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(54) OUTDOOR UNIT FOR AIR CONDITIONER

(57) The present invention allows for a reduction in the size of an outdoor unit while preventing a deterioration in humidifying performance in an outdoor unit having a humidifying function. A guide structure (56b) is provided that changes a direction of a portion of air blown by an outdoor fan (39). A humidifying unit (60) includes a moisture absorption section (61) for absorbing moisture from outdoor air, and an intake port (68a) and a discharge port (69) for outdoor air supplied to a moisture absorption section (62). The discharge port (69) is mounted facing a negative pressure space (70) at the periphery of the outdoor fan (39). The humidifying unit (60) is configured so that outdoor air for which the direction is changed by the guide structure (56b) flows from the intake port (68a) through the moisture absorption section (61) to the discharge port (69).

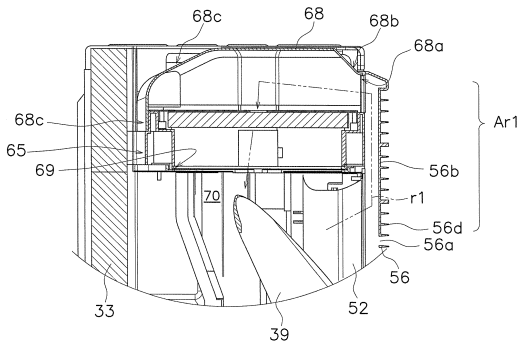


FIG. 9

EP 2 716 984 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an outdoor unit for an air conditioner having a humidifying unit.

BACKGROUND ART

[0002] A type of air conditioner in which an outdoor unit and a humidifying unit (or a humidifying device) are integrated is known among conventional air conditioners having a humidifying function. In this type of air conditioner, the outdoor unit is partitioned into upper and lower portions by a partition plate as described in, for example, Patent Literature 1 (Japanese Laid-Open Patent Application 2004-353898) and Patent Literature 2 (Japanese Laid-Open Patent Application 2008-241212). The humidifying unit is disposed above the partition plate, and a heat exchanger and a fan for blowing air into the heat exchanger are disposed below the partition plate in the outdoor unit described in Patent Literature 1 and 2.

[0003] A humidifying rotor (absorption rotating body or desiccant rotor) of a humidifying unit is disposed horizontally in the humidifying unit in the air conditioners described in Patent Literature 1 and 2 in order to reduce the size of the outdoor units having the humidifying function.

SUMMARY OF THE INVENTION

<Technical Problem>

[0004] However, the size reduction of the outdoor unit in the above configuration is either not sufficient, or the humidifying performance of the humidifying unit tends to deteriorate when attempting to reduce the size of the humidifying unit in order to make a compact outdoor unit.

[0005] An object of the present invention is to reduce the size of an outdoor unit while preventing deterioration in humidifying performance in an outdoor unit having a humidifying function.

<Solution to Problem>

[0006] An outdoor unit for an air conditioner according to a first aspect of the present invention comprises: a casing including a blower chamber through which outdoor air passes; an outdoor heat exchanger that is mounted in the blower chamber and that conducts a heat exchange with the outdoor air; an outdoor fan that is mounted in the blower chamber and that blows outdoor air into the outdoor heat exchanger; a guide structure that changes a direction of a portion of air blown by the outdoor fan; and a humidifying unit that includes a moisture absorption section that absorbs moisture from outdoor air, a moisture desorption section that desorbs moisture to humidify air, and an intake port and a discharge port for outdoor air supplied to the moisture absorption section, the humidifying unit being configured so that the discharge port is faced a negative pressure space around the outdoor fan, and air changed to a different direction by the guide structure flows from the intake port through the moisture absorption section and flows out through the discharge port.

[0007] According to the outdoor unit according to the first aspect, the humidifying unit is configured so that the intake port is faced the negative pressure space around the outdoor fan and air changed to a different direction by the guide structure flows from the intake port through the moisture absorption section and flows out through the discharge port. In this way, outdoor air is effectively guided into the moisture absorption section by the outdoor fan and moisture absorption performance is improved since the air flow is effectively guided into the moisture absorption section of the humidifying unit due to the outdoor fan and the negative pressure space around the outdoor fan. As a result, a dedicated fan and/or driving motor conventionally provided for guiding air into the moisture absorption section may be reduced in size or omitted. Consequently, a reduction in the size of the humidifying unit is possible.

[0008] An outdoor unit for an air conditioner according to a second aspect of the present invention is the outdoor unit according to the first aspect, wherein the humidifying unit sucks in only the air from the intake port that has been guided through the outdoor fan and along the guide structure.

[0009] According to the outdoor unit for the second aspect, the air is effectively guided into the intake port due to the sufficient use of the air flow generated by the outdoor fan since only the air guided through the outdoor fan and along the guide structure is sucked in at the intake port.

[0010] An outdoor unit for an air conditioner according to a third aspect of the present invention, is the outdoor unit of the first aspect, wherein the humidifying unit collectively sucks in, at the intake port, air guided along the guide structure via a first route and air guided via a second route that differs from the first route.

[0011] According to the outdoor unit of the third aspect, air flowing along the guide structure can be used for drawing in air guided via the second route, and thus outdoor air with a higher humidity than the air on the first route is more easily

guided into the moisture absorption section with the use of the second route.

[0012] An outdoor unit for an air conditioner according to a fourth aspect of the present invention is any one of the outdoor units of the first to third aspects, wherein the casing includes a front plate having an outlet port through which outdoor air is blown by the outdoor fan, and the guide structure is provided to the front plate so as to cover a portion of the outlet port.

[0013] According to the outdoor unit of the fourth aspect, the guide structure can be easily mounted since the guide structure is attached to the front plate.

[0014] An outdoor unit for an air conditioner according to a fifth aspect of the present invention is the outdoor unit of the fourth aspect, wherein the casing further includes a grill that is attached to the front plate and that covers the outlet port of the front plate, and the guide structure is formed on the grill.

[0015] According to the outdoor unit of the fifth aspect, the guide structure can be formed when forming the grill since the guide structure is formed on the grill.

[0016] An outdoor unit for an air conditioner according to a sixth aspect of the present invention is the outdoor unit of the fourth or the fifth aspect, and further comprises a partitioning member that is provided between the guide structure and the front plate and that partitions a space sandwiched between the guide structure and the front plate, whereby a channel is formed that surrounds a flow of air flowing from the outlet port toward the intake port.

[0017] According to the outdoor unit of the sixth aspect, air can be effectively fed into the intake port since a flow of air that deviates from the path and does not reach the intake port is eliminated since the flow of air is surrounded by the channel formed by providing the partitioning member.

[0018] An outdoor unit for an air conditioner according to a seventh aspect of the present invention is the outdoor unit of the sixth aspect, wherein the partitioning member extends in a rotating direction of the outdoor fan.

[0019] According to the outdoor unit of the seventh aspect, pressure caused by the partitioning member in the flow of air blown by the outdoor fan and turning in the rotating direction of the outdoor fan can be reduced since the partitioning member extends in the rotating direction of the outdoor fan.

[0020] An outdoor unit for an air conditioner according to an eighth aspect of the present invention is the outdoor unit of any one of the fourth to seventh aspects, wherein the guide structure includes a baffle member that hinders the flow of air flowing in a direction from the intake port toward the outlet port in a vicinity of an edge part near a rotational center of the outdoor fan.

[0021] According to the outdoor unit of the eighth aspect, the baffle member is able to suppress a flow of air flowing in the direction from the intake port toward the outlet port, whereby the amount of air guided to the intake port can be greater than a case in which no baffle member is used.

[0022] An outdoor unit for an air conditioner according to a ninth aspect of the present invention is the outdoor unit of any one of the fourth to eighth aspects, and further includes a rectifying member that is provided between the guide structure and the front plate and that extends smoothly from the outlet port toward the intake port.

[0023] According to the outdoor unit of the ninth aspect, the flow of air is rectified due to the air flowing along the rectifying member toward the intake port, whereby noise caused by the flow of air toward the intake port can be suppressed.

[0024] An outdoor unit for an air conditioner according to a tenth aspect of the present invention is the outdoor unit of any one of the first to ninth aspects, wherein the humidifying unit further includes a moisture absorption duct that is provided above the outdoor fan and that guides outdoor air from the intake port to the moisture absorption section, the moisture absorption duct being curved downward when seen in a side view.

[0025] According to the outdoor unit of the tenth aspect, outdoor air is easily guided through the moisture absorption duct toward the moisture absorption section due to blowing by the outdoor fan from the lower part toward the top of the outdoor unit.

<Advantageous Effects of Invention>

[0026] In the outdoor unit for the air conditioner according to the first aspect of the present invention, an air flow due to the negative pressure space at the periphery of the outdoor fan and due to the outdoor fan is guided effectively to the moisture absorption section of the humidifying unit by the guide structure, whereby a reduction in humidifying performance is prevented while the outdoor unit can be reduced in size.

[0027] In the outdoor unit for the air conditioner according to the second aspect of the present invention, outdoor air is effectively guided to the intake port by the guide structure, whereby other structures for guiding outdoor air to the moisture absorption section can be made more compact.

[0028] In the outdoor unit for the air conditioner according to the third aspect of the present invention, humidifying performance can be improved when guiding air with a higher humidity than air in the first route to the moisture absorption section by using the second route.

[0029] In the outdoor unit for the air conditioner according to the fourth aspect of the present invention, mounting of the guide structure is simple and an outdoor unit reduced in size can be provided at a low cost.

[0030] In the outdoor unit for the air conditioner according to the fifth aspect of the present invention, an outdoor unit having a guide structure can be provided at a low cost.

[0031] In the outdoor unit for the air conditioner according to the sixth aspect of the present invention, a sufficient amount of air is easily supplied to the moisture absorption section due to the partitioning member whereby humidifying performance can be improved.

[0032] In the outdoor unit for the air conditioner according to the seventh aspect of the present invention, pressure due to the partitioning member is reduced in the flow of air guided toward the intake port, whereby humidifying performance can be improved.

[0033] In the outdoor unit for the air conditioner according to the eighth aspect of the present invention, a sufficient amount of air is easily supplied to the moisture absorption section due to the baffle member, whereby humidifying performance can be improved.

[0034] In the outdoor unit for the air conditioner according to the ninth aspect of the present invention, noise can be suppressed by the rectifying member.

[0035] In the outdoor unit for the air conditioner according to the tenth aspect of the present invention, outdoor air supplied to the moisture absorption section is increased, whereby humidifying performance is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

FIG. 1 is a schematic diagram showing an outline of a configuration of an air conditioner according to a first embodiment;
FIG. 2 is a circuit diagram showing an outline of an outdoor unit for an air conditioner;
FIG. 3 is a perspective view showing the external appearance of the outdoor unit with a grill and an outdoor heat exchanger removed;
FIG. 4 is a plan view of the outdoor unit with a top plate removed;
FIG. 5 is a perspective view showing an external appearance of the outdoor unit with a front plate, the top plate, and a left side plate and the like removed;
FIG. 6 is a cross-sectional view along lines I-I in FIG. 1;
FIG. 7 is a perspective view of a humidifying unit as seen diagonally from the front right side and from above;
FIG. 8 is a perspective view of a humidifying unit as seen diagonally from the rear right side and from above;
FIG. 9 is a partial enlarged cross-sectional view of the outdoor unit for illustrating the flow of outdoor air near the humidifying unit;
FIG. 10 is an exploded perspective view showing a humidifying rotor and a heater;
FIG. 11 is a bottom view of members near the heater of the humidifying unit;
FIG. 12 is a partial enlarged cross-sectional view near the humidifying unit of the outdoor unit;
FIG. 13 is a partial enlarged cross-sectional view of an outdoor unit for an air conditioner according to a second embodiment;
FIG. 14 is a circuit diagram showing an outline of an outdoor unit for an air conditioner according to a modified example of an embodiment;
FIG. 15 is a top view of the outdoor unit according to the modified example in FIG. 14 with the top plate removed;
FIG. 16 is an enlarged front view of the outdoor unit shown in FIG. 1.
FIG. 17 is a circuit diagram showing an outline of an outdoor unit for an air conditioner according to a third embodiment;
FIG. 18 is an enlarged front view of the outdoor unit according to the third embodiment;
FIG. 19 is a perspective view showing the external appearance with a grill and an outdoor heat exchanger removed from the outdoor unit in FIG. 18;
FIG. 20 is a perspective view showing the external appearance with the front plate and the top plate removed from the outdoor unit in FIG. 19;
FIG. 21 is a rear view showing the external appearance with the outdoor heat exchanger, the outdoor fan, and a protective metal screen and the like removed from the outdoor unit in FIG. 18;
FIG. 22 is a rear view showing an example of the grill according to the third embodiment;
FIG. 23 is a perspective view of the grill in FIG. 22 as diagonally seen from the rear side and above;
FIG. 24 is a perspective view of another grill according to the third embodiment as seen diagonally from the rear side and above;
FIG. 25 is a back view showing another example of the grill according to the third embodiment;
FIG. 26 is a perspective view of the grill in FIG. 25 as diagonally seen from the rear side and above.

DESCRIPTION OF EMBODIMENTS

[0037] Hereinafter, embodiments of the present invention will be described with reference to the drawings. The embodiments of the outdoor unit for the air conditioner applicable to the present invention are not limited to the embodiments described below and modifications can be made without departing from the spirit of the invention.

<First Embodiment>

(1) Outline of air conditioner configuration

[0038] An air conditioner 10 according to a first embodiment of the present invention is configured by connecting an indoor unit 20 and an outdoor unit 30 with a interconnecting line 12 as shown in FIG. 1. The air conditioner 10 has a plurality of operating modes such as a cooling operation, a warming operation, a dehumidifying operation, a humidifying operation, an air supply operation, and an air exhaust operation. The operating modes may be combined appropriately.

[0039] In the cooling operation or the warming operation, heat exchange is conducted with the indoor unit 20 and the outdoor unit 30 for cooling or heating air inside a room, and heat moves between the indoor unit 20 and the outdoor unit 30 via the interconnecting line 12. For example, a refrigerant circuit shown in FIG. 2 is formed in the air conditioner 10 for allowing the heat exchange and transfer of heat. In order to form the refrigerant circuit, an indoor heat exchanger 21 is provided in the indoor unit 20 and a compressor 31, a four-way switching valve 32, an outdoor heat exchanger 33, an electric-operated valve 34, a filter 35, an accumulator 36, a liquid closing valve 37, and a gas closing valve 38 are provided in the outdoor unit 30 in FIG. 2. A liquid refrigerant tube 14 and a gas refrigerant tube 16 for linking the indoor unit 20 and the outdoor unit 30 run through the interconnecting line 12.

[0040] In the humidifying operation, the air supply operation, and the air exhaust operation, air moves between the indoor unit 20 and the outdoor unit 30 through an air supply duct 18 in the interconnecting line 12 for supplying outdoor air into a room and for exhausting air inside a room. In particular in the humidifying operation, moisture is taken in from outdoor air by the outdoor unit 30, in order for high-humidity air containing abundant moisture to be supplied from the outdoor unit 30 to the indoor unit 20. For the purpose, a humidifying unit 60 having a function of taking in moisture from the outdoor air is provided in the outdoor unit 30.

(1-1) Action of refrigerant circuit

[0041] While the action of the refrigerant circuit is not changed from that of the prior arts, a simple explanation of the action of the refrigerant circuit shown in FIG. 2 will be provided.

[0042] During cooling operation, the four-way switching valve 32 is connected as shown by the solid lines, and the refrigerant compressed and discharged by the compressor 31 is fed to the outdoor heat exchanger 33 through the four-way switching valve 32. The refrigerant that loses heat by conducting heat exchange with the outdoor air in the outdoor heat exchanger 33 is fed to the electric-operated valve 34. The refrigerant in a high-pressure liquid state is changed to a low-pressure state by the electric-operated valve 34. The refrigerant expanded by the electric-operated valve 34 passes via the filter 35 through the liquid closing valve 37 and the liquid refrigerant tube 14 and enters the indoor heat exchanger 21. The refrigerant having an increased temperature due to absorbing heat while exchanging heat with indoor air in the indoor heat exchanger 21 is fed through the gas refrigerant tube 16 to the four-way switching valve 32. The gas closing valve 38 and the accumulator 36 are connected by the four-way switching valve 32. As a result, the refrigerant fed through the gas refrigerant tube 16 from the indoor heat exchanger 21 is fed to the compressor 31 via the accumulator 36.

[0043] During heating operation, the four-way switching valve 32 is connected as shown by the dashed lines, and the refrigerant compressed and discharged by the compressor 31 is fed to the indoor heat exchanger 21. The refrigerant output from the outdoor heat exchanger 33 follows a route that is in the opposite direction of the route during cooling operation and returns to the compressor 31. Namely, the refrigerant circulates in the order of the compressor 31, the four-way switching valve 32, the gas refrigerant tube 16, the indoor heat exchanger 21, the liquid refrigerant tube 14, the electric-operated valve 34, the outdoor heat exchanger 33, the four-way switching valve 32, the accumulator 36, and the compressor 31.

(2) Configuration of the indoor unit

[0044] In addition to the indoor heat exchanger 21, an indoor fan 22 that is driven by a motor is provided in the indoor unit 20 downstream of the indoor heat exchanger 21 as shown in FIG. 2. The indoor fan 22 is a cross-flow fan. When the indoor fan 22 is driven, indoor air that is sucked in from an inlet port 23 at the upper part of the indoor unit 20 shown in FIG. 1 passes through the indoor heat exchanger 21 and is blown out from an outlet port 24 at the lower part of the indoor unit 20.

[0045] An air supply port 25 for the air supply duct 18 is provided in the indoor unit 20 in a space on the upstream side of the indoor heat exchanger 21. The air supply duct 18 is connected to the humidifying unit 60 and high-humidity air fed from the humidifying unit 60 is supplied from the air supply port 25 to a space on the upstream side of the indoor heat exchanger 21. The indoor fan 22 is driven in a state in which the high-humidity air is supplied from the air supply port 25 whereby the humidity of conditioned air blown out from the outlet port 24 of the indoor unit 20 can be increased. For example, the humidifying operation and the cooling operation can be conducted at the same time by the indoor unit 20 by using the indoor heat exchanger 21 as an evaporator at the same time as the indoor fan 22 supplies the high-humidity air.

(3) Configuration of the outdoor unit

(3-1) Outline of the configuration of the outdoor unit

[0046] The outdoor unit 30 is provided with a casing 40 and a partition plate 43, and an internal space of the casing 40 is divided into a blower chamber 41 and a machine chamber 42 by the partition plate 43 as shown in FIG. 2. In other words, the blower chamber 41 and the machine chamber 42 are isolated from each other by the partition plate 43 so that wind from the blower chamber 41 does not flow into the machine chamber 42 in the outdoor unit 30.

[0047] In addition to the humidifying unit 60 and the abovementioned apparatuses that configure the refrigerant circuit, an outdoor fan 39 that is driven by a fan motor 39a is provided in the outdoor unit 30 on the downstream side of the outdoor heat exchanger 33 as shown in FIG. 2. The outdoor fan 39 is a propeller fan having a propeller 39b driven by the fan motor 39a. When the outdoor fan 39 is driven, outdoor air sucked in from the rear surface side of the outdoor heat exchanger 33 and passes through the outdoor heat exchanger 33 is blown out from an outlet port 44 in the outdoor unit 30. The front surface of the outlet port 44 is covered by a grill 56 as shown in FIG. 1 and is configured so that the propeller 39b of the outdoor fan 39 does not come into contact with any objects outside of the outdoor unit 30. The grill 56 is attached to a front plate 46 of the casing 40.

[0048] The humidifying unit 60 is provided in the blower chamber 41 of the outdoor unit 30 and the humidifying unit 60 is disposed in front of the outdoor heat exchanger 33. The reason for disposing the humidifying unit 60 in front of the outdoor heat exchanger 33 is to allow a portion of the humidifying unit 60 to be in a blowing route that passes through the outdoor heat exchanger 33. The humidifying unit 60 in the abovementioned location is provided with a shape and mounting position as described below in order to suppress an increase in wind resistance in the blowing route that passes through the outdoor heat exchanger 33.

(3-2) Casing

[0049] FIG. 3 is a perspective view of the outdoor unit 30 and shows a state in which the grill 56 and the like are removed from the outdoor unit 30 of FIG. 1. FIG. 4 is a plan view of the outdoor unit 30 and shows a state in which a top plate 48 is removed from the outdoor unit 30. FIG. 5 is a perspective view of the outdoor unit 30 and shows a state in which the front plate 46, the top plate 48, and a left side plate 50 and the like are removed. FIG. 6 is a cross-sectional view along lines I-I in FIG. 1.

[0050] The casing 40 of the outdoor unit 30 includes the front plate 46, a right side plate 47, the top plate 48, and a bottom plate 49 as shown in FIG. 3. The outdoor heat exchanger 33 has an L-shape as seen from above as shown in FIG. 4, and the left side plate 50 is attached to the left side surface of the casing 40 facing a left side face part 332 of the L-shaped outdoor heat exchanger 33. Although not shown in FIG. 4, the left side plate 50 is formed in a lattice shape in order to guide outdoor air to the outdoor heat exchanger 33. The rear side of the blower chamber 41 is open to a rear face part 331 of the outdoor heat exchanger 33, and a protective metal screen for covering the rear face part 331 of the outdoor heat exchanger 33 is attached at the rear side of the blower chamber 41.

[0051] The partition plate 43 that partitions the casing 40 into the blower chamber 41 and the machine chamber 42 is mounted roughly parallel to the right side plate 47 as shown in FIG. 5. The partition plate 43 extends from the right edge of the outdoor heat exchanger 33 toward the front and extends vertically from the bottom plate 49 up to the top plate 48. A front section of the partition plate 43 abuts and is attached to the front plate 46. The right side plate 47 covers the entire right side face and the partial rear face, the partial rear face which provides from the right edge to the right side surface of a rear face part 51 of the outdoor heat exchanger33.

[0052] An opening part 43b is formed in the partition plate 43 (see FIG. 5). An electric component box 55 shown in FIG. 4 is mounted in the opening part 43b, and a fin for cooling power devices is mounted so as to protrude from the opening part 43b toward the blower chamber 41.

[0053] The circular outlet port 44 is formed in the front plate 46 as shown in FIG. 3, and a ring-shaped bell mouth 52 is attached around the outlet port 44. The propeller 39b is disposed so that a portion of the propeller 39b enters a space surrounded by the bell mouth 52.

[0054] The fan motor 39a is disposed to the rear side surface of the propeller 39b, whereby a rotating shaft of the propeller 39b is joined to a drive shaft of the fan motor 39a. A fan motor stand 53 for supporting the fan motor 39a is a metal member that is elongated in the vertical direction at the rear surface side of the propeller 39b. The fan motor stand 53 is configured by two supporting parts that extend vertically and by a plurality of horizontal bars that join the supporting parts near the fan motor 39a and/or an upper edge 33b of the outdoor heat exchanger 33 and/or the bottom plate 49 so as not to disturb outdoor air flow produced by the propeller 39b. The fan motor stand 53 is attached to the bottom plate 49 and the upper edge 33b of the outdoor heat exchanger 33.

(3-3) Outdoor heat exchanger

[0055] The outdoor heat exchanger 33 has the rear face part 331 allocated on the rear side of the casing 40 and the left side face part 332 allocated on the left side of the casing 40 as previously described, and the outdoor heat exchanger 33 has an L-shape as seen from above. The outdoor heat exchanger 33 includes a multitude of fins that are elongated in the height direction, and a heat exchanger tube attached horizontally in a manner of piercing the fins to be thermally connected to the multitude of fins. The height of the outdoor heat exchanger 33 stretches from the bottom plate 49 to the top plate 48. The heat exchanger tube is disposed in a plurality of rows in the height direction by being folded a plurality of times at either edge of the outdoor heat exchanger 33. For example, during cooling operation, the heat exchanger tube is disposed so that a refrigerant with a high temperature enters the heat exchanger tube from the bottom-most row in the outdoor heat exchanger 33 and the temperature of the refrigerant drops as the refrigerant flows upward. During heating operation, a refrigerant with a low temperature enters the heat exchanger tube from the uppermost row and the temperature of the refrigerant rises as the refrigerant flows downward. When disposed in this way, during heating operation outdoor air cooled near the upper part of the outdoor heat exchanger 33 is guided to the moisture absorption duct 68 of the humidifying unit 60.

(3-3-1) Disposition of the outdoor heat exchanger and the humidifying unit

[0056] The humidifying unit 60 mounted in front of the outdoor heat exchanger 33 is shown in FIG. 7 and in FIG. 8. FIG. 7 is a perspective view of the humidifying unit 60 as the humidifying unit being seen from the front right diagonally and from above, the humidifying unit 60 being removed. FIG. 8 is a perspective view of the humidifying unit 60 as seen from the rear right diagonally and from above. However, FIGS. 7 and 8 show a state in which an upper part cover 67 shown in FIGS. 4 and 5 is removed.

[0057] The fact that the humidifying unit 60 is mounted in an uncovered manner in front of the outdoor heat exchanger 33 is a characteristic of the outdoor heat exchanger 33. The height of a position of an upper surface 60a of the humidifying unit 60 matches the height of the upper edge 33b (top part) of the outdoor heat exchanger 33. The humidifying unit 60 is provided with a shape in which the volume is reduced as much as possible while keeping a relatively complicated external appearance.

(3-4) Grill

[0058] The grill 56 shown in FIG. 1 is attached to a front plate 46 of the casing 40 and covers the outlet port 44. A multitude of opening parts 56a shown in FIG. 9 are formed in the grill 56 whereby outdoor air is blown out. A guide structure 56b is formed of a resin plate at the upper left part of the grill 56. Specifically, intervals between crosspieces 56d are blocked in an area Ar1 due to the formation of the plate-like guide structure 56b. For example, the guide structure 56b is formed by avoiding the formation of the opening parts 56a in a portion that becomes the guide structure 56b when forming the grill 56. When the grill 56 is formed by injection molding, a metal mold is made so that, for example, a region that corresponds to the guide structure 56b is blocked. A step for separately forming the guide structure 56b can be omitted when manufacturing the grill 56 in this way. The guide structure 56b is formed outside of the casing 40 whereby the casing 40 may be made in a compact manner.

[0059] The guide structure 56b is formed so as to cover a portion of the outlet port 44 when seen from the front as shown in FIG. 16, and shields a portion of the outdoor air being blown from the outlet port 44 toward the front. The shielded outdoor air is guided upward along the guide structure 56b on a route r1 shown by the chain double-dashed line in FIG. 9. The outdoor air guided upward along the guide structure 56b enters the intake port 68a open solely since the upper part of the grill 56 is blocked. That is, when looking at the outdoor unit 30 from the front as shown in FIG. 1, an overlapping portion 56b1 in which the upper edge and the left and right edges of the guide structure 56b overlaps the front plate 46 becomes a pathway, and outdoor air is guided from an overlapping portion 56b2 in which the guide structure 56b overlaps the outlet port 44 toward the above overlapping portion 56b1 and then enters the intake port 68a.

[0060] If the area of the overlapping portion 56b2 of the guide structure 56b that covers the outlet port 44 is increased when seen from the front, the air volume of outdoor air guided to the intake port 68a increases, but conversely, the air

volume of outdoor air guided to the outdoor heat exchanger 33 may decrease. As a result, the area of the guide structure 56b covering the outlet port 44 is set so that the air volume is distributed appropriately to both the intake port 68a and the outdoor heat exchanger 33.

(3-5) Humidifying unit

[0061] As shown in FIGS. 2, 5, etc., the humidifying unit 60 has a moisture absorption section 61 for absorbing moisture from the outdoor air, and a moisture desorption section 62 for desorbing moisture thereby humidifying the air.

(3-5-1) Moisture absorption section and moisture desorption section

[0062] The moisture absorption section 61 and the moisture desorption section 62 in the humidifying unit 60 are configured as a single disc-shaped humidifying rotor 63 as shown in FIG. 10. That is, the humidifying rotor 63 is a moisture absorption and desorption member that serves as both the moisture absorption section 61 and the moisture desorption section 62. The disc-shaped humidifying rotor 63 is a zeolite rotor having a honeycomb structure formed by the calcination of zeolite and the like. The humidifying rotor 63 is arranged so as to rotate around the center of the disc as a rotating shaft, and is rotated by motive power from a rotor driving motor (not shown) transmitted to gears 64 provided on the periphery of the humidifying rotor 63.

[0063] An adsorbent such as zeolite that forms the humidifying rotor 63 exhibits the properties of absorbing moisture from the air at normal temperature, for example, and desorbing moisture upon reaching a temperature higher than normal temperature due to air heated to a high temperature by a heater 71. That is, a part of the humidifying rotor 63 exposed to the heated air become the moisture absorption section 61 and the part of the humidifying rotor 63 exposed to the heated air become the moisture desorption section 62. When seen from another aspect, the humidifying rotor 63 absorbs moisture at a part in which the temperature of the humidifying rotor 63 is low, and desorbs moisture at a part in which the temperature of the humidifying rotor 63 is high. Since the humidifying rotor 63 rotates, water moisture adsorbed by the humidifying rotor 63 due to the moisture absorption by the moisture absorption section 61 is carried to the moisture desorption section 62 accompanying the rotation of the humidifying rotor 63, and the adsorbed water moisture is released due to the desorption by the moisture desorption section 62, and the air around the moisture desorption section 62 is humidified. The heater 71 is provided above the moisture desorption section 62 in order to heat air forced to pass through the moisture desorption section 62 of the humidifying rotor 63.

(3-5-2) Enclosure wall

[0064] As shown in FIGS. 7 and 8, the entire periphery of the external periphery of the disc-shaped humidifying rotor 63 is enclosed by enclosure walls 65 and 66. The external periphery of the moisture absorption section 61 is covered by the enclosure wall 65 and the external periphery of the moisture desorption section 62 is covered by the enclosure wall 66 in the humidifying unit 60.

(3-5-3) Moisture absorption duct

[0065] A moisture absorption duct 68 is provided at an upper part of the moisture absorption section 61 for guiding outdoor air to the moisture absorption section 61. When viewing the moisture absorption duct 68 from above, the top of the moisture absorption section 61 that has a sector form with a central angle α of more than 180 degrees is covered by the moisture absorption duct 68 as shown in FIG. 4.

[0066] The moisture absorption duct 68 has an intake port 68a that is open toward the front surface side and that sucks in outdoor air from the front surface side. The moisture absorption duct 68 includes a sloping part 68b that is formed in an upper part of the moisture absorption duct 68 and that continues to the intake port 68a as shown in FIG. 6. Consequently, the moisture absorption duct 68 has a shape that curves downward when seen from the side. Since the moisture absorption duct 68 has a structure that curves downward in this way, outdoor air blown from the lower part toward the upper part is able to easily enter the intake port 68a of the moisture absorption duct 68. Moreover, the moisture absorption duct 68 widens in a vertical manner progressively from the intake port 68a toward the rear surface side, and the outdoor air that progresses from the intake port 68a toward the rear surface side spreads in a vertical manner while progressing toward the rear surface side and easily traverses the full length of the moisture absorption section 61. The moisture absorption duct 68 covers the entire surface of the moisture absorption section 61 as shown in FIG. 4 and the outdoor air passes through the humidifying rotor 63 disposed below from the upper part to the lower part.

(3-5-4) Discharge port

[0067] A discharge port 69 is below the humidifying rotor 63. The discharge port 69 occupies an area approximately equal to a projection portion from the upper surface of the moisture absorption duct 68. The propeller 39b is disposed below the discharge port 69 as shown in FIG. 6 and FIG. 9. That is, the discharge port 69 faces a space 70 that has negative pressure when the propeller 39b is rotating. According to the above configuration, outdoor air that is blown from the bell mouth 52 by the propeller 39b to enter the intake port 68a runs through the route indicated by the chain double-dashed line in FIG. 9, is drawn toward the negative pressure space 70, and is blown out from the discharge port 69 into the blower chamber 41. As a result, outdoor air is fed to the moisture absorption section 61 only by the outdoor fan 39, and thus a dedicated fan that is required in the prior art for feeding the outdoor air to the moisture absorption section 61 can be omitted.

(3-5-5) Heater

[0068] The heater 71 is provided above the moisture desorption section 62 of the humidifying rotor 63 for desorbing moisture from the moisture desorption section 62 as shown in FIG. 10. FIG. 11 is a bottom view of the heater 71 and a heater supporting member 74 as seen from below. The heater 71 has a structure in which heating wires (not shown) are provided inside a cylindrical housing, and outdoor air that is sucked in from an intake port 72 and fed to the humidifying rotor 63 is heated by the heating wires. When the heated air passes through the openings of the honeycomb structure of the humidifying rotor 63, air in a humidifying duct 73 is humidified by moisture desorption from the humidifying rotor 63.

[0069] The heater 71 is attached to a lower side of the heater supporting member 74 as shown in FIG. 11. The heater supporting member 74 is a cylinder that includes an upper surface part 74a, a peripheral outer wall part 74b, and fixed plates 74c, and an upper surface and side surfaces of the heater supporting member 74 are surrounded by the upper surface part 74a and the outer wall part 74b so that the cylinder has open lower end. The housing of the heater 71 and the heater supporting member 74 are formed by sheet metal for maintaining a required heat resistance. The intake port 72 is formed at the front side face of the heater supporting member 74 and below the humidifying rotor 63, and outdoor air that is sucked in from the intake port 72 and flows through above the humidifying rotor 63 passes through the housing of the heater 71 from the front surface side toward the rear surface side. The outdoor air is heated by the heater 71 at this time. The air that passes through the housing of the heater 71 runs through above the humidifying rotor 63 and progresses to the rear side surface. Since the lower part of the rear side surface of the humidifying rotor 63 is leaded to the humidifying duct 73 (see FIG. 5), air that arrives above the humidifying duct 73 passes downward through the humidifying rotor 63 and is sucked into the humidifying duct 73. The humidifying rotor 63 is exposed to air that is heated to a higher temperature by the heater 71 and desorbs moisture. The air humidified by the humidifying rotor 63 in this way is guided through the humidifying duct 73 toward the indoor unit 20. For that purpose, the lower part of the heater supporting member 74 becomes the moisture desorption section 62 as shown in FIG. 10, and the other portions of the heater supporting member 74 become the moisture absorption section 61 in the humidifying rotor 63. The humidifying rotor 63 rotates in a clockwise direction as seen from above, whereby the humidifying rotor 63 functions as the moisture desorption section 62 when the humidifying rotor 63 functioning as the moisture absorption section 61 rotates to arrive below the heater supporting member 74. That is, the humidifying rotor 63 is a moisture absorption and desorption member that serves as both the moisture absorption section 61 and the moisture desorption section 62.

(3-5-6) Turbo fan and humidifying duct

[0070] The humidifying duct 73 provides wind resistance to outdoor air that passes through the outdoor heat exchanger 33 since the humidifying duct 73 is positioned at the lower rear side of the humidifying rotor 63 and in front of the outdoor heat exchanger 33 as described above. A turbo fan 75 is installed in the machine chamber 42 as shown in FIG. 2 and FIG. 4 because the turbo fan 75 having a relatively large occupied volume may cause wind resistance when disposed in front of the outdoor heat exchanger 33.

[0071] Since the propeller 39b is disposed below the humidifying unit 60, the highest position within the area in which the propeller 39b rotates is lower than the upper edge 33b of the outdoor heat exchanger 33 by the size in the highest direction of the humidifying unit 60. As a result, outdoor air that passes through in the vicinity of the upper edge of the outdoor heat exchanger 33 flows downward diagonally toward the propeller 39b. The humidifying duct 73 is mounted diagonally toward the turbo fan 75 so that the edge of the humidifying duct 73 closer to the turbo fan 75 is positioned at the same height as the upper edge 33b of the outdoor heat exchanger 33 in order to prevent as much as possible the humidifying duct 73 hindering the route of the outdoor air described above. A damper 78 is attached to the humidifying duct 73 as shown in FIG. 2 to prevent a reverse flow, that is, the flow of air from the turbo fan 75 side toward the humidifying rotor 63, in the humidifying duct 73 during a humidifying operation.

[0072] The turbo fan 75 is disposed so as not to take up space in the front-back direction as shown in FIG. 7. Specifically,

a rotating shaft of an impeller of the turbo fan 75 is disposed vertically to extend in the front-back direction. An intake port 76 of the turbo fan 75 is disposed facing the humidifying unit 60. A discharge port 77 of the turbo fan 75 is disposed diagonally and downward. The discharge port 77 and the vicinity of the discharge port 77 of the turbo fan 75 are included inside the outdoor unit 30 due to the provision of the damper 78 at the humidifying duct 73 side and the provision of the discharge port 77 diagonally and downward. The air supply duct 18 is able to be attached to the discharge port 77 of the turbo fan 75 that is exposed at an opening part 47a of the right side plate 47.

(3-5-7) Fixing of the humidifying unit

[0073] FIG. 12 is a partial cross-sectional view of the outdoor unit 30 for showing a cross-sectional shape of the humidifying unit 60. The humidifying unit 60 is fixed with a screw 53a onto the fan motor stand 53. The front of the humidifying unit 60 extends up to the front plate 46. The humidifying unit 60 does not move forward or backward or to the left or right in a fixed state. As a result, a certain interval Is is formed between a front surface 33a of the outdoor heat exchanger 33 and a rear surface 60b of the humidifying unit 60. The interval Is is reliably maintained by a rib 60c formed on the rear surface 60b. Moreover, a sloping part 68c is formed on the rear surface side of the moisture absorption duct 68, and a sloping part 65c that slopes so that it projects forward while going downward is provided on the enclosure wall 65 as shown in FIG. 12. The passage of outdoor air is improved when the sloping part 65c is provided in a sloping manner as shown in FIG. 12.

[0074] Outdoor air flows along a route r2 shown in FIG. 12 due to the interval Is being formed as described above, and the outdoor air passes through the outdoor heat exchanger 33 that is at the rear surface side of the humidifying unit 60 and undergoes heat exchange. Therefore, a reduction in heat exchange effectiveness may be suppressed.

[0075] Outdoor air that passes through the outdoor heat exchanger 33 toward the front to come up against at the sloping part 68c then comes up against the humidifying unit 60 and progresses forward to the left due to the presence of the sloping part 68c in the upper part of the humidifying unit 60. A route r3 is formed so that the outdoor air that progresses to the left and forward flows downward from a space 41a between the outdoor heat exchanger 33 and the humidifying unit 60 and toward the propeller 39b as shown in FIG. 4. As a result, amount of wind resistance when the route r3 is formed lesser than that of wind resistance when the route r3 is not formed.

(Second Embodiment)

[0076] Only air flow guided into the intake port 68a due to a guide structure 56Ab in the air flow produced by the outdoor fan 39 is sucked into the intake port 68a of the moisture absorption duct 68 in the first embodiment. The configuration of the first embodiment easily ensures the amount of outdoor air to be sucked in since the air flow of the outdoor fan 39 may be adequately used.

[0077] In contrast, an outdoor unit 30A of the second embodiment shown in FIG. 13 includes an opening part 56Aba in the guide structure 56Ab of the grill 56A. The opening part 56Aba is provided facing the intake port 68a. As a result, the route r1 that progresses along the guide structure 56Ab and enters the intake port 68a and a route r4 that enters directly from the opening part 56Aba to the intake port 68a can be realized. Outdoor air is guided along the route r4 into the intake port 68a along with outdoor air fed along the route r1.

(4) Characteristics

(4-1)

[0078] As shown in FIG. 9 and the like, the negative pressure space 70 from the outdoor heat exchanger 33 up to the portion partitioned by the outdoor fan 39 and the bell mouth 52 is a space that has negative pressure when the outdoor fan 39 rotates. The discharge port 69 faces the negative pressure space 70 and an air flow is produced onto either side of the discharge port 69 from the side in which the humidifying rotor 63 is present toward the negative pressure space 70. In contrast, an air flow that is blown out from the outlet port 44 is produced in front of the bell mouth 52. The route r1 is formed in the outdoor unit 30 so that air that changes direction at the guide structure 56b, 56Ab shown in FIG. 9 and FIG. 13 is blown out from the outlet port 44 and then goes through the intake port 68a and the moisture absorption section 61 to escape through the discharge port 69. As a result, outdoor air can be guided effectively to the moisture absorption section 61 by the outdoor fan 39 whereby the moisture absorption function is improved. Consequently, a dedicated fan and/or driving motor for driving the dedicated fan conventionally provided for guiding outdoor air into the moisture absorption section 61 may be omitted. While the dedicated fan is described as being omitted in the above embodiments, a reduction in size of the humidifying unit 60 is still possible if the dedicated fan and/or driving motor is made smaller instead of being omitted. The outdoor unit 30 may also be reduced in size if the humidifying unit 60 is reduced in size.

(4-2)

[0079] The configuration of the first embodiment shown in FIG. 9 is one that sucks in only air guided through the outdoor fan 39 and along the guide structure 56b, 56Ab, at the intake port 68a. Outdoor air can be effectively guided into the intake port 68a by sufficiently using the air flow produced by the outdoor fan 39 in this configuration.

(4-3)

[0080] Air guided along the guide structure 56Ab on the route r1 (first route) as shown in FIG. 13 is able to be used for drawing in air guided on the route r4 (second route) and thus air with a higher humidity than the air in the route r1 (first route) is easily guided into the moisture absorption section due to the use of the route r4.

[0081] The humidity of outdoor air fed along the route r1 may fall due to condensation in the outdoor heat exchanger 33 since the air that passes through the outdoor heat exchanger 33 once is mostly the outdoor air fed along the route r1. Conversely, outdoor air that enters the intake port 68a directly from the opening part 56Aba may have a high humidity more often than the outdoor air carried along the route r1 since the outdoor air that enters the intake port 68a directly from the opening part 56Aba does not pass through the outdoor heat exchanger 33. Air with a high humidity may be able to be drawn in by introducing outdoor air through the intake port 68a by using the route r4. In this case, air with a higher humidity than the air in the route r1 is guided into the moisture absorption section 61 by using the route r4 whereby humidifying performance can be improved.

(4-4)

[0082] The guide structure 56b, 56Ab is formed on the grill 56, 56A as shown in FIG. 1, FIG. 9, and FIG. 13, and the grill 56, 56A as well as the guide structure 56b, 56Ab are attached to the front plate 46. That is, the attachment of the guide structure 56b, 56Ab can be conducted due to the attachment of the grill 56, 56A, whereby the guide structure 56b, 56Ab can be attached very easily.

[0083] While the grill 56, 56A is described as being integrally formed with the guide structure 56b, 56Ab in the above embodiment, the grill 56, 56A may also be separate from the guide structure 56b, 56Ab. In addition to the guide structure 56b, 56Ab being attached to the front plate 46 indirectly via the grill 56, 56A as in the above embodiments, the guide structure 56b, 56Ab may be attached directly to the front plate 46.

(4-5)

[0084] As described above, the guide structure 56b, 56Ab is formed on the grill 56, 56A and is configured with a portion in which stamping out the opening parts 56a of the grill 56, 56A is not performed. As a result, the formation of the guide structure 56b, 56Ab can be conducted at the same time as the formation of the grill 56, 56A. As a result, a dedicated step for forming the guide structure 56b, 56Ab may not be added and the outdoor unit 30, 30A having the guide structure 56b, 56Ab may be provided at a low cost.

(4-6)

[0085] As shown in FIG. 9, the humidifying unit 60 has the moisture absorption duct 68 mounted above the outdoor fan 39. The moisture absorption duct 68 that guides the outdoor air from the intake port 68a to the moisture absorption section 61 is understood to curve downward in relation to lines passing through vertical midpoints from the top edge to the bottom edge of the moisture absorption duct 68 as seen from the side. Since the moisture absorption duct 68 curves downward, outdoor air rising from below along the route r1 is easily sucked into the moisture absorption duct 68, and the outdoor air supplied to the moisture absorption section 61 increases whereby humidifying performance is improved.

(5) Modified examples

(5-1)

[0086] While a pair-type of air conditioner 10 in which one indoor unit 20 is connected to one outdoor unit 30 is described in the above embodiments, the type of air conditioner applicable to the present invention is not limited to the pair-type. For example, a multi-type air conditioner in which one outdoor unit is connected to a plurality of indoor units may be applicable to the present invention.

(5-2)

[0087] While the inside of the casing 40 of the outdoor unit 30 is described as being divided into the blower chamber 41 and the machine chamber 42 in the above embodiments, the outdoor unit of the present invention may be configured so long as the casing 40 is provided with the blower chamber 41 therein. For example, a partitioned space other than the blower chamber 41 or the machine chamber 42 may be formed, and the machine chamber 42, for example, may be provided as another chamber including other functions.

(5-3)

[0088] While the outdoor heat exchanger 33 is described as having an L-shape when seen from above in the above embodiments, the outdoor heat exchanger that is configured in the outdoor unit of the present invention is not limited to the above shape. For example, a configuration with an outdoor heat exchanger having an I-shape as seen from above may be possible.

(5-4)

[0089] An exhaust duct 80 may be provided as shown in FIG. 5. An interval Is2 (see FIG. 6) is preferably provided between the front surface 33a of the outdoor heat exchanger 33 and the rear surface of the exhaust duct, in addition to the certain interval Is if the exhaust duct is provided. A sloping part that slopes downward from the exhaust duct 80 is provided and wind resistance is preferably reduced due to the sloping part 80a.

(5-5)

[0090] While the outdoor fan 39 is described as having the propeller 39b in the above embodiments, the outdoor fan 39 is not limited to having the propeller 39b. The outdoor unit of the present invention may be configured with an outdoor fan having a type of blade other than a propeller type.

(5-6)

[0091] While the moisture absorption section 61 is described as being larger than the moisture desorption section 62 and as having a sector form with the central angle α of the moisture absorption section 61 being more than 180 degrees as shown in FIG. 4, the sizes of the moisture absorption section 61 and the moisture desorption section 62 may be set as appropriate. For example, the sizes of the moisture absorption section 61 and the moisture desorption section 62 may be approximately equal as shown in FIG. 13, and the central angles may both be set to 180 degrees.

(5-7)

[0092] While a dedicated fan for guiding outdoor air to the moisture absorption section 61 and a motor for driving the dedicated fan are omitted in the above embodiments, a dedicated fan and a motor for driving the dedicated fan that are made smaller than conventional ones may be attached. Even in this case, since outdoor air is blown to the moisture absorption section 61 by the outdoor fan 39, the outdoor unit may be made more compact than the prior art by an amount corresponding to the amount that the dedicated fan for guiding the outdoor air to the moisture absorption section 61 and the motor for the dedicated fan may be reduced in comparison to the prior art.

(5-8)

[0093] While the space between the moisture desorption section 62 and the turbo fan 75 is described as being partitioned by the partition plate 43 in the above embodiments, a configuration is also possible in which the space between the moisture absorption section 61 and the moisture desorption section 62 is partitioned by the partition plate 43 as shown in FIGS. 14 and 15. By mounting the partition plate 43 at the border between the moisture absorption section 61 and the moisture desorption section 62 as shown in FIGS. 14 and 15, a configuration in which the moisture desorption section 62, the humidifying duct 73, and the turbo fan 75 are mounted in the machine chamber 42 is made possible. Consequently, cooling of the moisture desorption section 62 by outdoor air passing through the outdoor heat exchanger 33 may be prevented. Since all of the moisture desorption section 62 and the humidifying duct 73 is outside of the pathway of the outdoor air that passes through the outdoor heat exchanger 33 instead of a portion of the turbo fan 75 and the humidifying duct 73, an increase in wind resistance caused by the moisture desorption section 62 and the humidifying duct 73 may be reduced. Even with this type of modified example, the guide structure described above may

be used since the position of the guide structure moves toward the partition plate 43 along with the position of the intake port 68a.

[0094] While an example in which the entire moisture desorption section 62 is mounted in the machine chamber 42 is shown in FIGS. 14 and 15, a configuration in which a portion of the moisture desorption section 62 is mounted in the machine chamber 42 is possible. When a portion of the moisture desorption section 62 is mounted in the machine chamber 42, an effect of reducing an increase in the wind resistance and an effect in preventing cooling of the moisture desorption section 62 is reduced in comparison to when the entire moisture desorption section 62 is mounted in the machine chamber 42; however the effects are improved when compared to the first embodiment.

[0095] Moreover, while an example is described of a case in which the turbo fan 75 is installed so that the direction in which the rotating shaft thereof extends is in the front-back direction, the installation direction of the turbo fan 75 is not limited to the example. For example, as shown in FIG. 15, a configuration in which the direction that the rotating shaft extends matches the left-right direction that is the longitudinal direction of the casing 40 is possible. The length of the longitudinal direction of the casing is easily shortened by matching the direction in which the rotating shaft extends with the longitudinal direction of the casing 40.

(Third Embodiment)

(1) Outline of configurations of air conditioner and outdoor unit

[0096] The following describes an outdoor unit for an air conditioner according to a third embodiment with reference to FIGS. 17 to 23. While the outline of the configuration of the air conditioner incorporating an outdoor unit 30B according to the third embodiment as shown in FIGS. 17 to 23 is approximately the same as the outline of the configuration of the air conditioner 10 described using FIG. 2 in the first embodiment, a portion is changed. The outdoor unit 30B of the third embodiment is provided with a casing 40B and a partition plate 43B in the same way as the outdoor unit 30 of the first embodiment, and the internal space of the casing 40B is divided into a blower chamber 41b and a machine chamber 42B by the partition plate 43B, as shown in FIGS. 17 and 20. In order to configure a refrigerant circuit, the compressor 31, the four-way switching valve 32, the outdoor heat exchanger 33, the electric-operated valve 34, the filter 35, the accumulator 36, the liquid closing valve 37, and the gas closing valve 38 are provided in the outdoor unit 30B in the same way as in the outdoor unit 30. As shown in FIG. 20, an outdoor fan 39B in which a propeller 39Bb is driven by a fan motor 39Ba is provided on the downstream side of the outdoor heat exchanger 33. The propeller 39Bb rotates in the anticlockwise direction when seen from the front. A humidifying unit 60B is mounted inside a space in the blower chamber 41B and mounted above the outdoor fan 39B.

(2) Humidifying unit

[0097] As shown in FIG. 17, the feature of the humidifying unit 60B having the moisture absorption section 61 and the moisture desorption section 62 is the same as the humidifying unit 60 of the first embodiment. Moreover, the feature of the humidifying unit 60B having the one disc-shaped humidifying rotor 63 and the heater 71 as shown in FIG. 10, the feature of the humidifying unit 60B having the moisture absorption duct 68 shown in FIG. 9, the discharge port 69 shown in FIG. 10, and an intake port 72B (see FIG. 20) corresponding to the intake port 72 shown in FIG. 7, and the feature of the humidifying unit 60B having the humidifying duct 73 shown in FIG. 7 and a turbo fan 75B corresponding to the turbo fan 75, are the same as those of the humidifying unit 60 of the first embodiment.

[0098] The features in which the intake port 72B of the humidifying unit 60B differ from the intake port 72 of the humidifying unit 60 are the shape and size thereof; however the structure for feeding outdoor air sucked in from the intake port 72B is the same in the humidifying unit 60B and the humidifying unit 60. While the mounting of the turbo fan 75 in the humidifying unit 60 is vertical, the mounting of the turbo fan 75B in the humidifying unit 60B is horizontal. That is, whereas the rotating shaft for the blades of the turbo fan 75 extends in the front-back direction, the rotating shaft for the blades of the turbo fan 75B extends in the vertical direction. While the turbo fan 75B is mounted in the blower chamber 41B above the propeller 39Bb as shown in FIG. 20, the turbo fan 75B is attached inside the blower chamber 41B horizontally so that an increase in wind resistance is suppressed.

[0099] Moreover, a filter 68f is attached to the intake port 68a of the humidifying unit 60B. As a result, while sucking in the outdoor air is made more difficult by the amount of pressure loss from the filter 68f in comparison to the humidifying unit 60, the configuration allows for sucking in a sufficient amount of outdoor air due to the guide structure mentioned below.

(3) Disposition relation between the outdoor heat exchanger and the humidifying unit

[0100] The humidifying unit 60B mounted in front of the outdoor heat exchanger 33 is shown in FIG. 20. The fact that the humidifying unit 60B is mounted in an uncovered manner in front of the outdoor heat exchanger 33 is a characteristic

of the outdoor heat unit 30. The height of a position of an upper surface 60Ba of the humidifying unit 60B matches the height of the upper edge 33b (top part) of the outdoor heat exchanger 33. As a result, the humidifying unit 60B is provided with a shape in which the volume is reduced as much as possible thus keeping a relatively complicated external appearance. While the height of the position of the upper surface 60Ba of the humidifying unit 60B matches the height of the upper edge 33b of the outdoor heat exchanger 33 in this case, the two heights do not need to match, and the outdoor unit 30B may be made more compact by mounting the humidifying unit 60B in an uncovered manner in front of the outdoor heat exchanger 33.

(4) Casing

[0101] FIG. 18 is a front view of the outdoor unit 30B and FIG. 19 is a perspective view of the outdoor unit 30B. FIG. 19 shows the outdoor unit 30B in FIG. 18 in a state with the grill 56 and the like removed. The casing 40B of the outdoor unit 30B is provided with a front plate 46B, the right side plate 47, the top plate 48, and the bottom plate 49. A left side plate formed in a lattice shape is attached to the left side surface of the casing 40B in the same way as the casing 40 facing the left side surface part of the L-shaped outdoor heat exchanger 33. Moreover, a protective metal screen that covers the rear face part of the outdoor heat exchanger 33 is attached to the rear side of the blower chamber 41B of the casing 40B in the same way as the casing 40, and the rear side of the blower chamber 41B is open.

[0102] The circular outlet port 44 is formed in the front plate 46B as shown in FIG. 19, and the ring-shaped bell mouth 52 is attached on the periphery of the outlet port 44B. The propeller 39Bb is mounted so that a portion thereof enters a space surrounded by the bell mouth 52.

[0103] An important feature among the features that differ between the casing 40B of the outdoor unit 30B of the second embodiment and the casing 40 of the first embodiment is the feature that the opening part 46Ba for the intake port 68a and the opening part 46Bb for the intake port 72B are formed separate from each other on the front plate 46B. In contrast, only one opening part 46a (see FIG. 3) for the intake port 68a and for the intake port 72 is formed in the front plate 46 of the casing 40 in the first embodiment. The two opening parts 46Ba and 46Bb in the front plate 46B are separated by a rib 56q (see FIG. 23) of the grill 56B mentioned below.

(5) Grill

[0104] The grill 56B attached to the casing 40B is shown as seen from the back in FIG. 21 in a state in which the outdoor heat exchanger 33 and the outdoor fan 39B and the like are removed from the casing 40B. FIG. 22 is a back surface view of the grill 56B and FIG. 23 is a perspective view of the back surface of the grill 56B as seen diagonally from above. The grill 56B shown in FIG. 18 is attached to the front plate 46B of the casing 40B and covers the outlet port 44. A multitude of crosspieces 56d and opening parts 56a between the crosspieces 56d are formed in the grill 56B. A guide structure 56Bb is formed in a resin plate in an upper part of the grill 56B.

[0105] The guide structure 56Bb is formed so as to cover a portion of the outlet port 44 when seen from the front (or seen from the back) as shown in FIGS. 18 and 21, and shields a portion of the air being blown from the outlet port 44 toward the front. When forming the guide structure 56Bb, the guide structure 56Bb may be formed on the resin grill 56B by injection molding so that the crosspieces 56d and the opening parts 56a that are blocked between the crosspieces 56d are not formed in the portion that becomes the guide structure 56Bb in the same way as when forming the grill 56.

[0106] As shown in FIG. 21, the guide structure 56Bb is understood to have an overlapping portion 56Bb1 that overlaps the front plate 46B and an overlapping portion 56Bb2 that overlaps the outlet port 44 when looking at the outdoor unit 30B. A space between the front plate 46B and the overlapping portion 56Bb1 that overlaps the front plate 46B becomes a pathway, and outdoor air that has changed direction due to the overlapping portion 56Bb2 that overlaps the outlet port 44 runs through a pathway formed by the front plate 46B and the overlapping portion 56Bb1 that overlaps the front plate 46B and is guided to the intake port 68a. If the surface area of the overlapping portion 56b2 that overlaps the outlet port 44 is increased, the air volume of the outdoor air guided to the intake port 68a increases, but conversely, wind resistance is increased due to the overlapping portion 56Bb2 that overlaps the outlet port 44 and the air volume of the outdoor air guided to the outdoor heat exchanger 33 may decrease. For the reason, the surface area of the overlapping portion 56Bb2 that overlaps the outlet port 44 is set so that the air volume is distributed appropriately to both the intake port 68a and the outdoor heat exchanger 33.

[0107] An intake opening part 56p is formed in the grill 56B in a position facing the intake port 72B. The periphery of the intake opening part 56p is surrounded by a rib 56q and the outdoor air sucked in from the intake port 72B is introduced from the front of the outdoor unit 30B instead of being blown by the outdoor fan 39B. The outdoor air flowing from the outlet port 44 toward the intake port 68a due to the guide structure 56Bb is shielded by the rib 56q surrounding the intake opening part 56p so as not to be sucked into the intake port 72B.

[0108] A rib 56r is formed below the intake opening part 56p on the inside surface of the grill 56B. The outer surface of the rib 56r is formed as a smooth plate and extends in the rotating direction of the outdoor fan 39B. In other words,

the rib 56r extends in a direction substantially orthogonal to a straight line that extends radially from a rotational center 39Bb1 of the propeller 39Bb of the outdoor fan 39B. The intake port 68a faces an area Ar2 surrounded by the long dashed double-dotted line in FIG. 23. A channel surrounded in three directions by a route r5 shown in FIG. 23 is formed by the rib 56r, the front plate 56B, and the guide structure 56Bb. Outdoor air that is turned and blown out from the outlet port 44 in the rotating direction of the propeller 39Bb of the outdoor fan 39B may be guided smoothly along the route r5 due to the channel.

(6) Characteristics

(6-1)

[0109] A space from the outdoor heat exchanger 33 to a portion partitioned by the outdoor fan 39B and the bell mouth 52 becomes a space of negative pressure when the outdoor fan 39B is rotating in the same way as in the first embodiment as described with reference to FIG. 9 and the like. The discharge port 69 faces the negative pressure space and an air flow is produced on either side of the discharge port 69 from the side in which the humidifying rotor 63 is present toward the negative pressure space. In contrast, an air flow that is blown out from the outlet port 44 is produced in front of the bell mouth 52.

[0110] The route r5 is formed in the outdoor unit 30B so that air that changes direction at the guide structure 56Bb shown in FIGS. 22 and 23 flows from the outlet port 44 and goes through the intake port 68a and then the moisture absorption section 61 to flow out through the discharge port 69. As a result, outdoor air may be guided effectively to the moisture absorption section 61 by the outdoor fan 39B whereby the moisture absorption function is improved. Consequently, a dedicated fan and/or driving motor for driving the dedicated fan conventionally provided for guiding air into the moisture absorption section 61 may be omitted. While the dedicated fan and the like is described as being omitted in the above embodiments, the reduction in size of the humidifying unit 60B is still possible if the dedicated fan and/or driving motor is made smaller instead of being omitted. If the size of the humidifying unit 60B is reduced, the outdoor unit 30B may also be reduced in size.

(6-2)

[0111] The configuration of the third embodiment shown in FIG. 23 is one in which only air guided through the outdoor fan 39B and along the guide structure 56Bb in the route 5 is sucked in at the intake port 68a. Outdoor air can be effectively guided into the intake port 68a by sufficiently using the air flow produced by the outdoor fan 39 in this configuration.

[0112] While a configuration in which the air guided along the guide structure 56Ab shown in FIG. 13 in the route r1 (first route) is used to draw in the air guided on the route r4 (second route) is not described in the third embodiment, an opening part such as the opening part 56Aba in the second embodiment may be provided in the guide structure 56Bb facing the intake port 68a of the third embodiment to make a route corresponding to the route r4 so that air with a higher humidity than the air on the route r1 may be guided into the moisture absorption section 61.

(6-3)

[0113] The guide structure 56Bb is formed on the grill 56B, and the grill 56B and the guide structure 56Bb are attached to the front plate 46B as shown in FIGS. 21 to 23. That is, the attachment of the guide structure 56Bb may be conducted due to the attachment of the grill 56B, whereby the attachment of the guide structure 56Bb may be conducted very easily.

[0114] While the grill 56B and the guide structure 56Bb have been described as being formed integrally in the third embodiment, the grill 56B and the guide structure 56Bb may also be separate. The guide structure 56Bb may be attached directly to the front plate 46B instead of a case in which the guide structure 56Bb is attached indirectly via the grill 56B as in the above embodiments.

[0115] As described above, the guide structure 56Bb is formed on the grill 56B and is configured with a portion in which the opening parts 56a of the grill 56B are not formed. As a result, the formation of the guide structure 56Bb may be conducted at the same time as the formation of the grill 56B. Consequently, a dedicated step for forming the guide structure 56Bb may not be added and the outdoor unit 30B having the guide structure 56Bb may be provided at a low cost.

(6-4)

[0116] As shown in FIG. 20, the moisture absorption duct 68 in the humidifying unit 60B is provided above the outdoor fan 39B in the same way as the humidifying unit 60. The moisture absorption duct 68 of the humidifying unit 60B also curves downward from a line drawn through a midpoint between the upper edge and the lower edge thereof in the same way as the moisture absorption duct 68 of the humidifying unit 60. As a result, outdoor air rising from below on the route

r1 is easily sucked into the moisture absorption duct 68, and the outdoor air supplied to the moisture absorption section 61 increases whereby humidifying performance is improved.

(6-5)

[0117] The rib 56r shown in FIGS. 22 and 23 is provided between the guide structure 56Bb and the front plate 46B and is a partitioning member that partitions a space sandwiched between the guide structure 56Bb and the front plate 46B. The flow of air guided from the outlet port 44 to the intake port 68a due to the provision of the rib 56r passes through a channel surrounded on three sides by the front plate 46B, the guide structure 56Bb, and the rib 56r. Air may be effectively fed into the intake port 68a since the flow of air that deviates from the pathway and does not reach the intake port 68a is suppressed since the flow of air is surrounded by the channel formed by providing the rib 56r the partitioning member. While the partitioning member preferably touches, for example, the front plate 46B to partition the space without any gaps in order to suppress the flow of air flowing in an unnecessary direction, the partitioning member is not required to touch the front plate 46B.

[0118] Moreover, the rib 56r is able to smoothly guide the flow of air blown out from the outdoor fan 39B and turning in the rotating direction of the outdoor fan 39B, to the intake port 68a since the rib 56r extends in the rotating direction of the outdoor fan 39B. Consequently, pressure caused by the rib 56r on the flow of air guided to the intake port 68a may be reduced.

(7) Modifications

(7-1)

[0119] While a pair-type of air conditioner 10 in which one indoor unit 20 is connected to one outdoor unit 30B is described in the above third embodiment as shown in FIG. 17, the type of air conditioner applicable to the present invention is not limited to the pair-type. For example, a multi-type air conditioner in which one outdoor unit is connected to a plurality of indoor units may be applicable to the present invention.

(7-2)

[0120] While the inside of the casing 40B of the outdoor unit 30B is described as being partitioned into the blower chamber 41B and the machine chamber 42B in the third embodiment, the outdoor unit of the present invention may be configured so long as the blower chamber 41B is provided inside the casing 40B, and a partitioned space other than the blower chamber 41B and the machine chamber 42 may be formed and the machine chamber 42, for example, may be provided as another chamber including other functions.

(7-3)

[0121] While the outdoor heat exchanger 33 is described as having an L-shape when seen from above in the third embodiment, the outdoor heat exchanger that is configured in the outdoor unit of the present invention is not limited to the above shape. For example, a configuration with an outdoor heat exchanger having an I-shape as seen from above may be possible.

(7-4)

[0122] The humidifying unit 60B may be provided with the exhaust duct 80 in the same way as the humidifying unit 60 shown in FIG. 5.

(7-5)

[0123] While the outdoor fan 39B is described as having the propeller 39Bb in the third embodiment, the outdoor fan 39B is not limited to having the propeller 39Bb. The outdoor unit of the present invention may be configured with an outdoor fan having a type of blade other than a propeller type.

(7-6)

[0124] While a dedicated fan for guiding outdoor air to the moisture absorption section 61 and a motor for driving the fan are omitted in the third embodiment, a dedicated fan and a motor for driving the dedicated fan that are made smaller

than conventional ones may be attached. Even in this case, since air is blown to the moisture absorption section 61 by the outdoor fan 39B, the outdoor unit may be made more compact than the prior art by an amount corresponding to the amount that the dedicated fan for guiding the outdoor air to the moisture absorption section 61 and/or the motor for the dedicated fan may be reduced in comparison to the prior art.

(7-7)

[0125] While a location between the turbo fan 75B and the air supply duct 18 is described as being partitioned by the partition plate 43B in the third embodiment, another location may be partitioned as described in the first and second embodiments.

(7-8)

[0126] The grill 56B of the third embodiment includes a rib 56s that is only formed in the guide structure 56Bb at a location other than the overlapping portion 56Bb2 that overlaps the outlet port 44 as shown in FIGS. 22 and 23. However, the guide structure may also have a baffle member that hinders the flow of air flowing in the direction from the intake port toward the outlet port in the vicinity of an edge part near the rotational center of the outdoor fan. For example, by using a grill 56C shown in FIG. 24 in place of the grill 56B shown in FIG. 22 to hinder the flow of air flowing in the direction from the intake port 68a toward the outlet port 44, a rib 56t may be formed as a baffle member on an edge part 56Cb3 of a guide structure 56Cb near a rotational center 39Bb1 of the outdoor fan 39B. In this case, the flow of air in the direction from the intake port 68a toward the outlet port 44 may be suppressed by the rib 56t whereby the amount of air guided to the intake port 68a increases in comparison to the grill 56B. The grill 56C has the same structure as the grill 56B except for the structure of the rib 56s. Moreover, the baffle member is not limited to a rib structure such as the rib 56t. While the baffle member may be configured of another member such as a plastic film or sponge and the like, the baffle member preferably has a structure that is integrated with the grill 56B such as the rib 56t.

(7-9)

[0127] The inner surface of the guide structure 56Cb in the grill 56C of the third embodiment is formed flat, as shown in FIG. 24. However, a rectifying member may be provided mounted between the guide structure and the front plate and that smoothly extends from the outlet port toward the intake port. For example, by using a grill 56D shown in FIGS. 25 and 26 in place of the grill 56B shown in FIG. 22, ribs 56u that are mounted on the inner surface of a guide structure 56Db, that is, between the guide structure 56Db and the front plate 56B, and that extend smoothly from the outlet port 44 toward the intake port 68a may be provided as rectifying members. According to the above structure, the flow of air is tightened due to the air flowing along the ribs 56u toward the intake port 68a, whereby noise caused by the flow of air toward the intake port 68a may be suppressed. The grill 56D has the same structure as the grill 56B except for the structure of the rib 56s and the ribs 56u. Moreover, while the rectifying members are not limited to the rib structure such as the ribs 56u, the rectifying members are preferably integrated with the grill 56B in the same way as the ribs 56u.

REFERENCE SIGNS LIST

[0128]

10	Air conditioner
20	Indoor unit
30, 30B	Outdoor unit
33	Outdoor heat exchanger
39, 39B	Outdoor fan
40, 40B	Casing
41, 41B	Blower chamber
56, 56A, 56B, 56C, 56D	Grill
60, 60B	Humidifying unit
63	Humidifying rotor
68	Moisture absorption duct
73	Humidifying duct
75, 75B	Turbo fan

CITATION LIST

PATENT LITERATURE

[0129]

(Patent Literature 1) Japanese Laid-open Patent Application 2004-353898
〈Patent Literature 2〉 Japanese Laid-open Patent Application 2008-241212.

Claims

1. An outdoor unit for an air conditioner, the outdoor unit comprising:

a casing (40) including a blower chamber (41) through which outdoor air passes;
an outdoor heat exchanger (33) that is mounted in the blower chamber and conducts a heat exchange with outdoor air;
an outdoor fan (39, 39B) that is mounted in the blower chamber and that blows outdoor air into the outdoor heat exchanger;
a guide structure (56b, 56Ab, 56Bb, 56Cb, 56Db) that changes the direction of a portion of air blown by the outdoor fan; and
a humidifying unit (60) that includes a moisture absorption section (61) for absorbing moisture from outdoor air, a moisture desorption section (62) for desorbing moisture to humidify air, and an intake port (68a) and a discharge port (69) for outdoor air supplied to the moisture absorption section, the humidifying unit being configured so that the discharge port is faced a negative pressure space around the outdoor fan, and air changed to a different direction by the guide structure flows from the intake port through the moisture absorption section and flows out through the discharge port.

2. The outdoor unit for an air conditioner according to claim 1, wherein
all of the air sucked in from the intake port is air that is guided through the outdoor fan and along the guide structure (56b, 56Bb, 56Cb, 56Db).

3. The outdoor unit for an air conditioner according to claim 1, wherein
the humidifying unit collectively sucks in, at the intake port, air guided along the guide structure via a first route (r1) and air guided via a second route (r4) that differs from the first route.

4. The outdoor unit for an air conditioner according to any one of claims 1 to 3, wherein
the casing comprises a front plate (46, 46B) having an outlet port through which outdoor air is blown by the outdoor fan; and
the guide structure is provided to the front plate so as to cover a portion of the outlet port.

5. The outdoor unit for an air conditioner according to claim 4, wherein
the casing further includes a grill (56, 56Ab, 56Bb, 56Cb, 56Db) that is attached to the front plate and that covers the outlet port of the front plate; and
the guide structure is formed on the grill.

6. The outdoor unit for an air conditioner according to claim 4 or 5, further comprising:

a partitioning member (56r) that is provided between the guide structure (56Bb) and the front plate (56B) and that partitions a space sandwiched between the guide structure and the front plate thereby forming a channel that surrounds the flow of air flowing from the outlet port (44) toward the intake port (68a).

7. The outdoor unit for an air conditioner according to claim 6, wherein
the partitioning member extends in a rotating direction of the outdoor fan.

8. The outdoor unit for an air conditioner according to any of claims 4 through 7, wherein
the guide structure (56Cb) includes a baffle member (56t) that hinders the flow of air in a direction from the intake port toward the outlet port in the vicinity of an edge part near a rotational center of the outdoor fan.

9. The outdoor unit for an air conditioner according to any one of claims 4 to 8, further comprising:

a rectifying member (56u) that is provided between the guide structure (56Db) and the front plate and that extends from the outlet port toward the intake port.

10. The outdoor unit for an air conditioner according to any one of claims 1 to 9, wherein
the humidifying unit further includes a moisture absorption duct (68) that is provided above the outdoor fan and that guides outdoor air from the intake port to the moisture absorption section, the moisture absorption duct being curved downward when seen from the side.

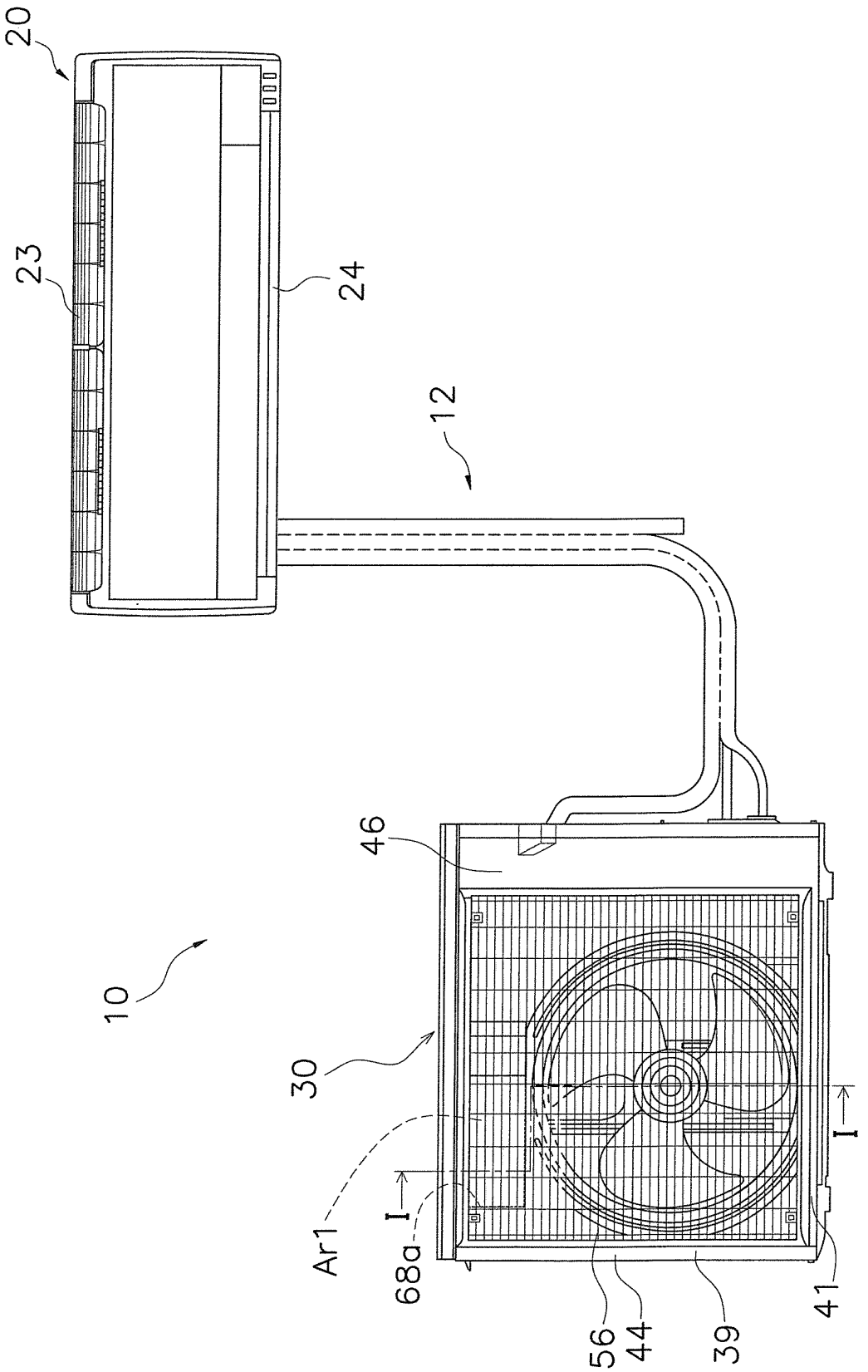
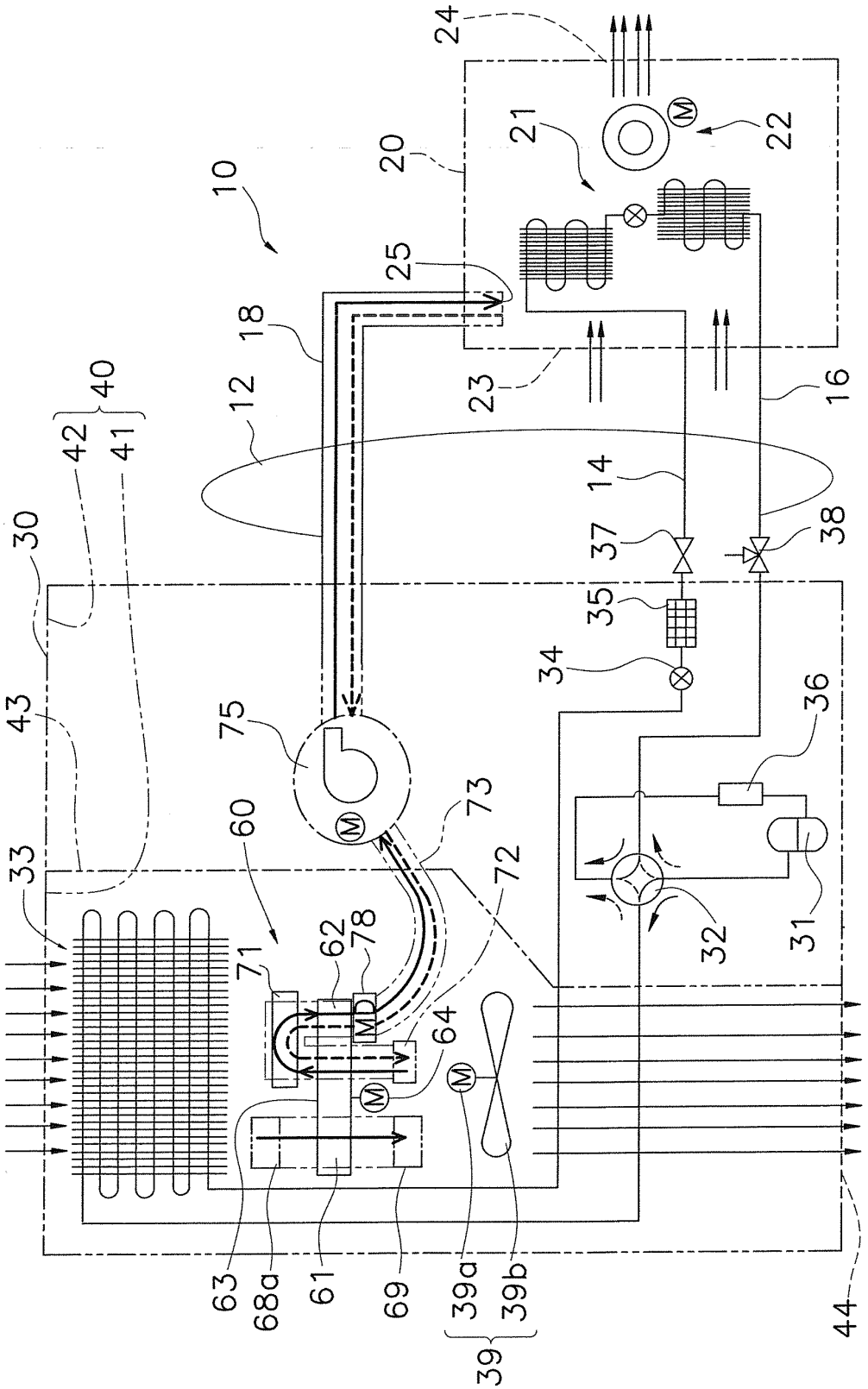


FIG. 1

FIG. 2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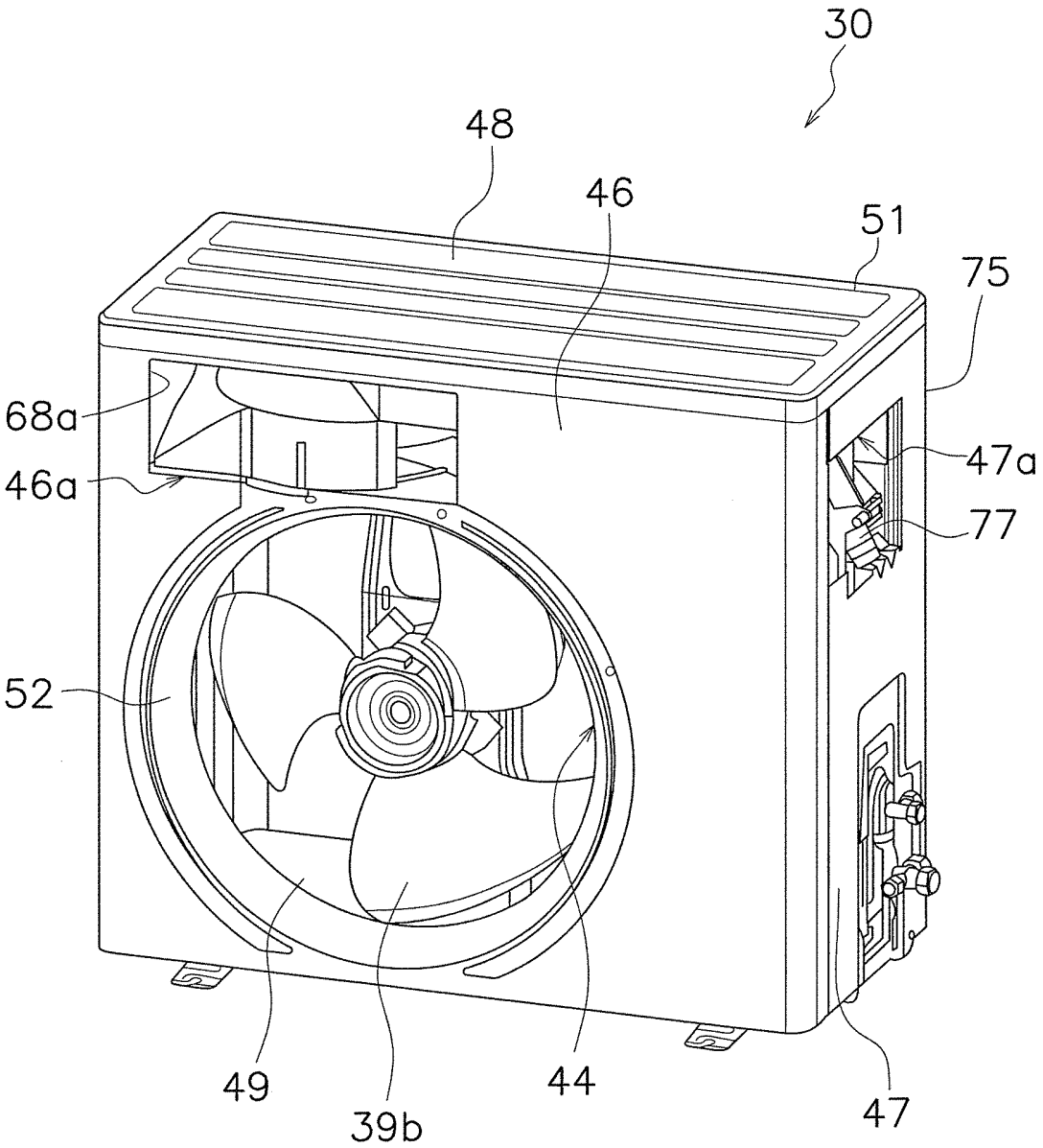


FIG. 3

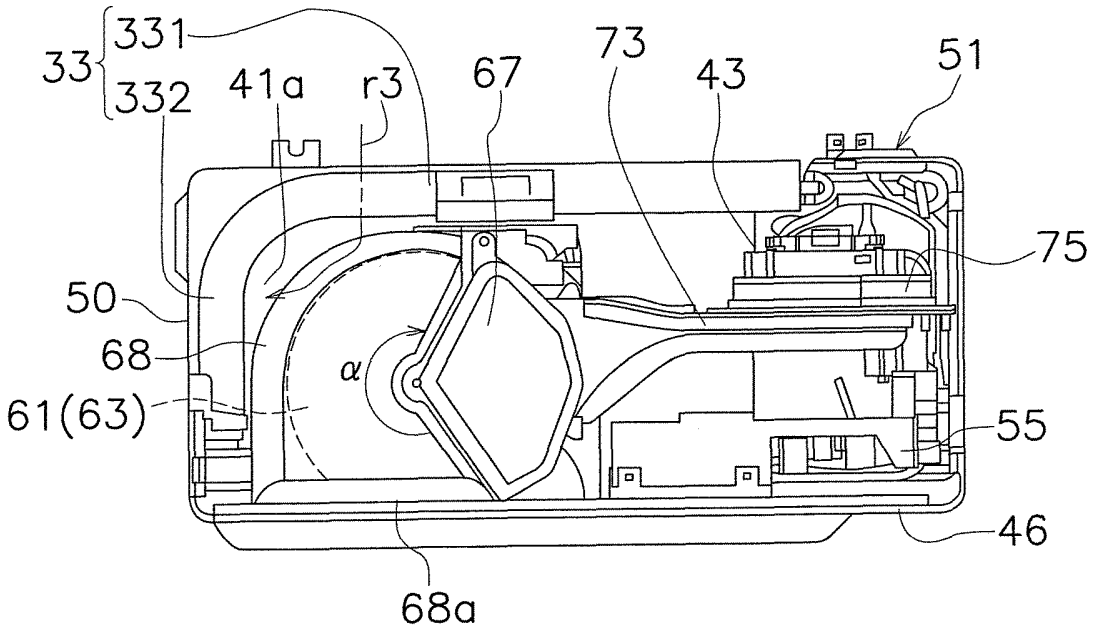


FIG. 4

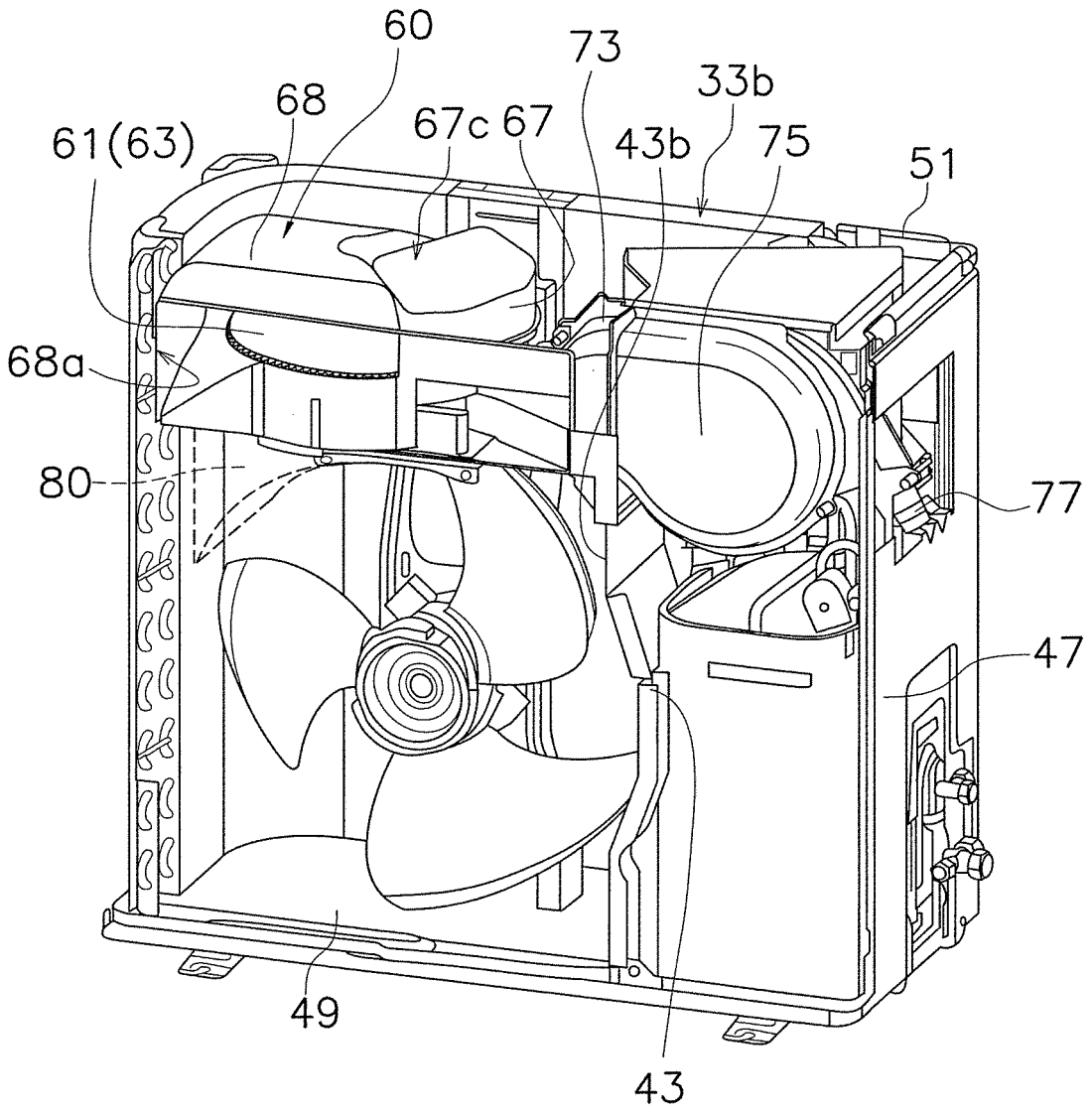


FIG. 5

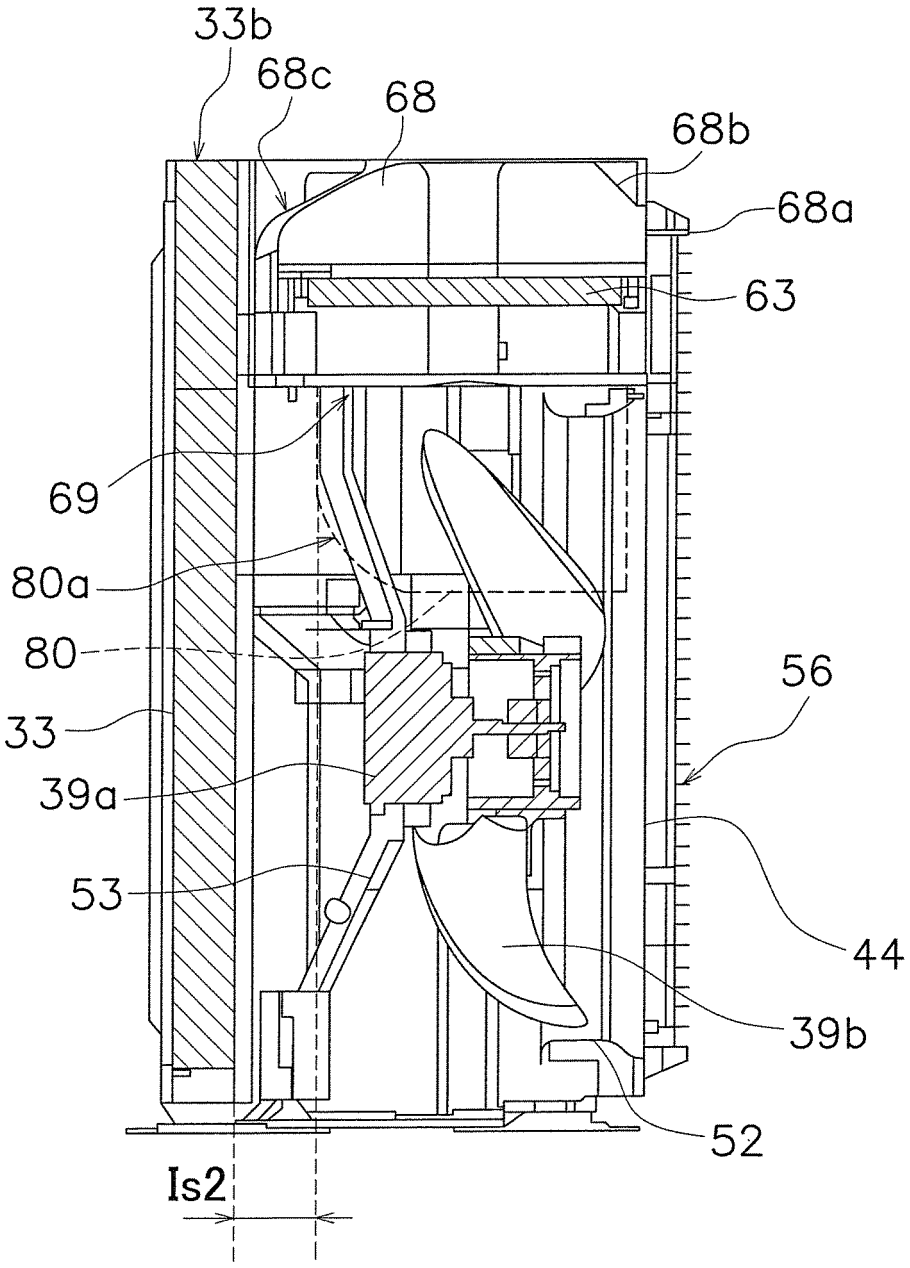


FIG. 6

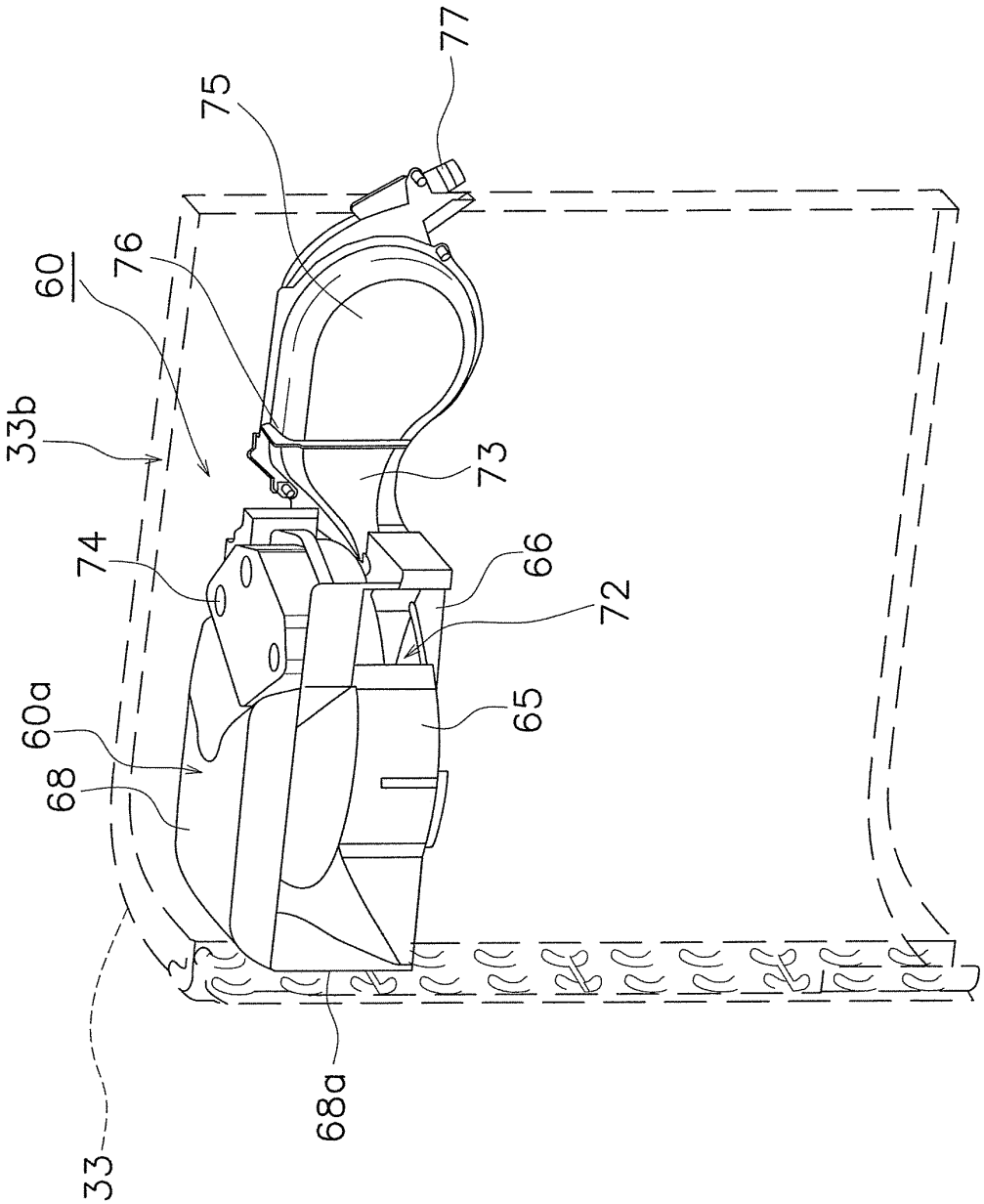


FIG. 7

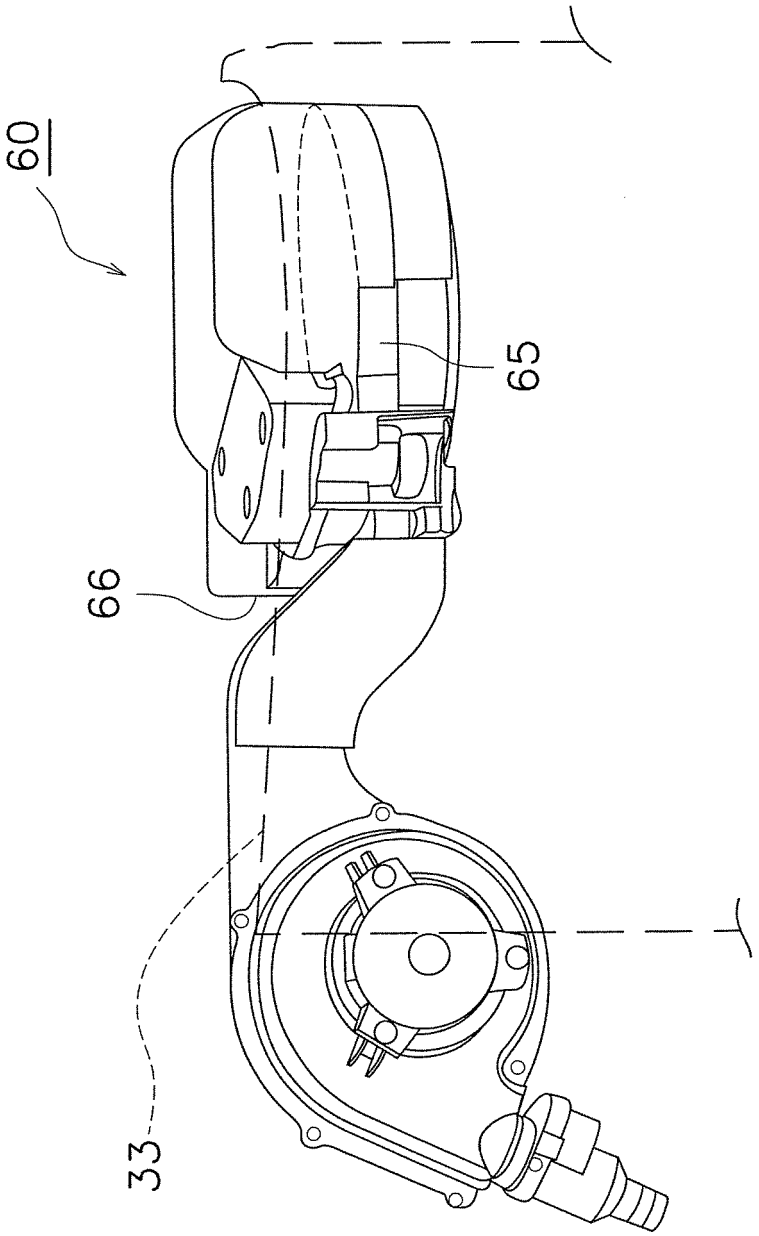


FIG. 8

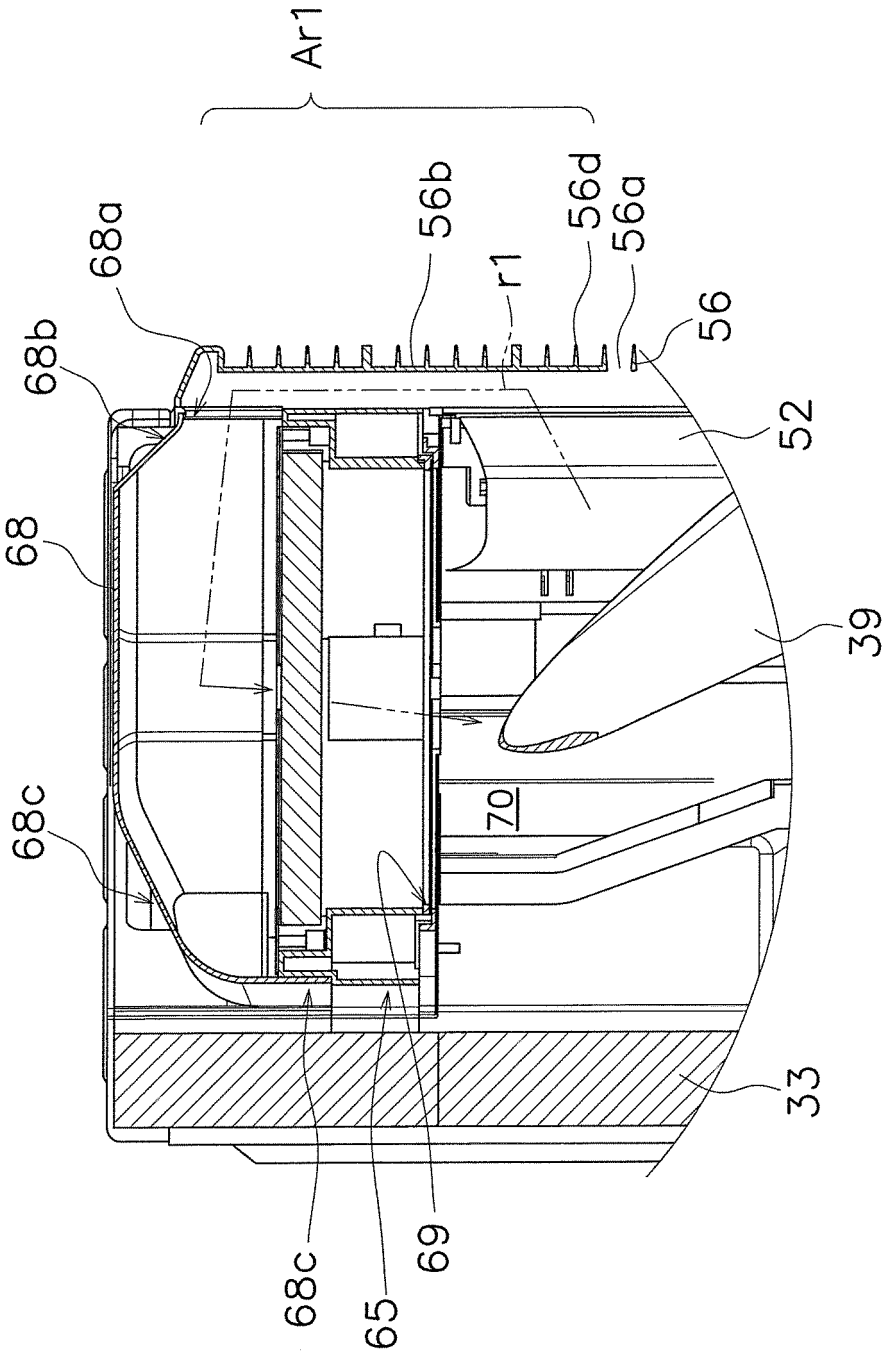


FIG. 9

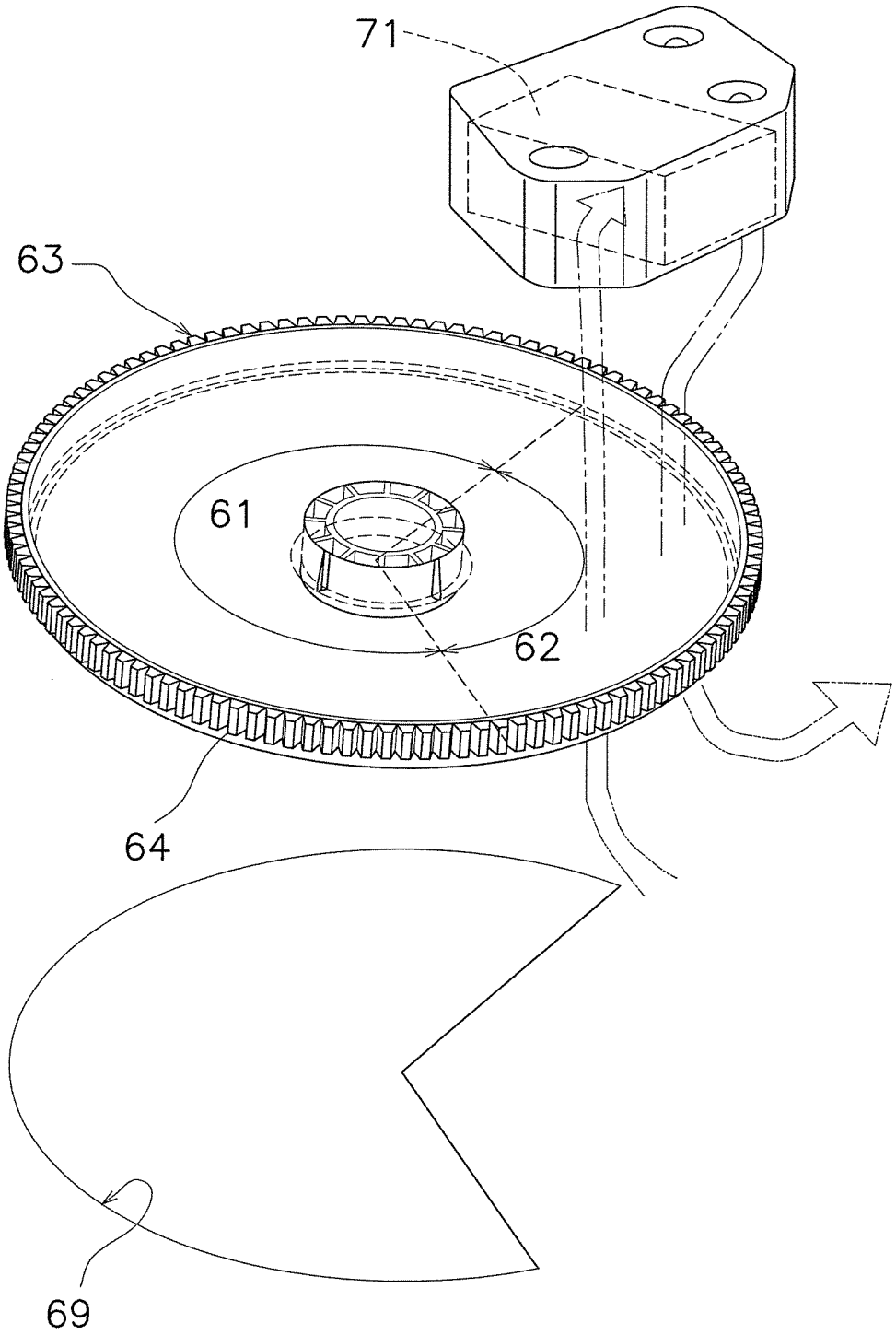


FIG. 10

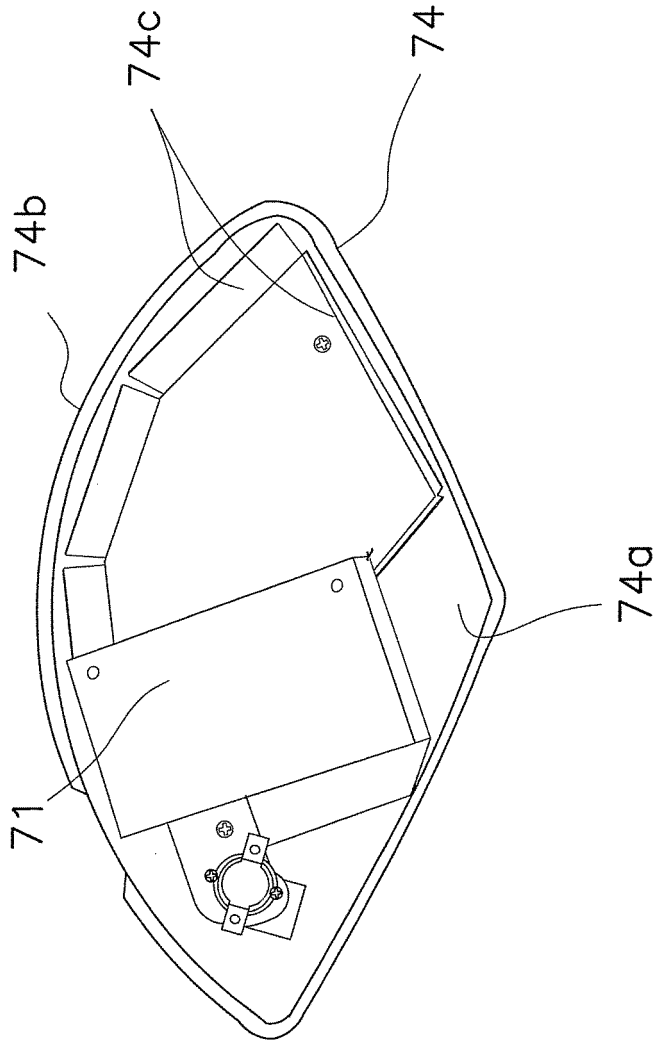


FIG. 11

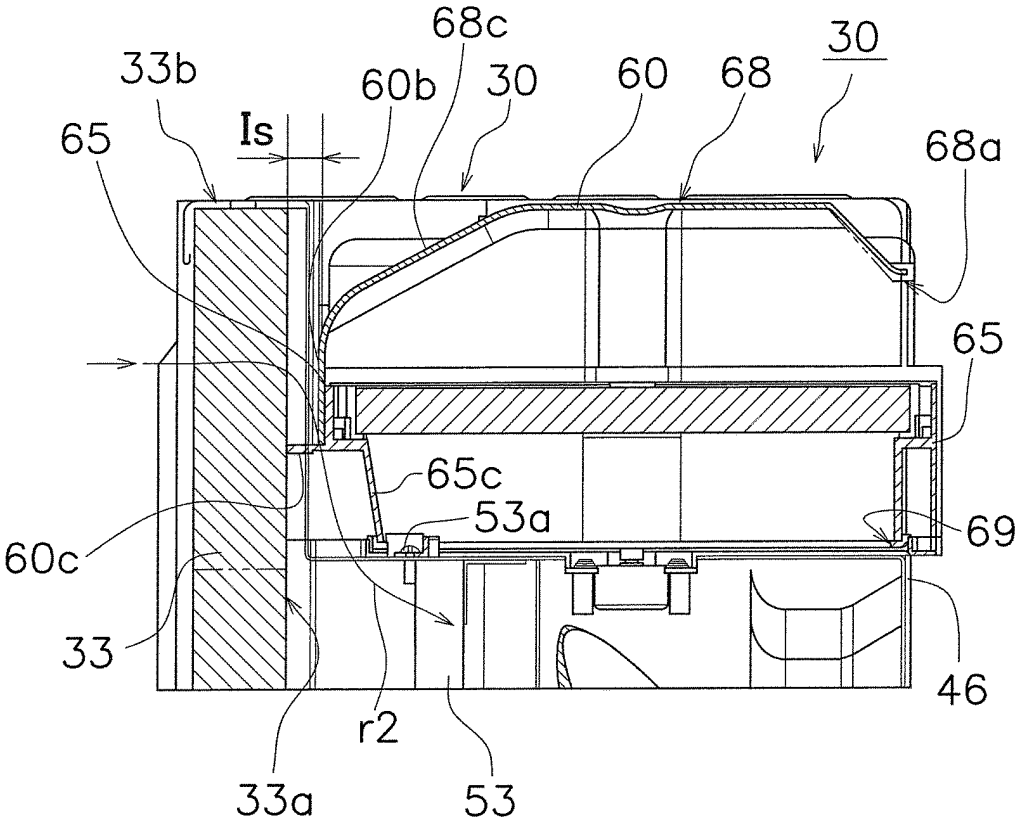
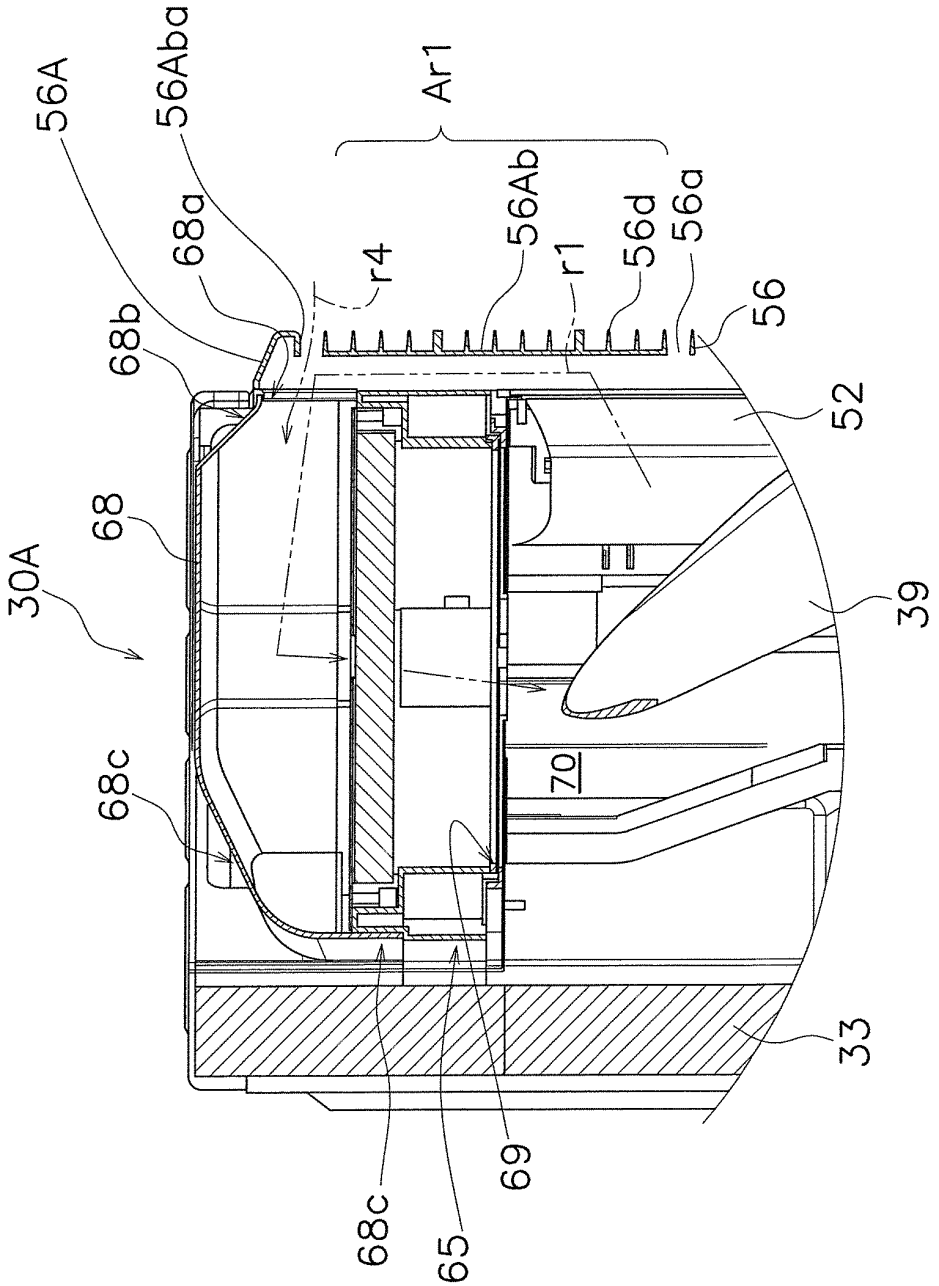


FIG. 12


56A
56Aba
Ar1
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r4
56Ab
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56d
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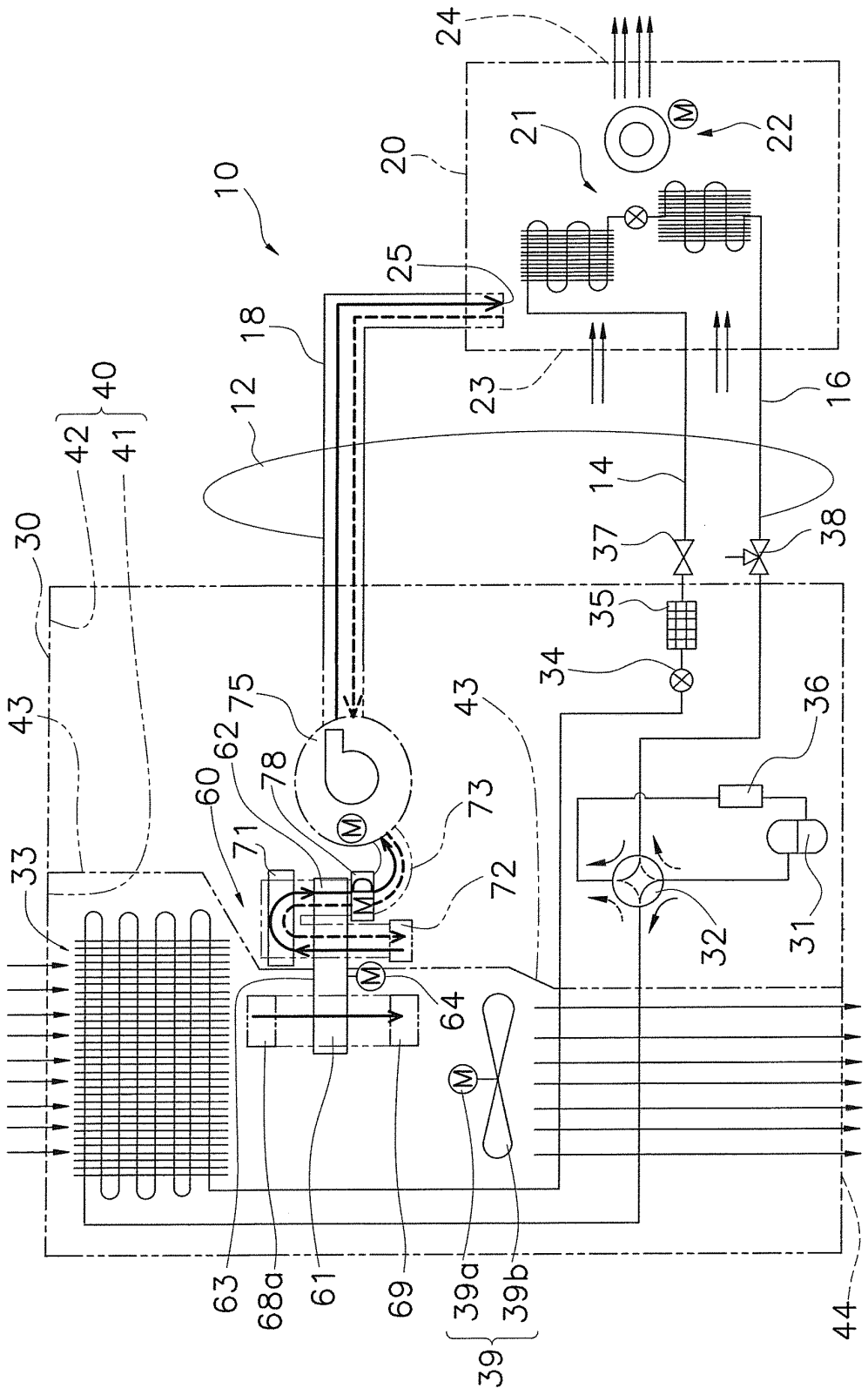
FIG. 13

FIG. 14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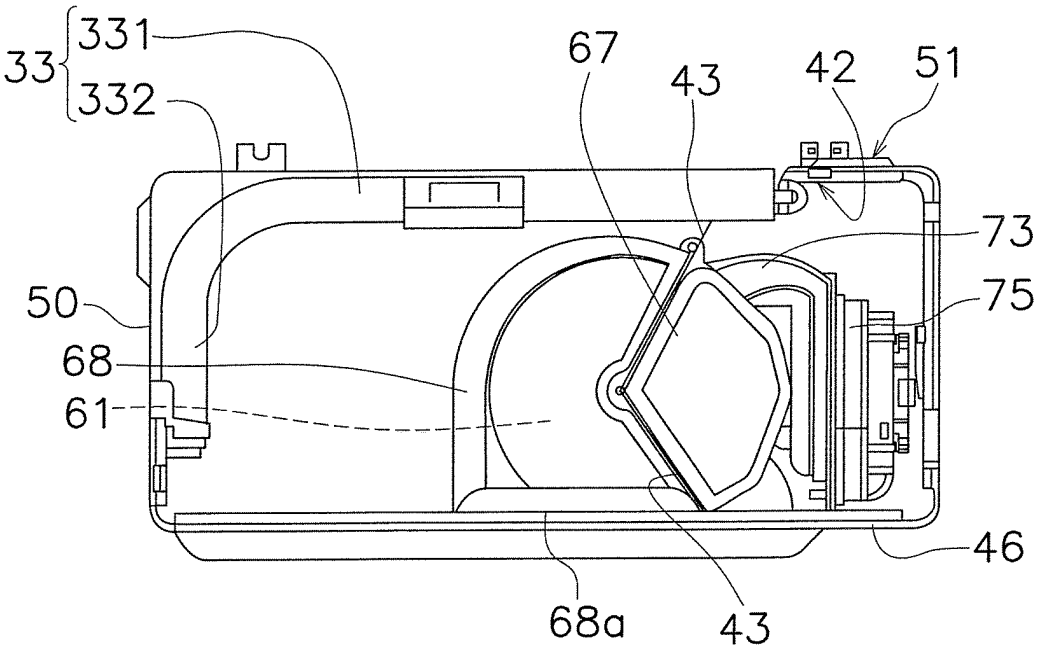


FIG. 15

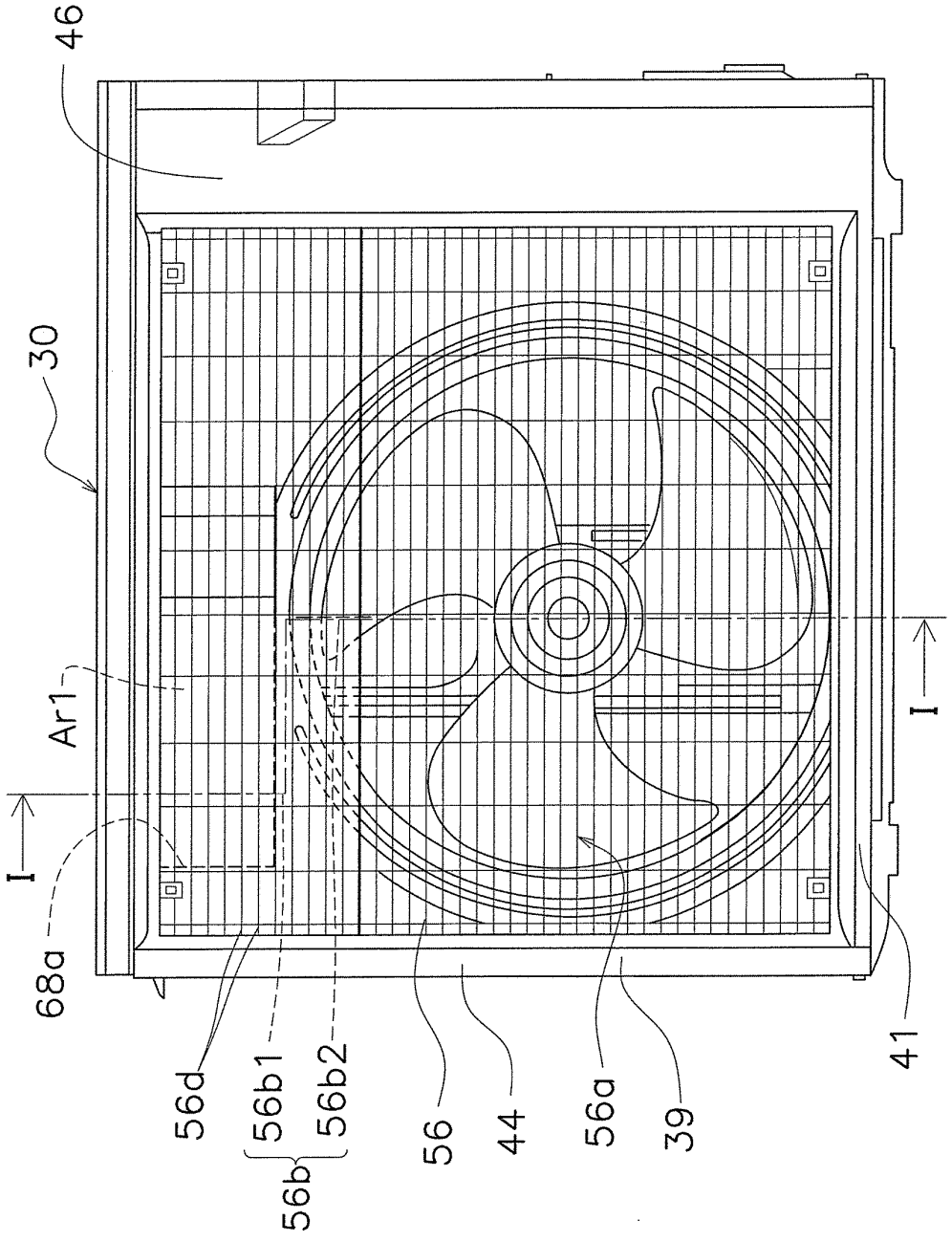
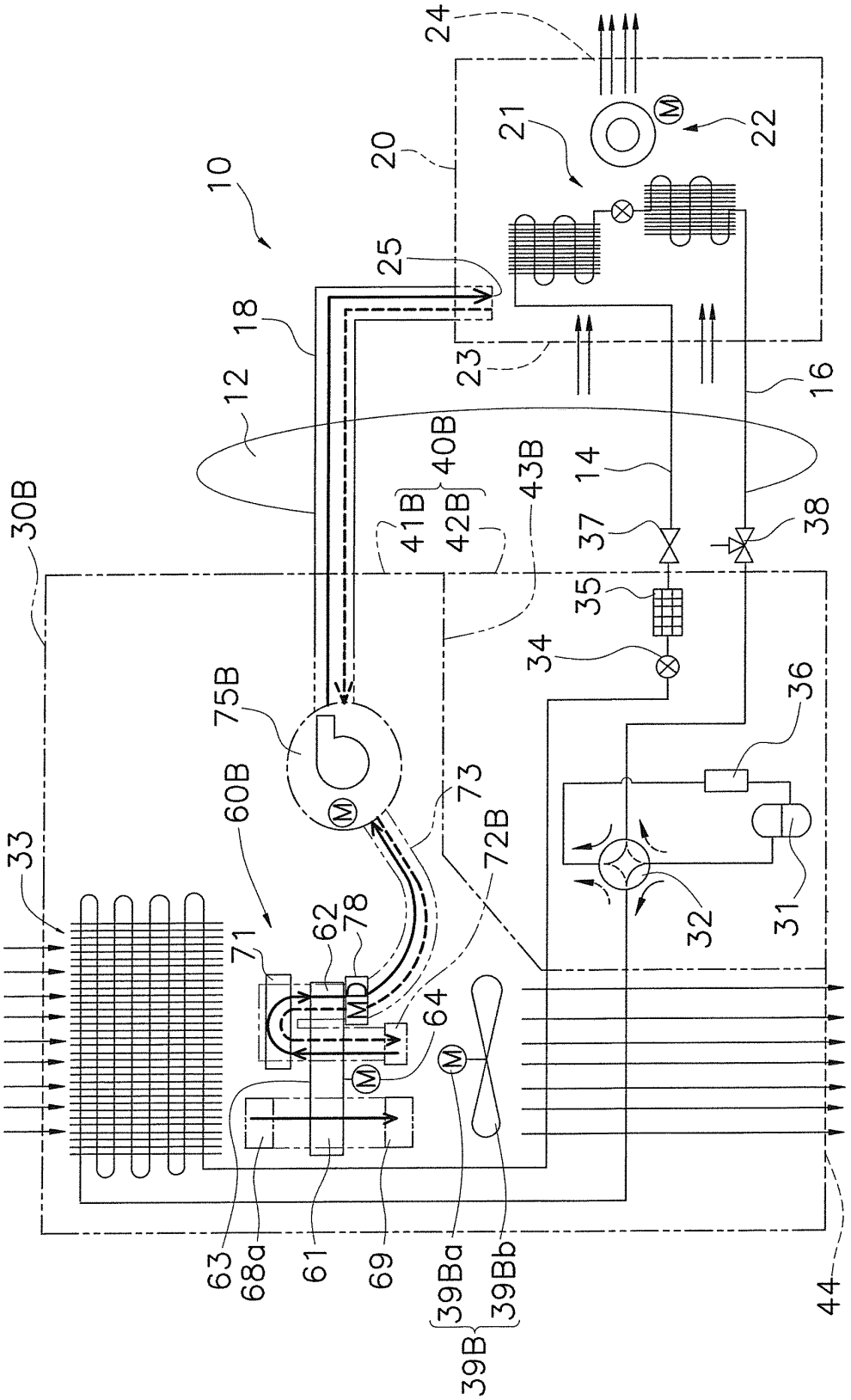


FIG. 16

FIG. 17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39B
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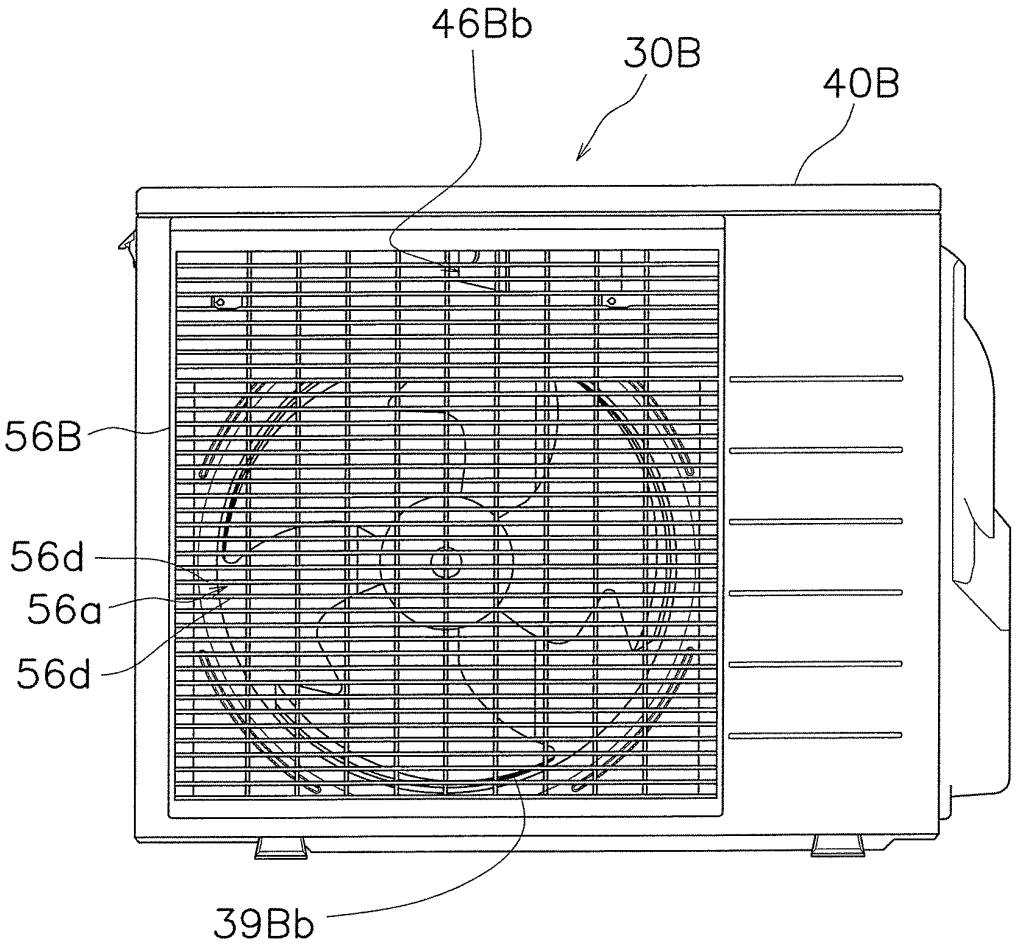


FIG. 18

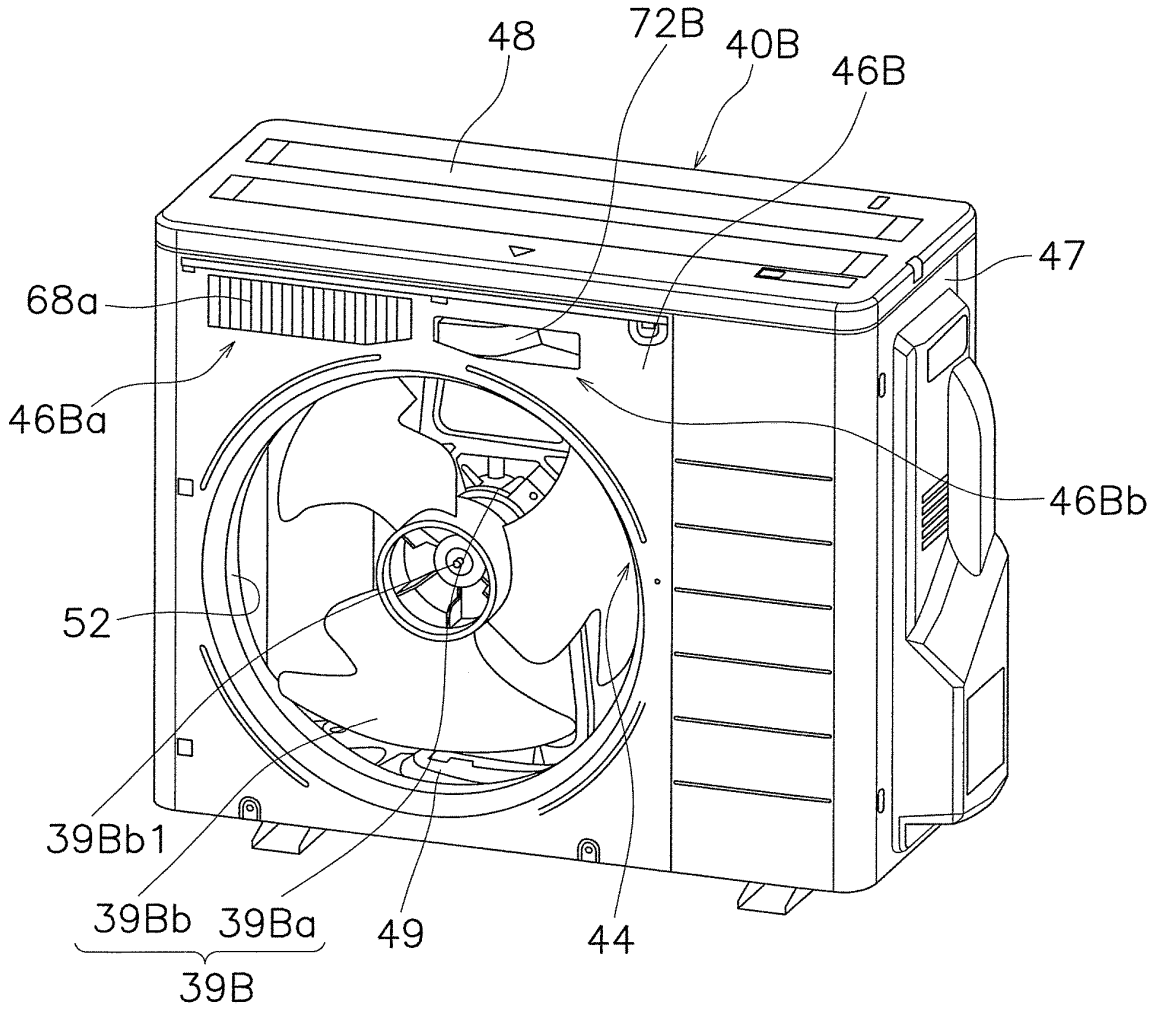
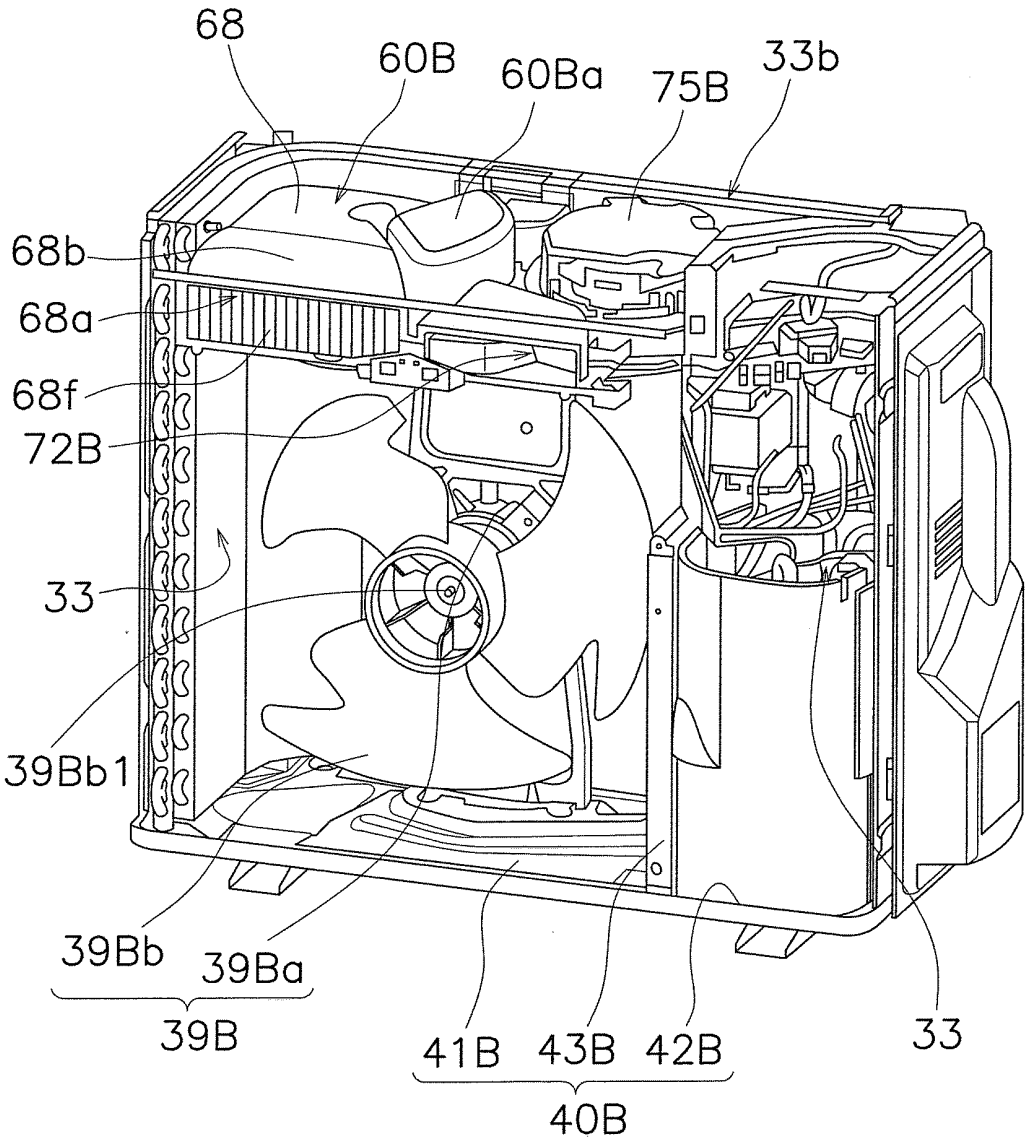


FIG. 19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43B
42B
40B
33

FIG. 20

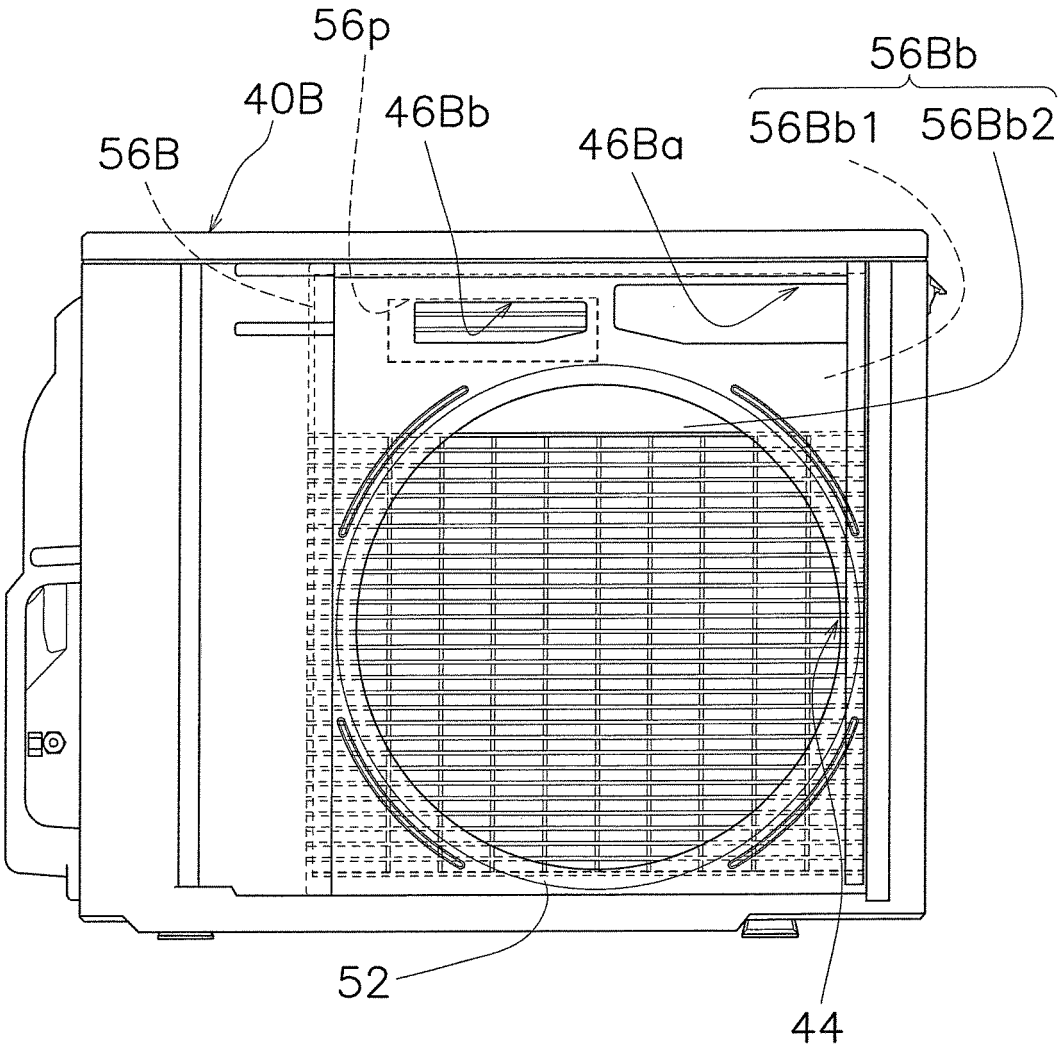

FIG. 21

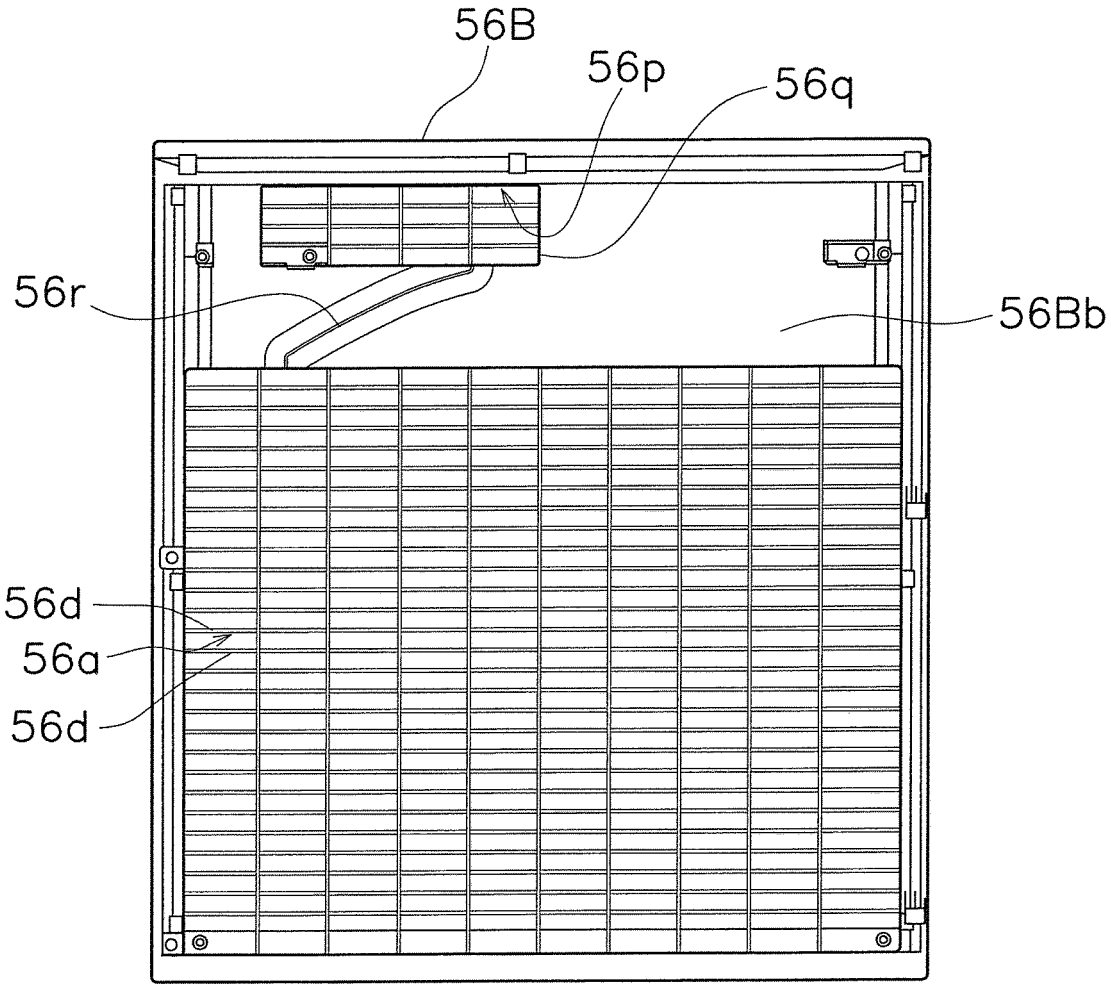

FIG. 22

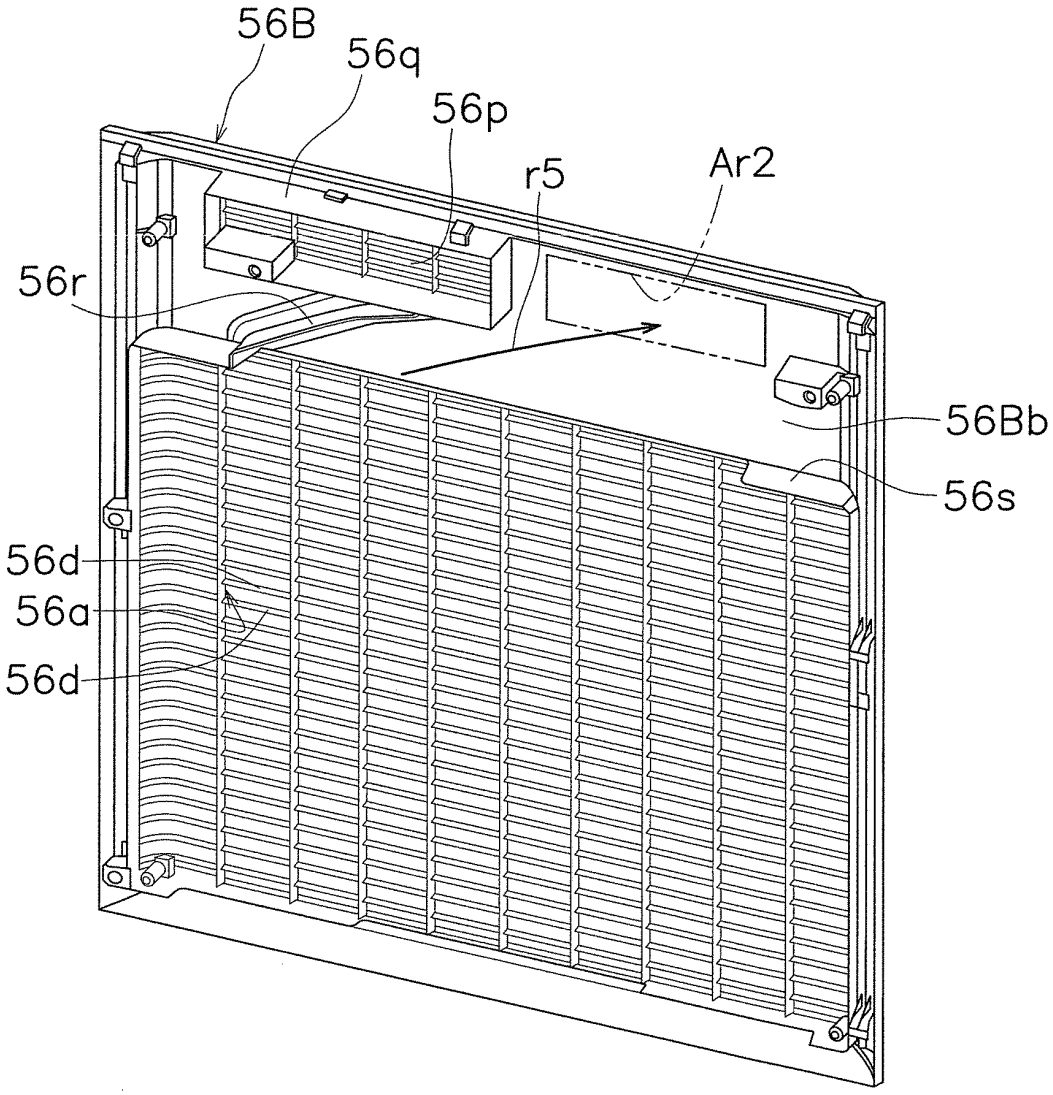

FIG. 23

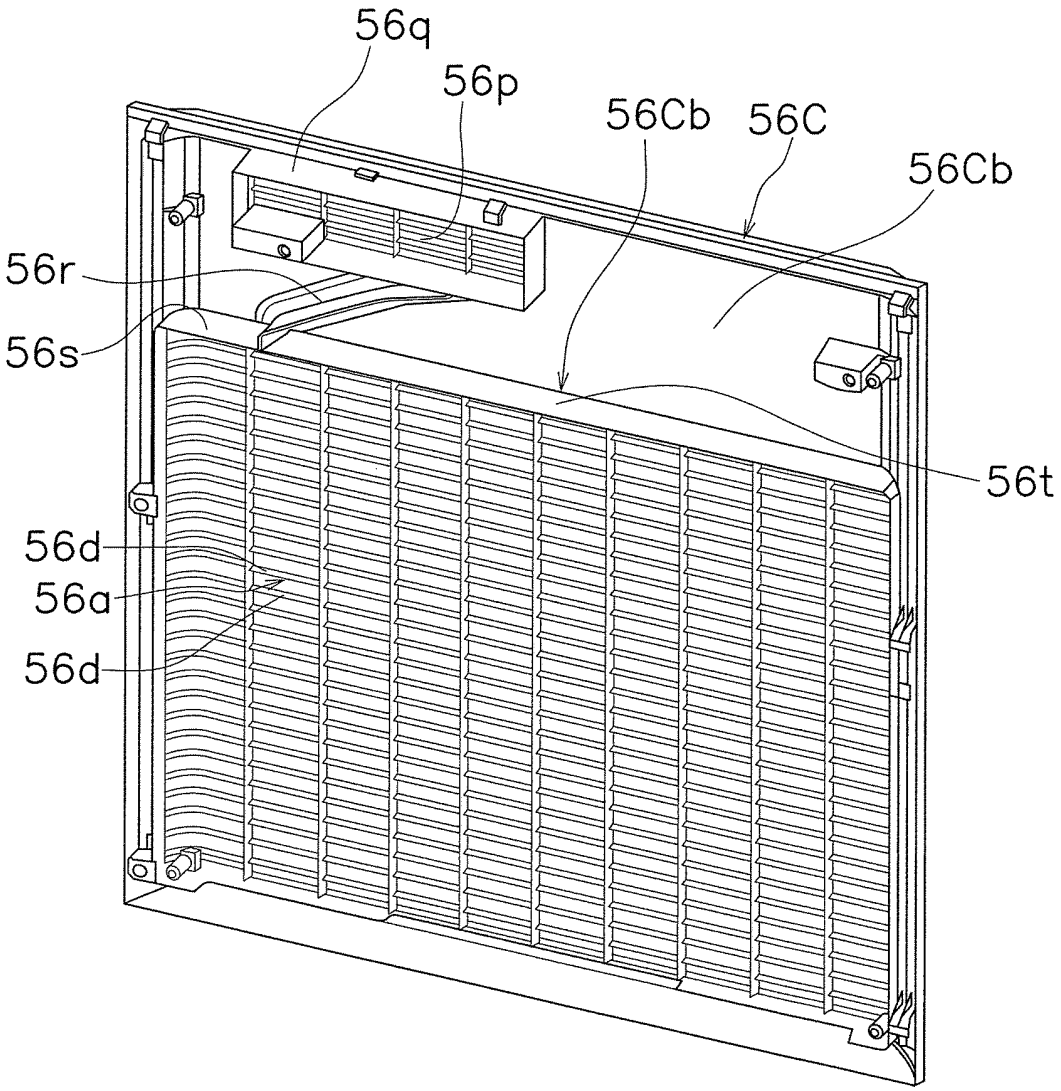

FIG. 24

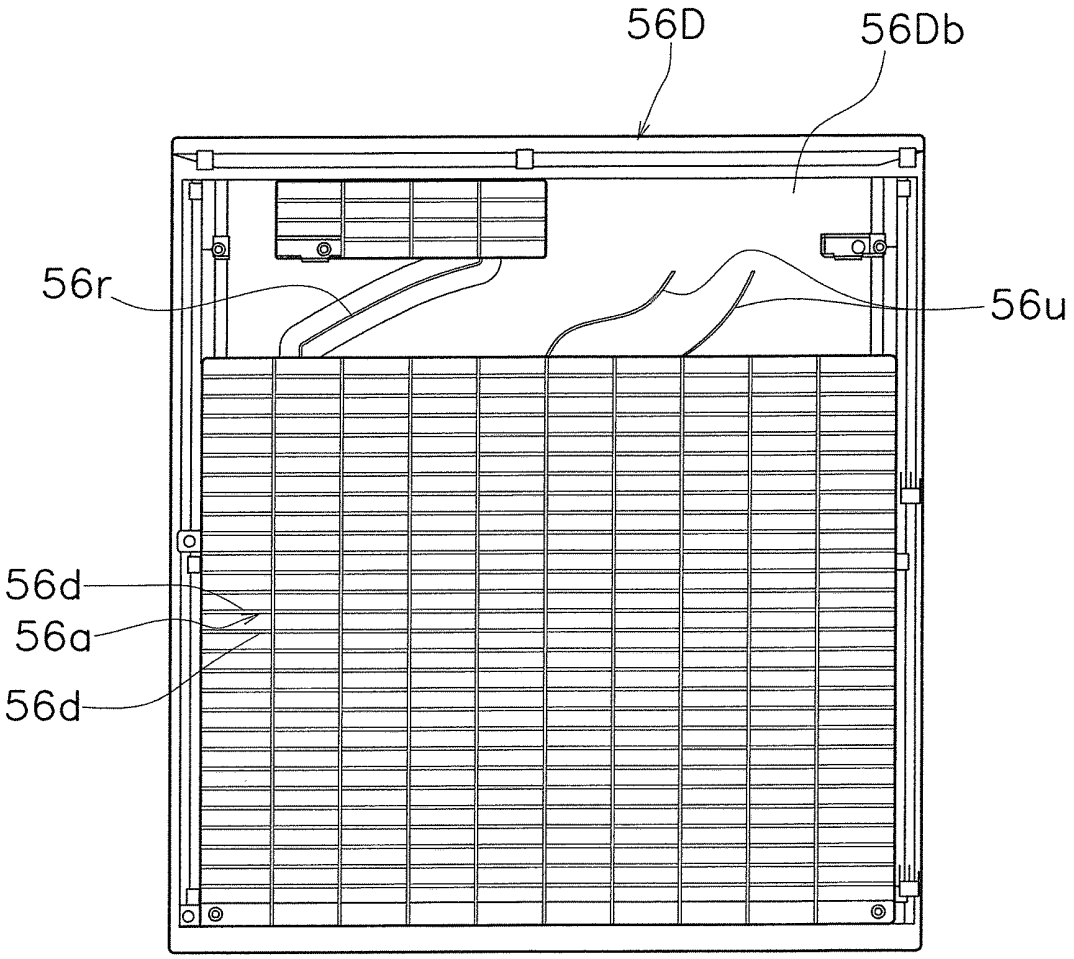

FIG. 25

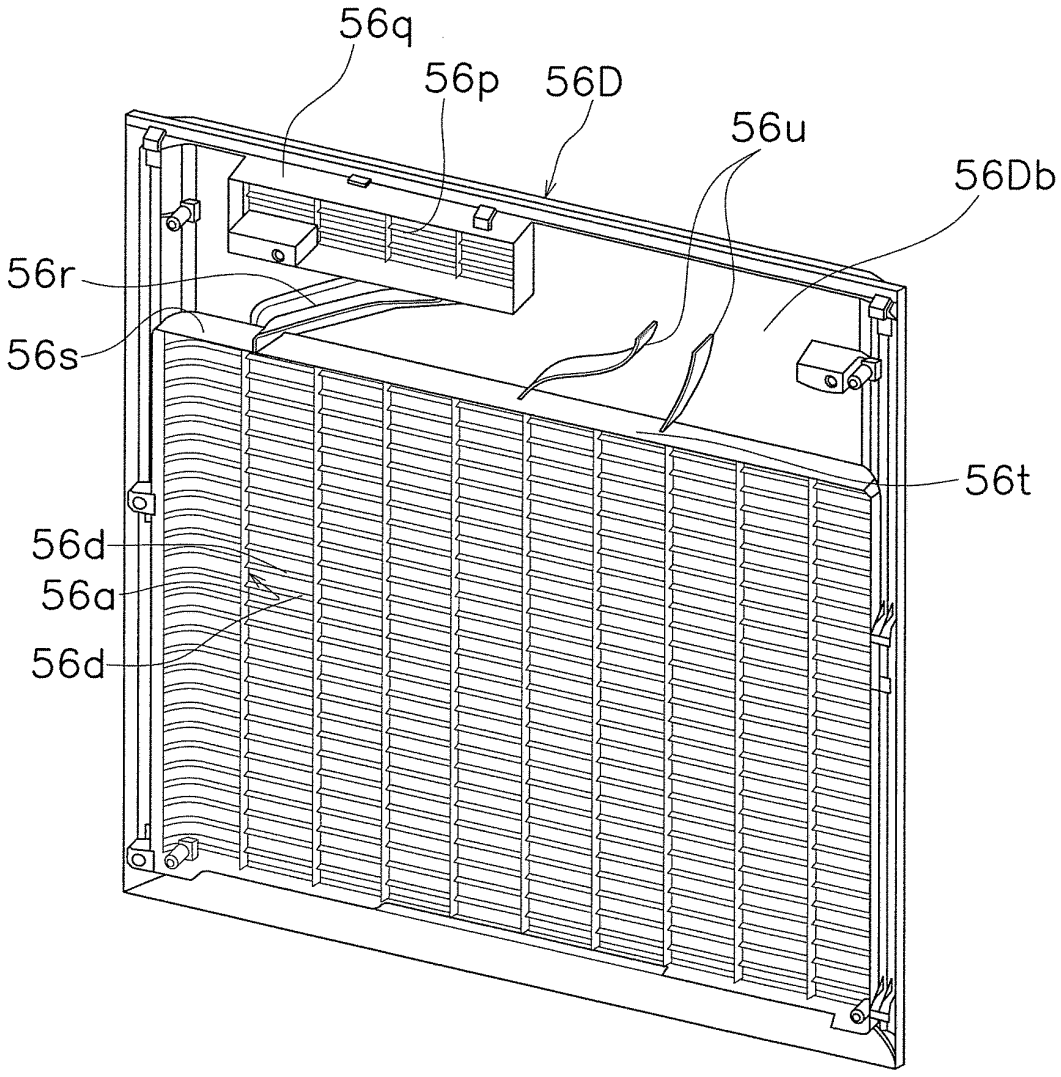

FIG. 26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/064036

A. CLASSIFICATION OF SUBJECT MATTER
F24F1/54(2011.01)i, *F24F1/46*(2011.01)i, *F24F6/00*(2006.01)i, *F24F6/10*(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)
F24F1/54, F24F1/46, F24F6/00, F24F6/10

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 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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 2002-089896 A (Daikin Industries, Ltd.), 27 March 2002 (27.03.2002), paragraphs [0029] to [0050]; fig. 1 to 8 & EP 1326056 A1 & WO 2002/023094 A1 & DE 60135135 D & CN 1446301 A & AT 403116 T & ES 2307634 T	1-4 5-10
Y A	JP 2002-098373 A (Daikin Industries, Ltd.), 05 April 2002 (05.04.2002), paragraphs [0014] to [0022]; fig. 1, 2 (Family: none)	1-4 5-10
Y A	JP 2010-043848 A (Daikin Industries, Ltd.), 25 February 2010 (25.02.2010), paragraphs [0050] to [0054]; fig. 1 to 3 (Family: none)	3 5-10

☒ 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
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"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	Date of mailing of the international search report
09 August, 2012 (09.08.12)	21 August, 2012 (21.08.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/064036

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-321116 A (Matsushita Electric Industrial Co., Ltd.), 17 November 2005 (17.11.2005), paragraphs [0009] to [0018]; fig. 1, 2 (Family: none)	5-10

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004353898 A **[0002] [0129]**
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