (44, 45) are integrated and guided to the lower side.

6. The air conditioning device according to any one of claims 2 to 5, wherein
the drain pan (37) forms a heat insulating layer (60) between the upper and lower heat exchange portions (17).

7. The air conditioning device according to any one of claims 1 to 6, wherein
the partial defrosting means has a defrosting circuit (50) in which a part of the heat exchange portions (17) used for the heating operation and the other heat exchange portions (17) for which the defrosting operation is performed are connected in series, the refrigerant flows from the other heat exchange portions (17) to the part of the heat exchange portions (17), and after the refrigerant is condensed and supercooled in the other heat exchange portions (17), the refrigerant is evaporated in the part of the heat exchange portions (17).

FIG. 1

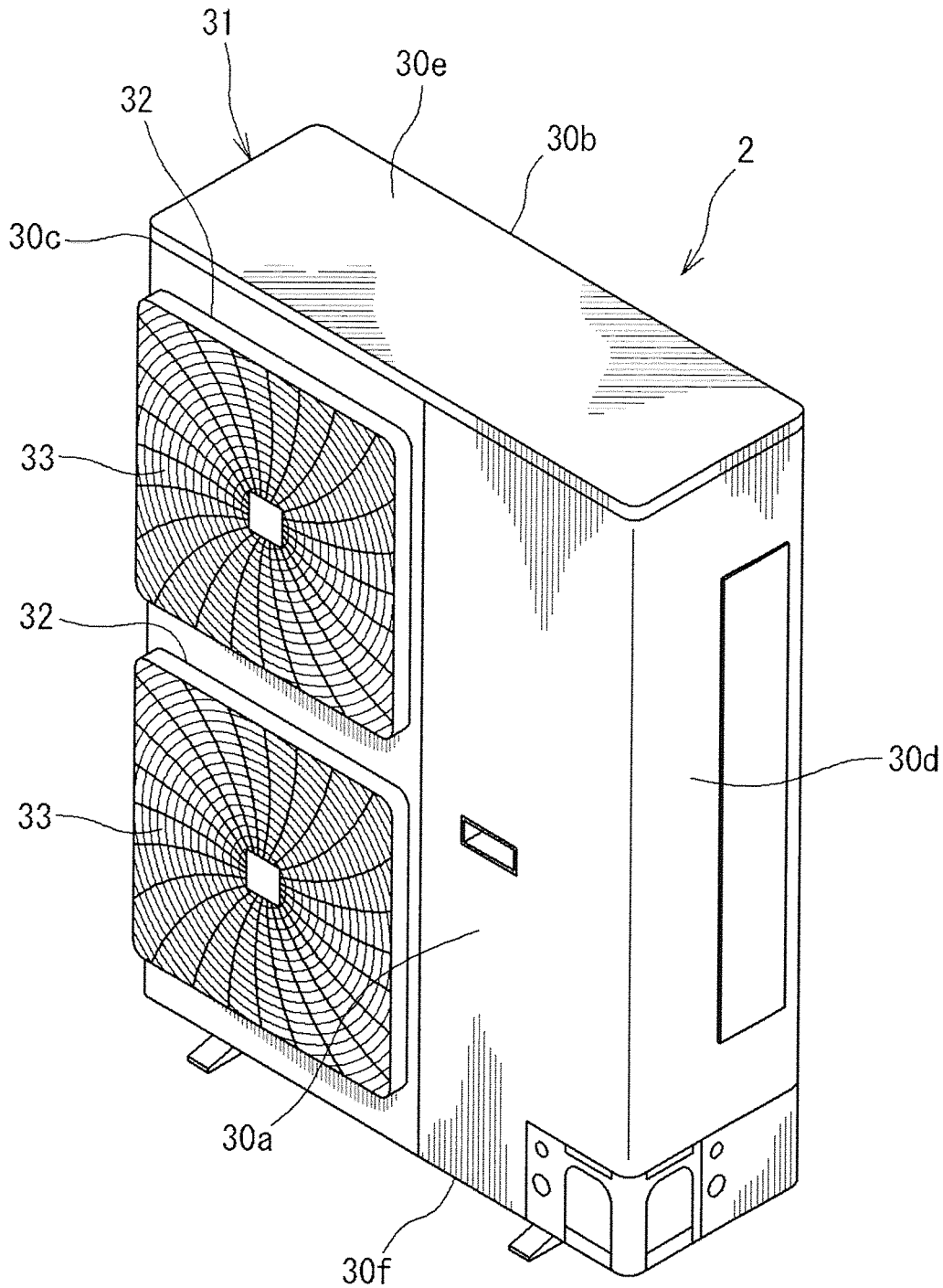


FIG. 2

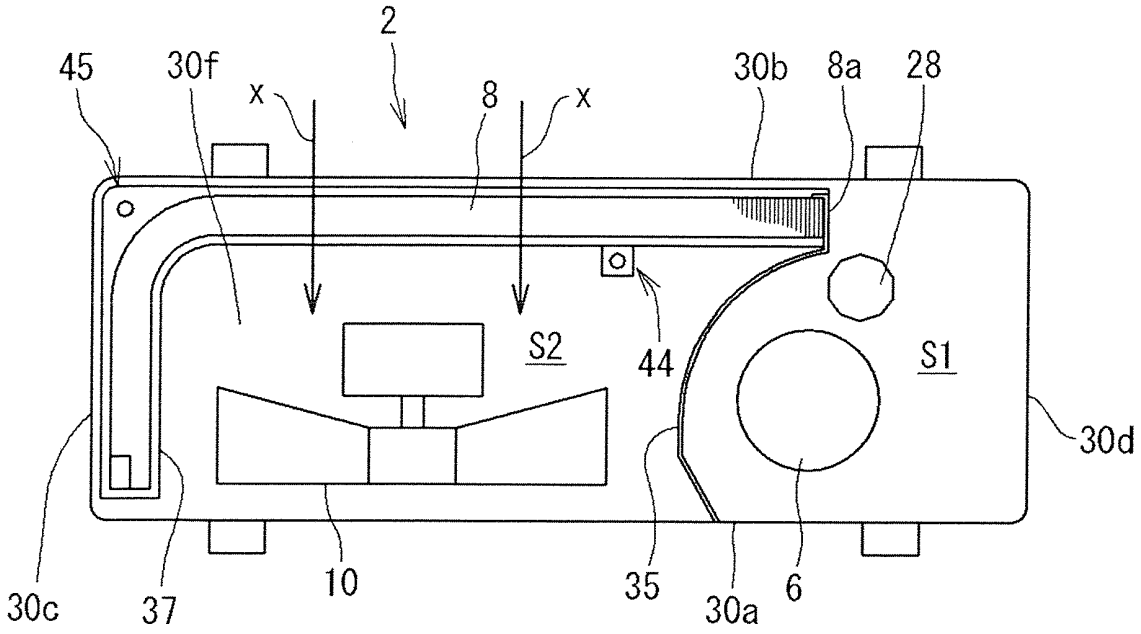
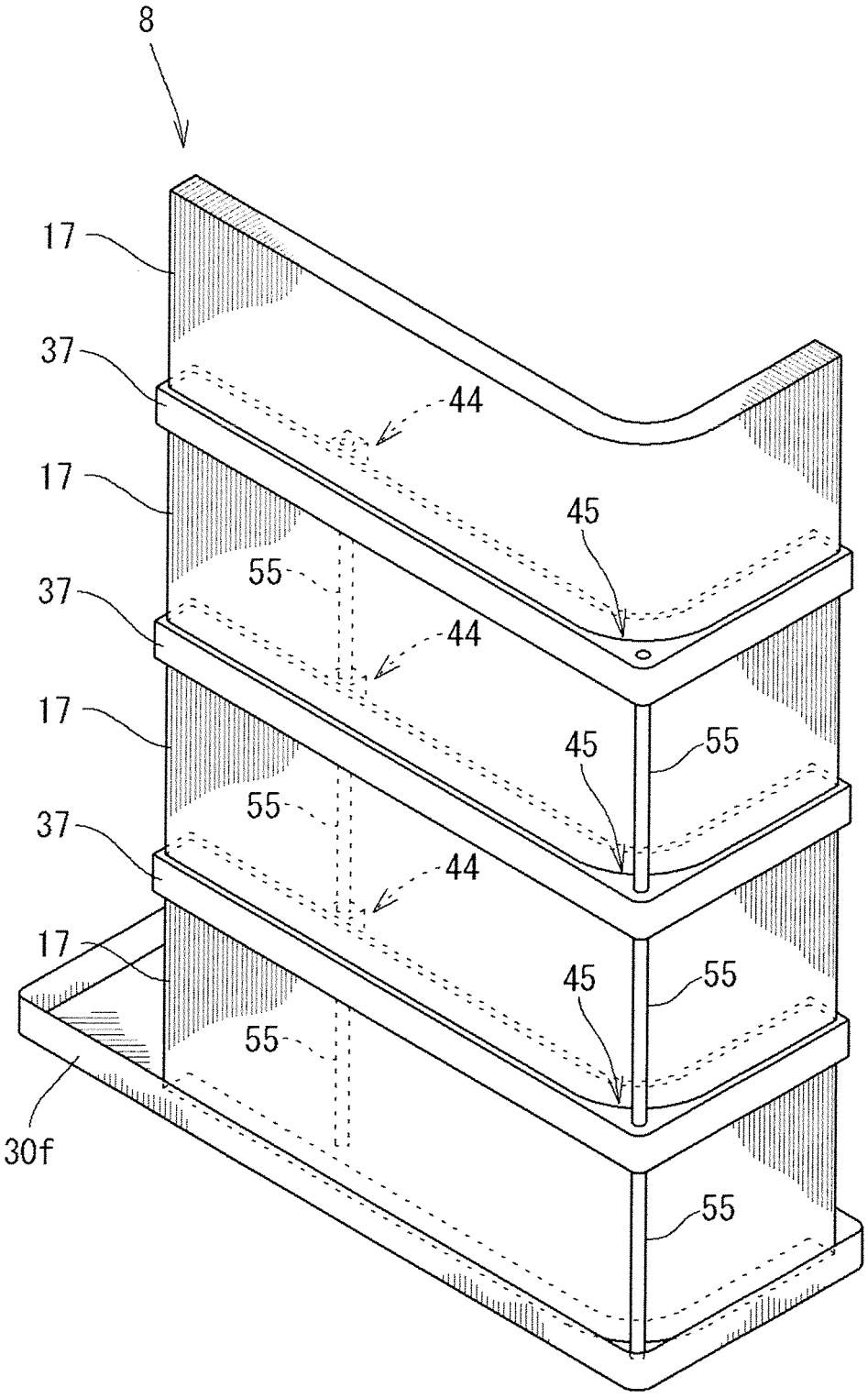


FIG. 3



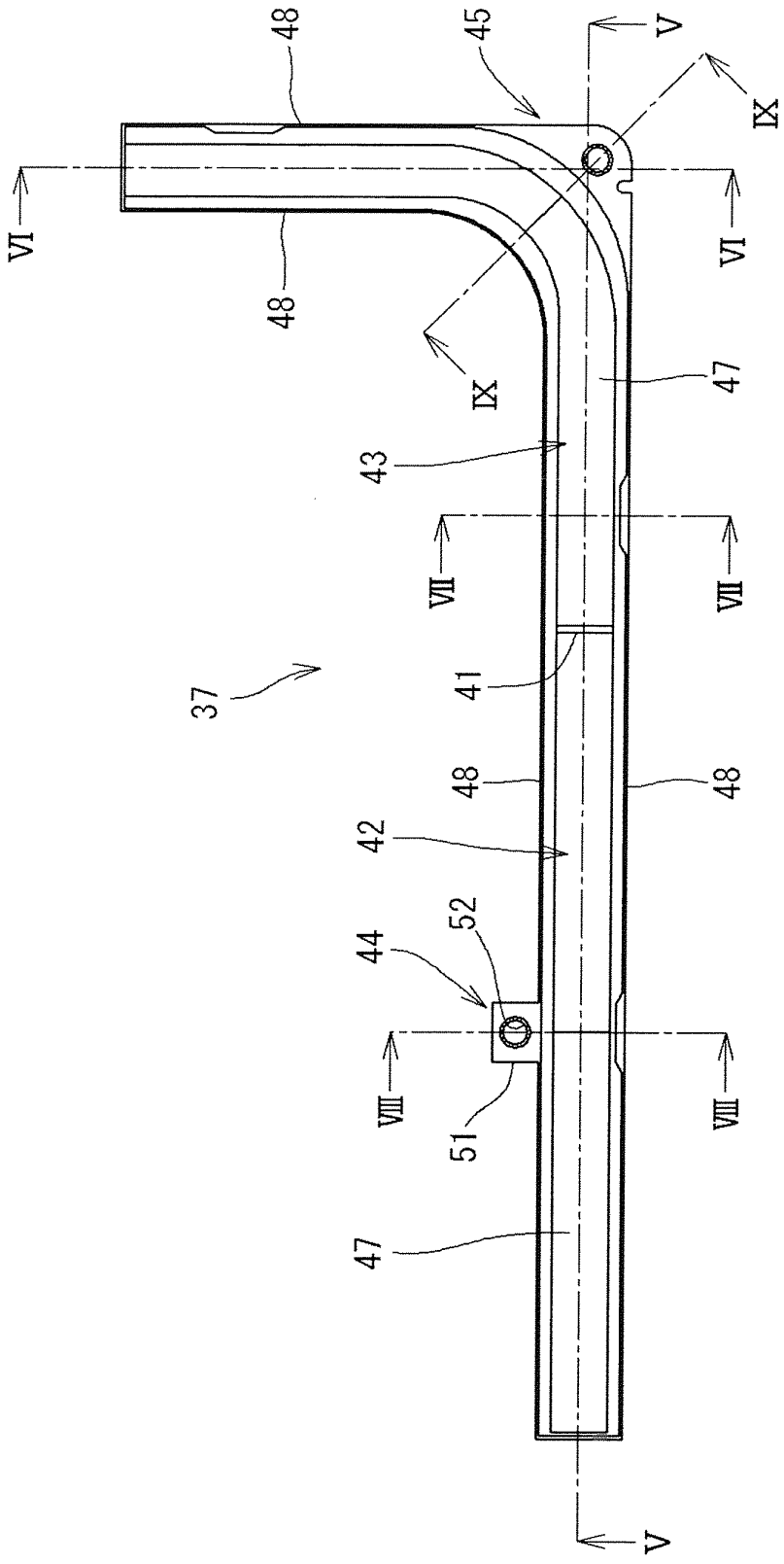

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FIG. 4

FIG. 5

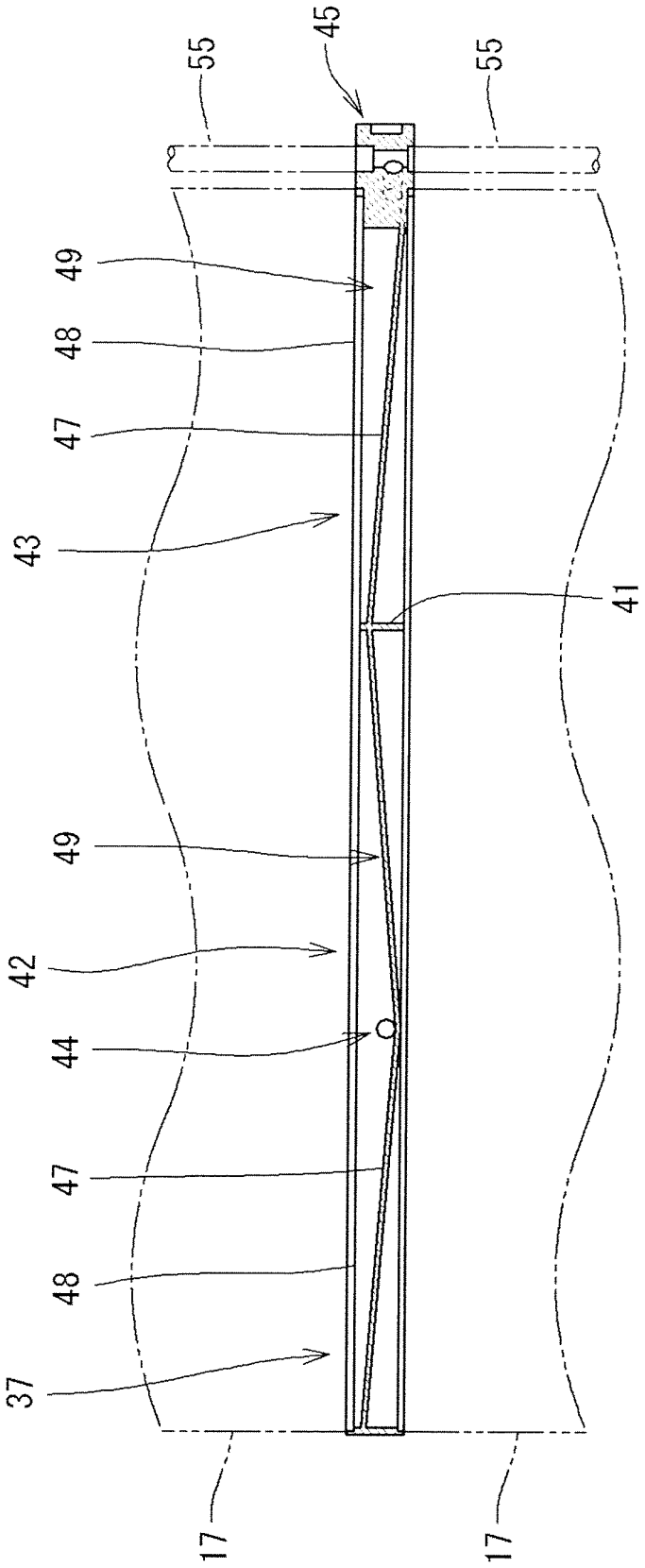

FIG. 6

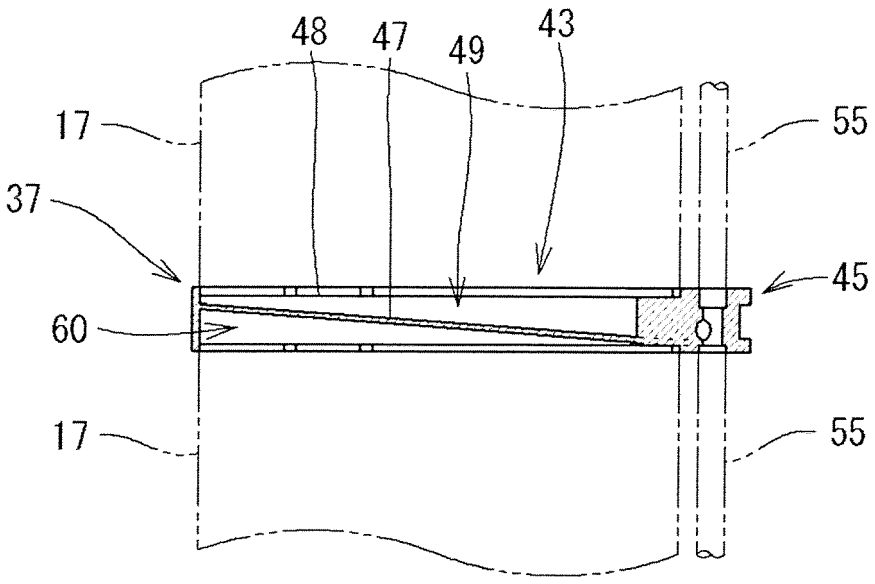

FIG. 7

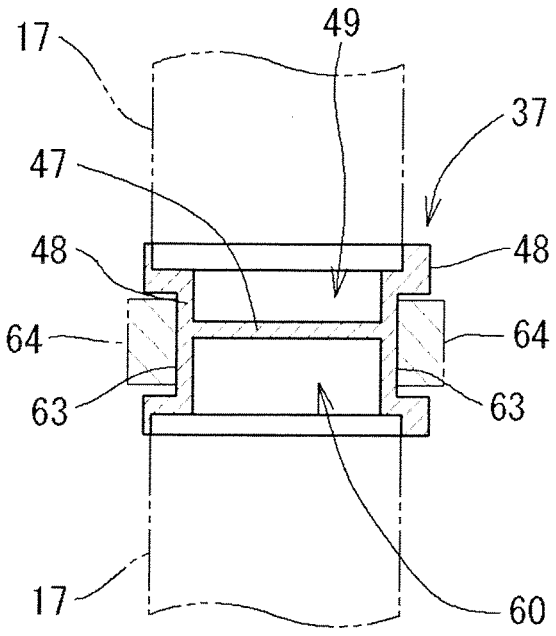

FIG. 8

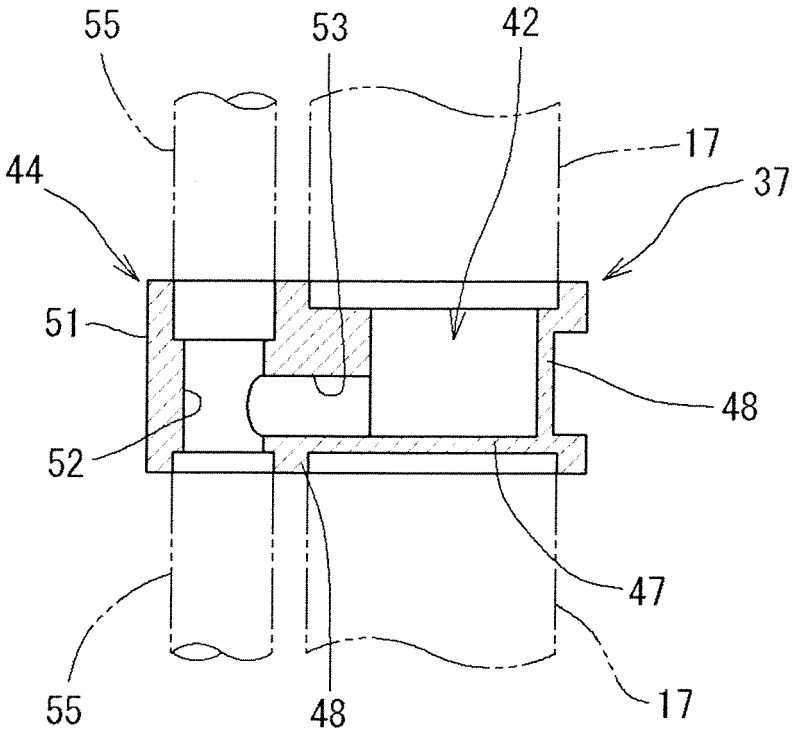

FIG. 9

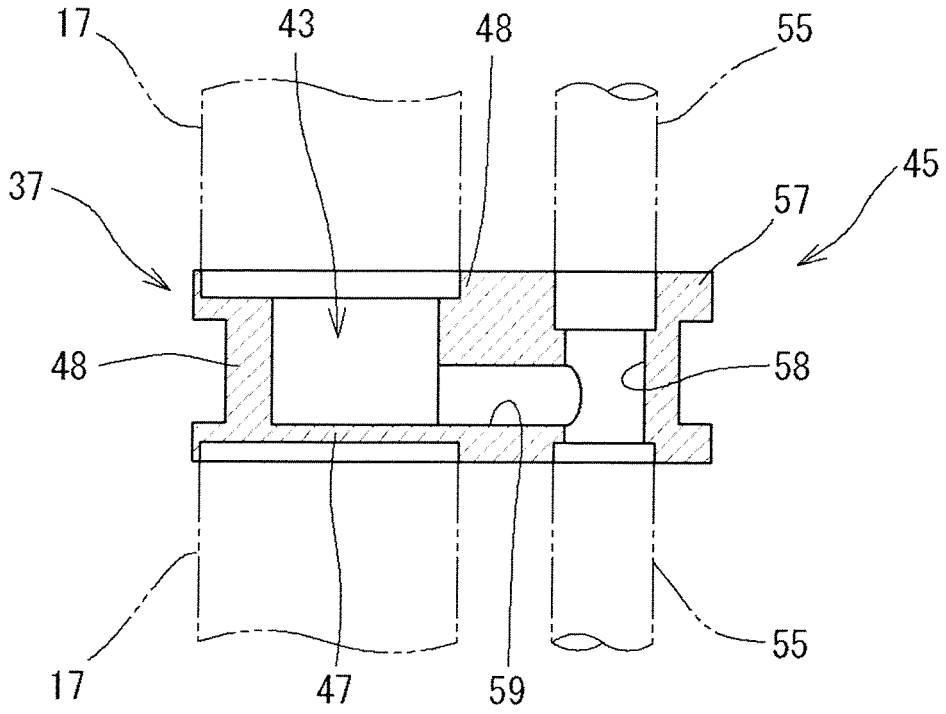

FIG. 10

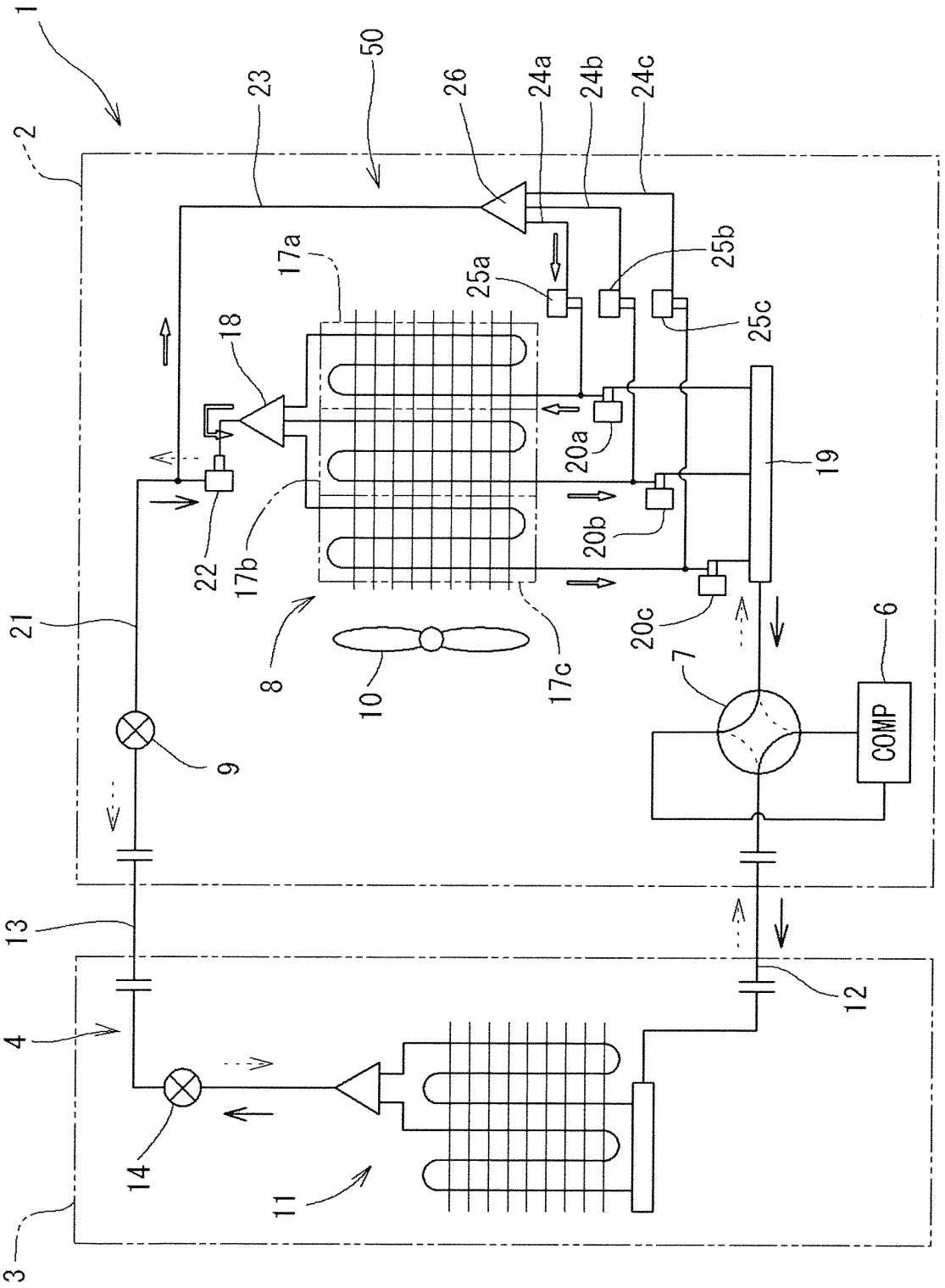
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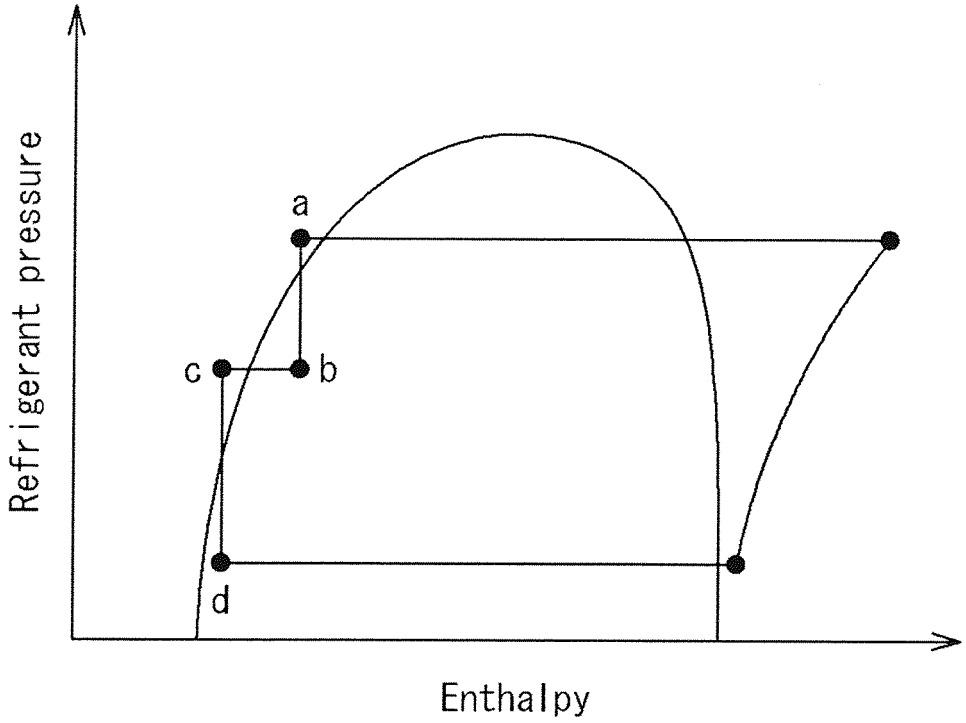
FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/082916

A. CLASSIFICATION OF SUBJECT MATTER
F24F1/36(2011.01)i, *F24F1/16*(2011.01)i, *F24F11/02*(2006.01)i

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)
F24F1/36, F24F1/16, F24F11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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.
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 82650/1990(Laid-open No. 39619/1992) (Misawa Homes Co., Ltd.), 03 April 1992 (03.04.1992), page 5, line 10 to page 11, line 16; fig. 1 to 3 (Family: none)	1-3,5,7 4,6,7
X Y	JP 6-337136 A (Toshiba Corp., Toshiba AVE Co., Ltd.), 06 December 1994 (06.12.1994), paragraphs [0018] to [0025]; fig. 1 to 10 (Family: none)	1-3,5 4,6,7

☒ 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	Date of mailing of the international search report
30 January, 2013 (30.01.13)	12 February, 2013 (12.02.13)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/082916

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 6-94263 A (Hitachi, Ltd.), 05 April 1994 (05.04.1994), paragraph [0013]; fig. 4 (Family: none)	4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 122111/1990(Laid-open No. 78420/1992) (Matsushita Refrigeration Co.), 08 July 1992 (08.07.1992), claims (Family: none)	6
Y	JP 3-177726 A (Mitsubishi Electric Corp.), 01 August 1991 (01.08.1991), page 2, upper right column, line 19 to lower left column, line 2 (Family: none)	6
Y	JP 3-102149 A (Mayekawa Mfg., Co., Ltd.), 26 April 1991 (26.04.1991), claims (Family: none)	7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2009281698 A **[0005] [0058]**
- JP 2001059664 A **[0058]**
- JP 2009162393 A **[0058]**