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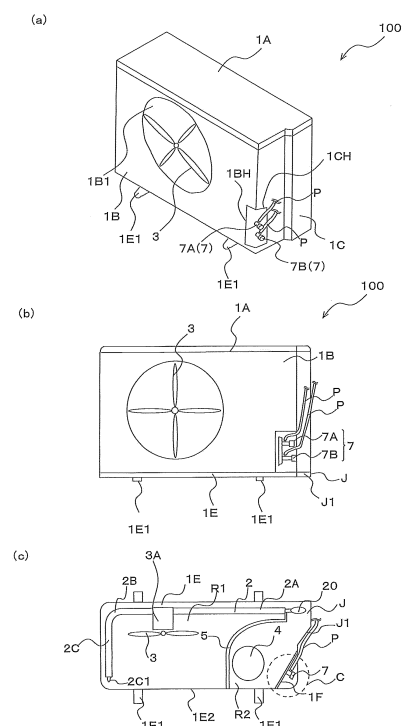
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(54) **OUTDOOR UNIT**

(57) An outdoor unit is configured to accommodate a compressor and is connected to a refrigerant pipe used for circulating refrigerant between an indoor unit. The outdoor unit includes a bottom panel disposed under the compressor so as to support the compressor, a first side panel disposed on a peripheral edge of the bottom panel, a second side panel disposed at a position facing the first side panel on the peripheral edge of the bottom panel, and an outdoor heat exchanger supported above the bottom panel and extending in a direction from the first side panel toward the second side panel, wherein the outdoor heat exchanger has an end portion facing one of side end portions of the second side panel, and the bottom panel includes a projection formed at a position corresponding to the end portion of the outdoor heat exchanger and protruding in a direction from the first side panel toward the second side panel.

FIG. 2



Description

Technical Field

[0001] The present invention relates to an outdoor unit of a refrigeration cycle apparatus.

Background Art

[0002] Conventionally, an outdoor unit of refrigeration cycle apparatus such as air-conditioning apparatus has a casing that accommodates, for example, a compressor, a heat exchanger, a blower and the like. The outdoor unit of air-conditioning apparatus is connected via a refrigerant pipe to an indoor unit that accommodates a heat exchanger, a blower and the like. When the blower is actuated, outside air is supplied to the heat exchanger so that heat is exchanged between air and refrigerant which flows in the heat exchanger. The capability of the refrigeration cycle apparatus such as heating and cooling depends on the amount of heat exchange between air and refrigerant. That is, the larger the size of heat exchanger is, the larger heating capacity and cooling capacity can be obtained.

[0003] According to Patent Literature 1, the outdoor unit has a rectangular shaped bottom panel and the heat exchanger is disposed, for example, to extend in a long side direction of the bottom panel. This allows a large sized heat exchanger to be accommodated in the casing of the outdoor unit.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 5-133571

Summary of Invention

Technical Problem

[0005] In general, the outdoor unit of air-conditioning apparatus is installed outside the building. For example, when the outdoor unit is installed in an apartment building, the outdoor unit is installed in a balcony. Compared to an individual house that usually has an available space for installation of the outdoor unit such as a garden, an installation space in a balcony of an apartment building is relatively small and is often limited. Accordingly, besides the indoor unit which is installed inside the building, the outdoor unit which is installed outside the building is also required to be reduced in size.

[0006] Increasing the size of outdoor unit allows a larger sized heat exchanger to be accommodated in the casing, thereby obtaining larger heating capacity and cooling capacity. However, as the outdoor unit increases in size, there may be a problem for the outdoor unit in installation

outside the building.

[0007] The present invention has been made to overcome the above problem, and an object of the invention is to provide an outdoor unit capable of housing a larger heat exchanger (outdoor heat exchanger) while preventing increasing in size of the outdoor unit.

Solution to Problem

[0008] According to an aspect of the invention, there is provided an outdoor unit configured to accommodate a compressor and connected to a refrigerant pipe used for circulating refrigerant between an indoor unit and the outdoor unit, the outdoor unit comprising: a bottom panel disposed under the compressor to support the compressor; a first side panel disposed on a peripheral edge of the bottom panel; a second side panel disposed at a position facing the first side panel on the peripheral edge of the bottom panel; and an outdoor heat exchanger supported above the bottom panel and extending in a direction from the first side panel toward the second side panel, wherein the outdoor heat exchanger has an end portion facing one of side end portions of the second side panel, and the bottom panel includes a projection formed at a position corresponding to the end portion of the outdoor heat exchanger, the projection protruding in a direction from the first side panel toward the second side panel. Advantageous Effects of Invention

[0009] According to an outdoor unit of the present invention having the above configuration, a larger heat exchanger (outdoor heat exchanger) can be used while preventing increasing in size of the outdoor unit.

Brief Description of Drawings

[0010]

[Fig. 1] Fig. 1 is a schematic view of a refrigeration cycle apparatus having an outdoor unit according to Embodiment of the present invention.

[Fig. 2] Fig. 2 is a schematic view which shows a configuration of the outdoor unit according to Embodiment of the present invention.

[Fig. 3] Fig. 3 is an explanatory view of a casing of the outdoor unit according to Embodiment of the present invention.

[Fig. 4] Fig. 4 is a top view of a bottom panel of the outdoor unit according to Embodiment of the present invention.

[Fig. 5A] Fig. 5A is an explanatory view of and around a valve of the outdoor unit according to Embodiment of the present invention.

[Fig. 5B] Fig. 5B is an explanatory view which shows a bottom panel, a fixed panel, a valve, a refrigerant pipe and a cover of the outdoor unit according to Embodiment of the present invention.

[Fig. 5C] Fig. 5C is an explanatory view of a state in which the cover of Fig. 5B is removed.

[Fig. 6] Fig. 6 is a modified example 1 of the outdoor unit according to Embodiment of the present invention.

[Fig. 7A] Fig. 7A is a modified example 2 of the outdoor unit according to Embodiment of the present invention.

[Fig. 7B] Fig. 7B is a modified example 3 of the outdoor unit according to Embodiment of the present invention.

[Fig. 7C] Fig. 7C is a modified example 4 of the outdoor unit according to Embodiment of the present invention.

[Fig. 7D] Fig. 7D is a modified example 5 of the outdoor unit according to Embodiment of the present invention.

[Fig. 7E] Fig. 7E is a modified example 6 of the outdoor unit according to Embodiment of the present invention.

[Fig. 8] Fig. 8 is a schematic view of a horizontal cross section of the outdoor unit of a conventional air-conditioning apparatus. Description of Embodiments

[0011] With document to the drawings, an outdoor unit 100 according to Embodiment of the invention will be described. In the accompanying drawings including Fig. 1, the same reference signs refer to the same or corresponding elements throughout the entire disclosure herein.

Embodiment

[0012] Fig. 1 is a schematic view of an air-conditioning apparatus 200 having an outdoor unit 100 according to Embodiment. Fig. 1 (a) is an example of a refrigerant circuit configuration of the air-conditioning apparatus 200, and Fig. 1 (b) shows that the outdoor unit 100 and an indoor unit 150 are connected via a refrigerant pipe P. The following Embodiment shows an example in which a refrigeration cycle apparatus is the air-conditioning apparatus 200.

[Air-conditioning apparatus 200]

[0013] The air-conditioning apparatus 200 includes the indoor unit 150 and the outdoor unit 100 which are connected via the refrigerant pipe P. The indoor unit 150 includes an indoor heat exchanger 151 which serves as an evaporator during cooling operation and a condenser during heating operation. Cooling energy or heating energy is generated in the outdoor unit 100 and is delivered to the indoor unit 150 via the refrigerant pipe P.

[0014] The outdoor unit 100 is disposed, for example, outside of a building, an apartment house or an individual house, and supplies cooling energy or heating energy to the indoor unit 150 via the refrigerant pipe P. The outdoor unit 100 includes a compressor 4 that compresses refrigerant, a four-way valve 8 that switches flow passages,

an expansion device 9 that reduces the pressure of refrigerant, an outdoor heat exchanger 2 that exchanges heat between air and refrigerant and a blower 3 that supplies air to the outdoor heat exchanger 2.

[0015] The indoor unit 150 is installed at a position suitable for supplying cooling air or heating air into a space to be air-conditioned, for example, in a room, and supplies cooling air or heating air into the air-conditioned space. The indoor unit 150 includes the indoor heat exchanger 151 that exchanges heat between air and refrigerant, and a blower 152 that supplies air to the indoor heat exchanger 151.

[0016] The indoor heat exchanger 151, the four-way valve 8 and the expansion device 9 will be described. The indoor heat exchanger 151 exchanges heat between room air which is suctioned by the blower 152 into the indoor unit 150 and refrigerant so that refrigerant is condensed and liquefied during heating operation and refrigerant is evaporated and gasified during cooling operation. The four-way valve 8 switches a flow of refrigerant during heating operation and a flow of refrigerant during cooling operation and defrost operation. During heating operation, the four-way valve 8 allows a discharge side of the compressor 4 to communicate with the indoor heat exchanger 151 and allows a suction side of the compressor 4 to communicate with the outdoor heat exchanger 2. Further, during cooling operation and defrost operation, the four-way valve 8 allows the discharge side of the compressor 4 to communicate with the outdoor heat exchanger 2 and allows the suction side of the compressor 4 to communicate with the indoor heat exchanger 151. The expansion device 9 reduces the pressure of refrigerant which flows in the refrigerant circuit and allows the refrigerant to be expanded. The expansion device 9 is connected to the outdoor heat exchanger 2 at one end and to the indoor heat exchanger 151 at the other end. The expansion device 9 may be a device capable of variably controlling an opening degree such as an electronic expansion valve. Other configuration (such as the compressor 4) will be described later.

[0017] Next, with document to Fig. 1 (a), a refrigeration cycle operation of a refrigerant circuit shown in the figure will be described. Here, a flow of refrigerant during heating operation will be described. At the start of heating operation, the four-way valve 8 switches the flow passage as shown in Fig. 1 (a). Gas refrigerant which is compressed and discharge by the compressor 4 flows into the indoor heat exchanger 151 via the four-way valve 8. Then, the gas refrigerant which flows into the indoor heat exchanger 151 exchanges heat with the room air supplied by the blower 152 and is condensed, and then flows out from the indoor heat exchanger 151. The refrigerant which flows out from the indoor heat exchanger 151 flows into the expansion device 9, and is expanded and decompressed by the expansion device 9. The decompressed refrigerant flows into the outdoor heat exchanger 2, and exchanges heat with outside air supplied by the blower 3 and is gasified, and then flows out from

the outdoor heat exchanger 2. The gas refrigerant which flows out from the outdoor heat exchanger 2 is suctioned into the compressor 4 via the four-way valve 8.

[Outdoor unit 100]

[0018] Fig. 2 is a schematic view which shows a configuration of an outdoor unit 100 according to Embodiment. Fig. 3 is an explanatory view of a casing of the outdoor unit 100 according to Embodiment of the present invention. Fig. 4 is a top view of a bottom panel 1 E of the outdoor unit 100 according to Embodiment. Fig. 2(a) is a perspective view of the outdoor unit 100, Fig. 2(b) is a front view of the outdoor unit 100, and Fig. 2(c) is a cross sectional view of the outdoor unit. Fig. 2 shows a state in which a cover 1 D is removed. Fig. 3(a) is a view of the outdoor unit 100 seen from the right side. Fig. 3(b) is a perspective view of the outdoor unit 100 with various components such as the outdoor heat exchanger 2 and the blower 3 having been removed from the casing.

[0019] The outdoor unit 100 includes the outdoor heat exchanger 2 which serves as a condenser during cooling operation and as an evaporator during heating operation. In the following description, the front panel 1 B is defined as a front surface (front side) of the outdoor unit, the side on which a first side panel 1 CC is located with respect to the front side is defined as left side, and the side on which a second side panel 1 C is located with respect to the front side is defined as right side.

[0020] The casing of the outdoor unit 100 includes a top panel 1 A that forms the top surface of the outdoor unit 100, a front panel 1 B that forms the front surface of the outdoor unit 100, a first side panel 1 CC that forms the left side surface of the outdoor unit 100, a second side panel 1 C that forms the right side surface of the outdoor unit 100, a fan grille 1 B2 that is disposed on the front panel 1 B and forms part of the front surface of the outdoor unit 100, and a bottom panel 1 E that forms the bottom of the outdoor unit 100. In this configuration, the first side panel 1 CC, the front panel 1 B and the second side panel 1 C correspond to a peripheral panel. That is, the peripheral panel is disposed on a peripheral edge 1 E1 of the bottom panel 1 E and stands on the bottom panel 1 E.

[0021] Further, the outdoor unit 100 includes a partition 5 that separates an inner space of the outdoor unit 100 into the right and left spaces, the compressor 4 that compresses and discharges refrigerant, the outdoor heat exchanger 2 that has an L-shaped horizontal cross section, the blower 3 that supplies outside air to the outdoor heat exchanger 2, and a motor support 3A that holds the blower 3. The outdoor unit 100 further includes the four-way valve 8 and an electric component box (not shown in the figure) that accommodates a controller that controls the rotation speed of the compressor 4 and the like.

[0022] The outdoor unit 100 further includes a fixed panel 1 F that is disposed at a corner C of the bottom panel 1 E so as to be located on the inner side of the

peripheral panel and stands upright on the bottom panel 1 E, a roof panel 1 FF that is connected to the fixed panel 1 F, a valve 7 that is fixed to the fixed panel 1 F and is connected to the refrigerant pipe P, and a cover 1 D that is mounted to cover the valve 7.

(Top panel 1 A)

[0023] The top panel 1 A forms the top surface of the outdoor unit 100. The top panel 1 A is mounted on the upper end portion of the peripheral panel so as to cover the upper part of the outdoor heat exchanger 2. The top panel 1 A is in contact with the top panel 1 A at the front end portion and the left end portion, respectively, so as to be supported by the front panel 1 B and the first side panel 1 CC, and is in contact with the second side panel 1 C at the right end portion so as to be supported by the second side panel 1 C. The top panel 1 A is formed of, for example, a metal plate.

(Front panel 1 B and first side panel 1 CC)

[0024] The front panel 1 B forms part of the front surface of the outdoor unit 100. The first side panel 1 CC is disposed on the left end portion of the front panel 1 B, and the second side panel 1 C is disposed on the right end portion of the front panel 1 B. Further, the cover 1 D is attached on the right end portion of the front panel 1 B. In Embodiment, the first side panel 1 CC is integrally formed with the front panel 1 B.

[0025] The front panel 1 B has a lower end portion disposed on the peripheral edge 1 E1 of the bottom panel 1 E, and an upper end portion disposed on the top panel 1 A. Further, the right end portion of a front surface-forming portion of the front panel 1 B extends along the front end portion of the second side panel 1 C. Moreover, the front panel 1 B has a circular opening 1 B1 which serves, for example, as an inlet for outside air. The fan grille 1 B2 is disposed so as to face a position of the opening 1 B1. The front panel 1 B is formed of, for example, a metal plate.

[0026] The front panel 1 B has a front cutout portion 1 BH formed in the lower part on the end portion adjacent to the second side panel 1 C. The cover 1 D is attached on the front cutout portion 1 BH.

[0027] The first side panel 1 CC is disposed on the peripheral edge 1 E1 of the bottom panel 1 E. The first side panel 1 CC is disposed on a portion which corresponds to one of short sides of the bottom panel 1 E. The second side panel 1 C is disposed at a position facing the first side panel 1 CC. The front end portion of the first side panel 1 CC extends along the left end portion of the front panel 1 B. The first side panel 1 CC has a plurality of openings through which air is supplied to the outdoor heat exchanger 2.

(Second side panel 1 C)

[0028] The second side panel 1C forms part of the back surface and the right side surface of the outdoor unit 100. The second side panel 1C has a substantially L-shaped horizontal cross section and stands vertically upright on the bottom panel 1E, and is located on the lateral side and back side of the compressor 4. The second side panel 1C has a front end portion which is in contact with the front panel 1B, an upper end portion which is in contact with the top panel 1 A, and a lower end portion which is in contact with the bottom panel 1 E. The second side panel 1C is formed of, for example, a metal plate.

[0029] The second side panel 1C is formed to extend along the peripheral edge 1 E1 of the bottom panel 1E, as described later, and has a tapered shape surface 1CT. Since the refrigerant pipe P gradually curves when being routed along the tapered shape surface 1CT, the refrigerant pipe P is prevented from being damaged.

[0030] The second side panel 1C has a side cutout portion 1 CH formed in the lower part on the front end portion which is located adjacent to the front panel 1 B. The cover 1 D is attached to the side cutout portion 1 CH.

(Fan grille 1 B2)

[0031] The fan grille 1 B2 forms part of the front surface of the outdoor unit 100 and is provided for preventing a user from being injured by the blower 3. The fan grille 1 B2 is a grating member made up of, for example, vertical and lateral bars.

(Bottom panel 1 E)

[0032] The bottom panel 1 E forms part of the bottom of the outdoor unit 100. The bottom panel 1 E is a rectangular shaped member that is disposed under the compressor 4, the outdoor heat exchanger 2 and the like so as to support the compressor 4 and the outdoor heat exchanger 2. The bottom panel 1 E includes a corner C2 (which corresponds to the first corner) that corresponds to a position at which a projection J is formed, and a corner C (which corresponds to the second corner) that corresponds to a position at which the valve 7 is disposed.

[0033] The vertically standing peripheral edge 1 E1 is formed on the periphery of the bottom panel 1 E. That is, the peripheral edge 1 E1 is a flange-like portion formed on the peripheral edge of the bottom panel 1 E. The outdoor heat exchanger 2, the compressor 4, the partition 5 and the like are disposed on the bottom panel 1 E. The bottom panel 1 E is formed of, for example, a metal plate.

[0034] The bottom panel 1 E includes a projection J that is formed on the peripheral edge 1 E1 on which the second side panel 1C is disposed, and protrudes in the horizontal direction. The projection J is formed at a position corresponding to an end portion of the first heat exchange section 2A of the outdoor heat exchanger 2, and protrudes in the horizontal direction. The projection

J horizontally protrudes in a direction from the first side panel 1 CC toward the second side panel 1C with respect to a position at which the valve 7 is located. Further, a tapered shape surface J1 is formed on the edge of the projection J so as to extend toward a portion of bottom panel 1 E which is located under the valve 7. Accordingly, the second side panel 1C is formed to correspond to the shape of the projection J of the bottom panel 1 E. That is, the second side panel 1C is formed to extend along the edge of the projection J, and has a tapered shape surface parallel to the tapered shape surface J1.

(Partition 5)

[0035] The partition 5 is disposed to divide a space into an area in which the compressor 4 and the valve 7 are located and an area in which the outdoor heat exchanger 2 and the blower 3 are located. That is, the partition 5 separates a space into a machine chamber R1 in which the compressor 4, the valve 7 and the like are located and a blower chamber R2 in which the outdoor heat exchanger 2, blower 3, motor support 3A and the like are located. The partition 5 is disposed, for example, on the bottom panel 1 E. The front end portion of the partition 5 is disposed on the front panel 1 B and the back end portion is fixed to the end portion of the outdoor heat exchanger 2.

(Compressor 4)

[0036] The compressor 4 suctions refrigerant and then compresses the refrigerant into high temperature and high pressure state and discharges it. The compressor 4 is connected via a pipe to the four-way valve 8 that switches cooling operation and heating operation by switching a flow of refrigerant. The partition 5, the front panel 1B, the fixed panel 1 F and the like are disposed around the compressor 4. An electric component box (which is not shown in the figure) used for various controls is disposed above the compressor 4. The compressor 4 may not be necessarily directly disposed on the bottom panel 1E, and may be placed on an installation table disposed on the bottom panel 1 E.

(Outdoor heat exchanger 2)

[0037] The outdoor heat exchanger 2 exchanges heat between air suctioned by the blower 3 into the outdoor unit 100 and refrigerant so that refrigerant is condensed and liquefied during cooling operation and refrigerant is evaporated and gasified during heating operation. The outdoor heat exchanger 2 is disposed, for example, on the bottom panel 1 E. The outdoor heat exchanger 2 may not be necessarily directly disposed on the bottom panel 1E, and may be placed on an installation table disposed on the bottom panel 1 E. The motor support 3A is hung above the outdoor heat exchanger 2. The outdoor heat exchanger 2 is formed of, for example, a fin-and-tube

heat exchanger that exchanges heat between refrigerant which flows in a heat transfer tube and air which passes through a fin.

[0038] The outdoor heat exchanger 2 includes a first heat exchange section 2A that extends straight in a direction from the first side panel 1 CC toward the second side panel 1C, a curved second heat exchange section 2B, and a third heat exchange section 2C that is disposed to face the first side panel 1 CC. The first heat exchange section 2A and the second heat exchange section 2B are connected to each other, and the second heat exchange section 2B and the third heat exchange section 2C are connected to each other. A refrigerant distribution member 20 such as a header that distributes refrigerant to various pipes and heat transfer tubes is disposed on the end portion of the outdoor heat exchanger 2 adjacent to the second side panel 1C. That is, the refrigerant distribution member 20 is disposed on the end portion of the first heat exchange section 2A. Further, a hairpin 2C1 which is a heat transfer tube bent in a semicircular shape is disposed on the third heat exchange section 2C.

(Fixed panel 1 F and roof panel 1 FF)

[0039] The fixed panel 1 F is formed to separate a space into a space (machine chamber R1) in which the compressor 4 is located and a space in which the valve 7 is located. The fixed panel 1 F is a plate member which extends in the up-down direction. The fixed panel 1 F extends from the bottom panel 1 E to a height position of the upper ends of the side cutout portion 1 CH of the front cutout portion 1 BH. One end portion (on the front side) of the fixed panel 1 F is disposed to face the inner surface of the front panel 1 B and the other end portion (on the back side) of the fixed panel 1 F is disposed along the front end portion of the second side panel 1C. The fixed panel 1 F is disposed to form an acute angle between the fixed panel 1 F and the front panel 1 B.

[0040] The fixed panel 1 F is connected to the roof panel 1 FF. The roof panel 1 FF is connected to the upper end portion of the fixed panel 1 F, the front cutout portion 1 BH and the side cutout portion 1 CH, and is disposed above the valve 7. Since the fixed panel 1 F does not extend from the bottom panel 1 E to the top panel 1 A and the upper end portion of the fixed panel 1 F is disposed at the middle between the bottom panel 1 E to the top panel 1 A, the machine chamber R1 may have a large volume, thereby effectively using a limited space in the outdoor unit 100. The roof panel 1 FF is formed of, for example, a triangular shaped plate member. The roof panel 1 FF is disposed such that the apex of the corner C of the bottom panel 1 E is located under the apex of the roof panel 1 FF. The apex of the roof panel 1 FF as described herein is an apex located at the corner of the right end portion of the front panel 1 B and the front end portion of the second side panel 1C. The apex has an angle which is larger than those of the other two angles.

(Valve 7)

[0041] The valve 7 is mounted on the fixed panel 1 F. The valve 7 is made up of a valve 7A and a valve 7B. The valve 7 is connected to the refrigerant pipe P. The valve 7 is disposed in a closed space formed by the outer surface of the fixed panel 1 F, the upper surface of the bottom panel 1 E and an inner surface of the cover 1 D. Accordingly, even if the refrigerant is burnt and the fire is spread to the refrigerant pipe P, the spread of fire can be prevented at a position of the valve 7. That is, fire is prevented from burning the compressor 4, the outdoor heat exchanger 2 and the like.

(Cover 1 D)

[0042] The cover 1 D is disposed on the peripheral edge 1 E1 of the bottom panel 1 E and is detachably mounted at a position facing the fixed panel 1 F so as to cover the valve 7. The cover 1 D is attached at a position corresponding to the corner C of the bottom panel 1 E. The cover 1 D forms part of front surface and part of right side surface of the casing of the outdoor unit 100. That is, the cover 1 D is detachably attached to the front cutout portion 1 BH and the side cutout portion 1 CH.

[0043] The cover 1 D includes a front surface 1 D1 which is parallel to the front panel 1B, a side surface 1 D2 which is perpendicular to the front surface 1 D1, a lead-out section 1 D3 used for leading out the refrigerant pipe P which is connected to the valve 7, and a terminal table protecting section 1 D4 which is formed to cover a mounting portion Q such as a terminal table connected to an electric component box 6. The cover 1 D is made up of the front surface 1 D1, the side surface 1 D2, the lead-out section 1 D3 and the terminal table protecting section 1 D4, which are integrally formed. The cover 1 D may be formed of, for example, a resin or a metal plate.

[0044] The front surface 1 D1 is a plate shaped member which upwardly extends from the bottom panel 1 E. The left end portion of the front surface 1 D1 extends along the right end portion of the front panel 1 B. Further, the right end portion of the front surface 1 D1 is connected to the side surface 1 D2.

[0045] The side surface 1 D2 is a plate shaped member which extends along the outer surface of the second side panel 1C. The side surface 1 D2 has an L-shape in plan view. The lead-out section 1 D3 is formed on the side surface 1 D2 at a height position of the valve 7.

[0046] The lead-out section 1 D3 is formed to protrude rightward from the side surface 1 D2. Accordingly, the side surface of the cover 1 D has a stepped portion at a position at which the lead-out section 1 D3 is formed. If the cover 1 D does not have the lead-out section 1 D3, although the refrigerant pipe P can be easily led out, rain water leaks into the casing of the outdoor unit 100. Since the cover 1 D has the lead-out section 1 D3 which protrudes from the side surface 1 D2, leaking of rain water into the casing of the outdoor unit 100 can be prevented

while avoiding interference with the refrigerant pipe P.

[0047] The terminal table protecting section 1 D4 is formed on the same plane as that of the lead-out section 1 D3, and protrudes rightward from the side surface 1 D2. The lower end portion of the terminal table protecting section 1 D4 is connected to the upper end portion of the lead-out section 1 D3. Further, the lower end portion of the terminal table protecting section 1 D4 is connected to the side surface 1 D2. The cover 1 D includes the front surface 1 D1, the side surface 1 D2, the lead-out section 1 D3 and the terminal table protecting section 1 D4 which are integrally formed, and can protect the terminal table as well as the valve 7.

[Rainwater leaking prevention configuration of cover 1 D]

[0048] Fig. 5A is an explanatory view of and around the valve 7 of the outdoor unit 100 according to Embodiment. Fig. 5B is an explanatory view which shows the bottom panel 1 E, the fixed panel 1 F, the valve 7, the refrigerant pipe P, and the cover 1 D of the outdoor unit 100 according to Embodiment. Fig. 5C is an explanatory view of a state in which the cover 1 D of Fig. 5B is removed.

[0049] As shown in Fig. 5A, the valve 7B is disposed under the valve 7A. The valve 7A and the valve 7B are connected to the respective refrigerant pipes P. The valve 7 is fixed to the fixed panel 1 F. As shown in Fig. 5B, the cover 1 D is attached at a position corresponding to the corner C of the bottom panel 1 E so as to prevent rainwater from leaking into a closed space SP in which the valve 7 is disposed.

[0050] Since the lead-out section 1 D3 which protrudes from the side surface 1 D2 is formed on the cover 1D, the refrigerant pipe P can be easily led out from the outdoor unit 100. In addition to that, the lead-out section 1 D3 can prevent rainwater from leaking into the casing. Further, it also prevents the valve 7 from being exposed, thereby improving the design.

[Advantage effect of outdoor unit 100 according to Embodiment]

[0051] In the outdoor unit 100 according to Embodiment, the bottom panel 1 E includes the projection J. The projection J is formed at a position corresponding to the first heat exchange section 2A of the outdoor heat exchanger 2 and protrudes in the horizontal direction. This allows a larger outdoor heat exchanger 2 to be accommodated. That is, a width dimension of the first heat exchange section 2A of the outdoor heat exchanger 2 can be increased by the amount of the area on which the projection J is formed.

[0052] Fig. 8 is a schematic view of a horizontal cross section of the outdoor unit of a conventional air-conditioning apparatus. The conventional outdoor unit which does not have the projection J as shown in Fig. 8 has a problem that, when housing a larger heat exchanger, the

width of the front and back sides of the outdoor unit increases, leading to increase in size of the outdoor unit.

[0053] In the bottom panel 1 E of the outdoor unit 100 of Embodiment, the front side of a portion of the peripheral edge 1 E1 on which the projection J is formed does not protrude. That is, in the bottom panel 1E, the width dimension on the back side of the outdoor unit 100 is increased due to the projection J being formed, while the width dimension on the front side is relatively short since there is no structure corresponding to the projection J. As a result, the outdoor unit 100 can be prevented from being increased in size.

[0054] Accordingly, the outdoor unit 100 of Embodiment 1 is capable of housing a larger heat exchanger (outdoor heat exchanger 2) while preventing the outdoor unit 100 from increasing in size.

[Modified example 1]

[0055] Fig. 6 shows a modified example 1 of the outdoor unit 100 according to Embodiment. Fig. 6(a) is a perspective view of the outdoor unit 100, and Fig. 6(b) is a front view of the outdoor unit 100. In the above embodiment, in order to increase a volume of the machine chamber R1, a front end of the roof panel 1 FF (apex of a right angle) comes on the front surface, and the apex of the corner C is located under the apex of the largest angle.

[0056] In modified example 1, the apex of the right angle of the roof panel 1 FF is located at a backward position. Accordingly, a folded portion 21 is formed on the front panel 1B, and a folded portion 22 is formed on the second side panel 1C. The front panel 1 B and the second side panel 1C are positioned such that a side end portion of the folded portion 21 and a side end portion of the folded portion 22 are along each other.

[0057] Further, in modified example 1, the fixed panel 1 F, the cover 1 D and the second side panel 1C are positioned from the bottom panel 1 E to the top panel 1 A extending in the up-down direction.

[Advantage effect of outdoor unit 100 according to modified example 1]

[0058] The outdoor unit 100 of modified example 1 has an effect as described below in addition to the same effect as that of the outdoor unit 100 of the above Embodiment. That is, the outdoor unit 100 of modified example 1 can be reduced in size, while reducing a volume of the machine chamber R1 since the outdoor unit 100 includes the folded portion 21 and the folded portion 22.

[Modified examples 2 to 6]

[0059] Figs. 7A to 7E show modified examples 2 to 6 of the outdoor unit according to Embodiment of the present invention. The following modified examples 2 to 6 show various variations of the bottom panel 1 E. The second side panel 1C is formed to extend along the pe-

ripheral edge 1 E1 of the bottom panel 1E.

[0060] Difference between the outdoor unit 100 according to the above embodiment and the outdoor unit 100 according to modified examples 2 to 6 will be described.

[0061] In modified examples 2 to 6, the fixed panel 1 F is not provided inward of the peripheral edge 1 E1 of the bottom panel 1 E.

[0062] Further, in modified examples 2 to 6, the valve 7 is mounted on the second side panel 1C.

[0063] Although the surface of the cover 1 D in Embodiment and modified example 1 is provided along the surface of the second side panel 1C, a cover 10D in modified examples 2 to 6 is mounted on the second side panel 1C such that the surface of the cover 1 D protrudes from the second side panel 1C.

[0064] Figs. 7A(a), 7B(a), 7C(a), 7D(a) and 7E(a) show sectional views of the outdoor unit 100. Figs. 7A(b1), 7B(b1), 7C(b1), 7D(b1) and 7E(b1) show examples which adopts the roof panel 1 FF of Embodiment, while Figs. 7A(b2), 7B(b2), 7C(b2), 7D(b2) and 7E(b2) show examples which adopts the roof panel 1 FF of modified example 1. Accordingly, the fixed panel 1 F shown in Figs. 7A(b2), 7B(b2), 7C(b2), 7D(b2) and 7E(b2) has a height dimension larger than the fixed panel 1 F shown in Figs. 7A(b1), 7B(b1), 7C(b1), 7D(b1) and 7E(b1).

[0065] As shown in Fig. 7A(a), in addition to the difference described above, modified example 2 has a difference that the tapered shape surface J1 described in Embodiment is provided as a vertical surface. Modified example 2 may adopt the roof panel 1 FF of the outdoor unit 100 of Embodiment as shown in Fig. 7A(b1), or may adopt the roof panel 1 FF of the outdoor unit 100 of modified example 1 as shown in Fig. 7A(b2).

[0066] As shown in Fig. 7B(a), modified example 3 is the same as the outdoor unit 100 of Embodiment except for the difference described above. Modified example 2 may adopt the roof panel 1 FF of the outdoor unit 100 of Embodiment as shown in Fig. 7B(b1), or may adopt the roof panel 1 FF of the outdoor unit 100 of modified example 1 as shown in Fig. 7B(b2).

[0067] As shown in Fig. 7C(a), in modified example 4, the bottom panel 1 E has a cutout portion J2 formed at a position of the corner C (which corresponds to the second corner). That is, in modified example 4, the bottom panel 1 E includes the cutout portion J2 which is formed by cutting the corner C in a tapered shape to decrease a volume of the machine chamber R1. The second side panel 1C may extend to a position of the cutout portion J2, or the front panel 1 B may extend to a position of the cutout portion J2. Further, modified example 4 may adopt the roof panel 1 FF of the outdoor unit 100 of Embodiment as shown in Fig. 7C(b1), or may adopt the roof panel 1 FF of the outdoor unit 100 of modified example 1 as shown in Fig. 7C(b2).

[0068] As shown in Fig. 7D(a), in modified example 5, the bottom panel 1 E is formed such that the tapered shape surface J1 of the projection J extends to the corner

C. Further, modified example 5 may adopt the roof panel 1 FF of the outdoor unit 100 of Embodiment as shown in Fig. 7D(b1), or may adopt the roof panel 1 FF of the outdoor unit 100 of modified example 1 as shown in Fig. 7D(b2).

[0069] As shown in Fig. 7E(a), in modified example 6, the bottom panel 1 E has the tapered shape surface J1 which is a vertical surface. Further, the bottom panel 1 E also has the projection J on a side on which the corner C is formed. In addition, another vertical surface is provided at a position facing the vertical surface. That is, in modified example 6, the bottom panel 1 E has a recess J3 formed of two projections J as seen from the above. The valve 7 is formed on the second side panel 1C at a position corresponding to the recess J3. Further, modified example 6 may adopt the roof panel 1 FF of the outdoor unit 100 of Embodiment as shown in Fig. 7E(b1), or may adopt the roof panel 1 FF of the outdoor unit 100 of modified example 1 as shown in Fig. 7E(b2).

[Advantage effect of outdoor unit 100 according to modified examples 2 to 6]

[0070] The outdoor unit 100 according to modified examples 2 to 6 has the same effect as that of the outdoor unit 100 of the above Embodiment. Document Signs List

[0071] 1A top panel 1B front panel 1B1 opening 1B2 fan grille 1 BH front cutout portion 1C second side panel 1 CC first side panel 1 CH side cutout portion 1 CT tapered shape surface 1 D cover 1 D1 front surface 1 D2 side surface 1 D3 lead-out section 1 D4 terminal table protecting section 1E bottom panel 1 E1 peripheral edge 1 F fixed panel 1 FF roof panel 2 outdoor heat exchanger 2A first heat exchange section 2B second heat exchange section 2C third heat exchange section 2C1 hairpin 3 blower 3A motor support 4 compressor 5 partition 6 electric component box 7 valve 7A valve 7B valve 8 four-way valve 9 expansion device 10D cover 20 refrigerant distribution member 21 folded portion 22 folded portion 100 outdoor unit 150 indoor unit 151 indoor heat exchanger 152 blower 200 air-conditioning apparatus C corner C2 corner J projection J1 tapered shape surface J2 cutout portion J3 recess P refrigerant pipe Q mounting portion R1 machine chamber R2 blower chamber SP closed space

Claims

1. An outdoor unit accommodating a compressor and connected to a refrigerant pipe used for circulating refrigerant between an indoor unit and the outdoor unit, the outdoor unit comprising:

a bottom panel disposed under the compressor to support the compressor;
a first side panel disposed on a peripheral edge of the bottom panel;

- a second side panel disposed at a position facing the first side panel on the peripheral edge of the bottom panel; and
 an outdoor heat exchanger supported above the bottom panel and extending in a direction from the first side panel toward the second side panel, wherein
 the outdoor heat exchanger has an end portion facing one of side end portions of the second side panel, and
 the bottom panel includes a projection formed at a position corresponding to the end portion of the outdoor heat exchanger, the projection protruding in a direction from the first side panel toward the second side panel.
2. The outdoor unit of claim 1, further comprising a valve disposed on a side on which the second side panel is located, the valve being connected to the refrigerant pipe, wherein
 the projection is formed to protrude in the direction from the first side panel toward the second side panel with respect to a position at which the valve is disposed.
3. The outdoor unit of claim 1 or 2, wherein
 a tapered shape surface is formed on an edge of the projection to extend toward a portion of the bottom panel located under the valve, and
 the second side panel is formed to extend along the edge of the projection.
4. The outdoor unit of any one of claims 1 to 3, further comprising a fixed panel which is disposed on the bottom panel and on which the valve is mounted.
5. The outdoor unit of claim 4, wherein
 the bottom panel includes
 a first corner corresponding to a position at which the projection is formed and
 a second corner of the bottom panel located under the valve,
 the second side panel is disposed at the first corner, and
 the fixed panel is disposed at the second corner.
6. The outdoor unit of claim 4 or 5, further comprising a cover disposed on the peripheral edge of the bottom panel and mounted at a position facing the fixed panel so as to cover the valve, wherein
 the cover has a lead-out section used for leading out the refrigerant pipe connected to the valve.
7. The outdoor unit of claim 6, further comprising a top panel disposed on an upper end portion of the first side panel and the second side panel so as to cover
- an upper part of the outdoor heat exchanger, wherein the fixed panel, the cover and the second side panel extend from the bottom panel to the top panel.
8. The outdoor unit of claim 6, further comprising a front panel which is disposed on the peripheral edge of the bottom panel and is provided with the first side panel at one end portion and the second side panel at the other end portion, wherein
 the front panel has a front cutout portion formed in a lower part of the other end portion,
 the second side panel has a side cutout portion formed in a lower part of the end portion adjacent to the front panel, and
 the cover is disposed in the front cutout portion and the side cutout portion.

FIG. 1

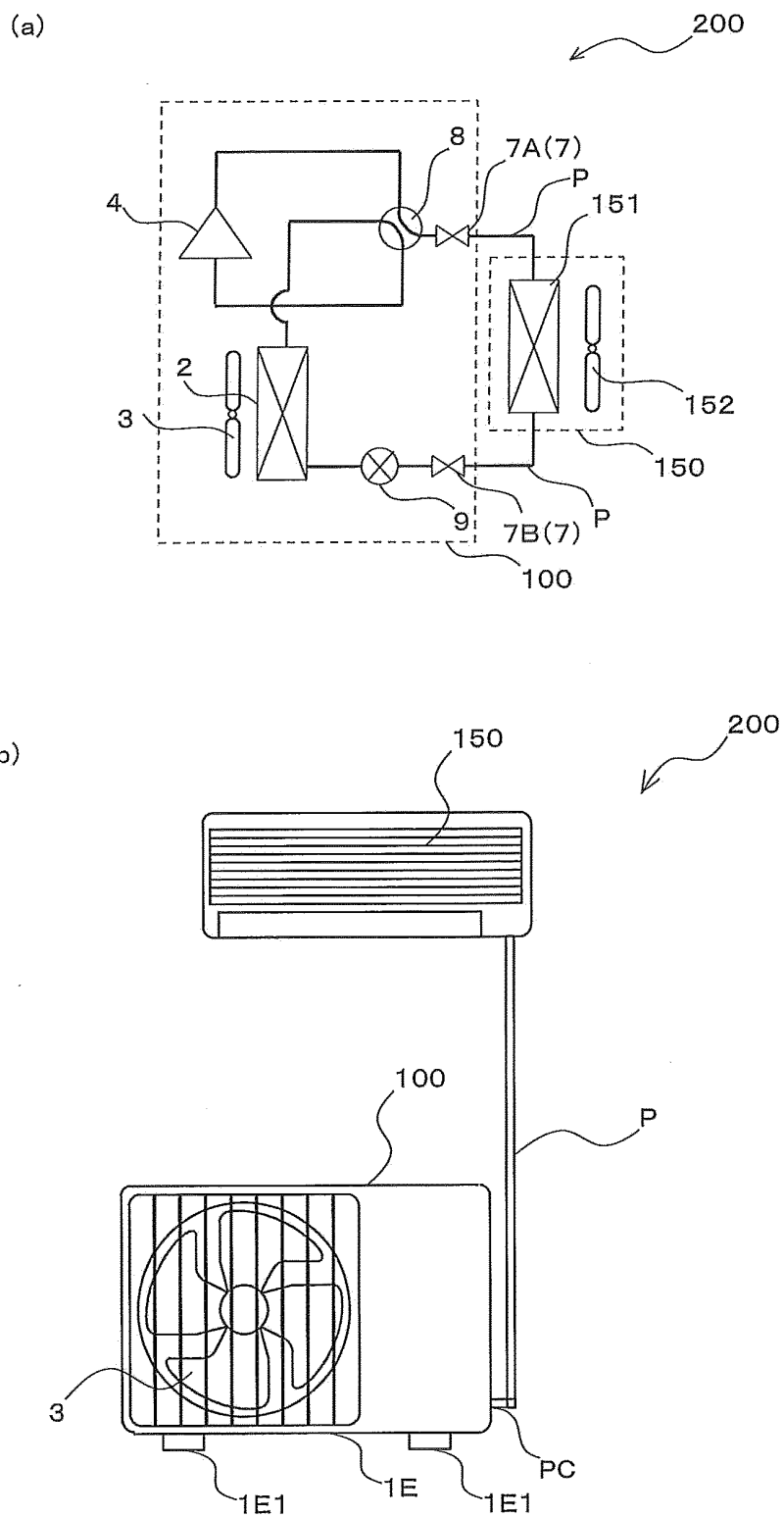


FIG. 2

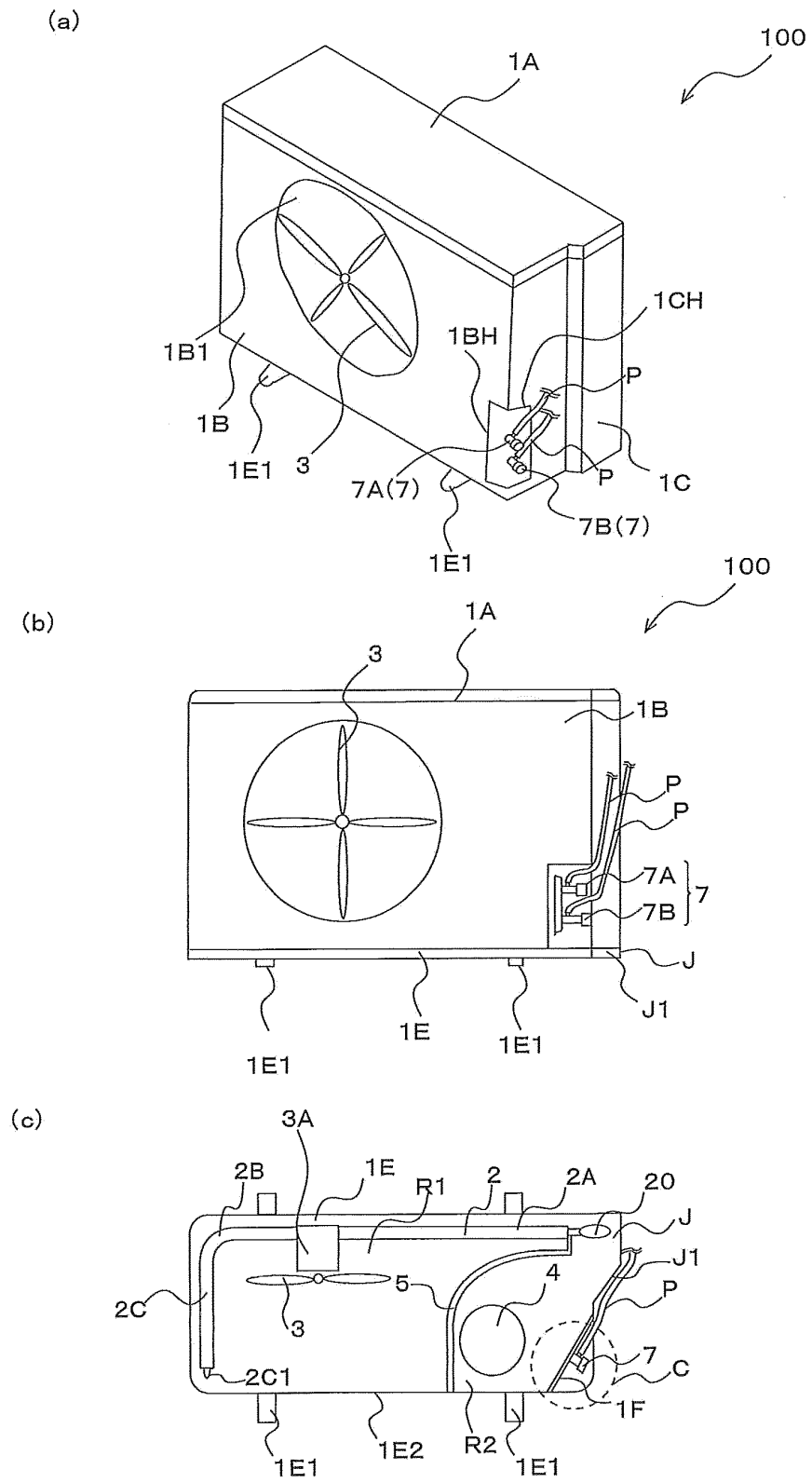


FIG. 3

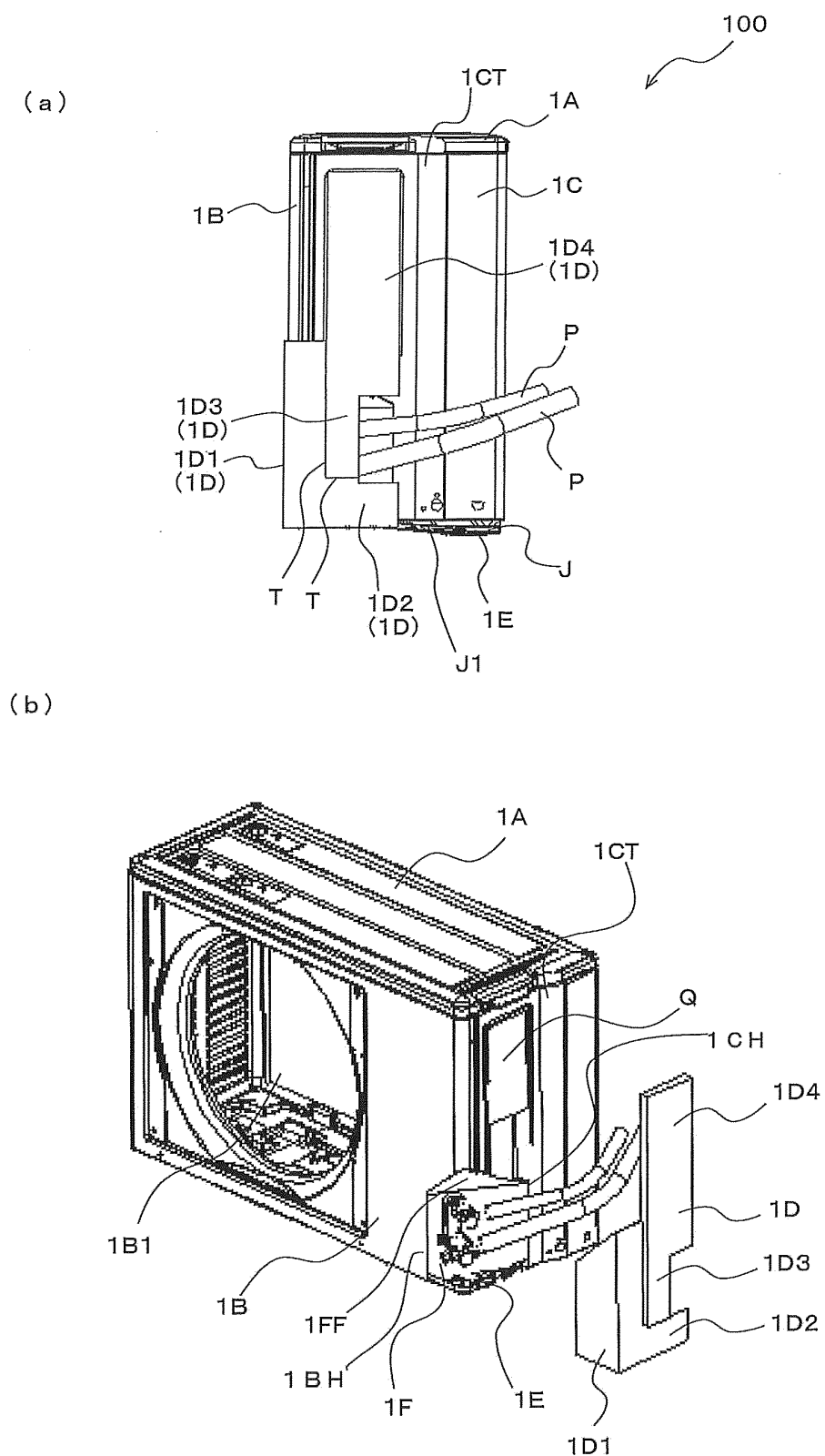


FIG. 4

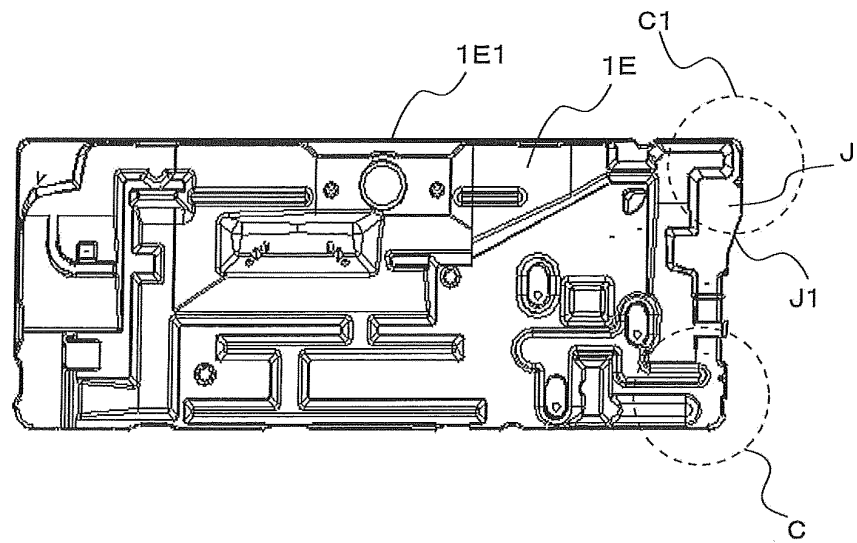


FIG. 5A

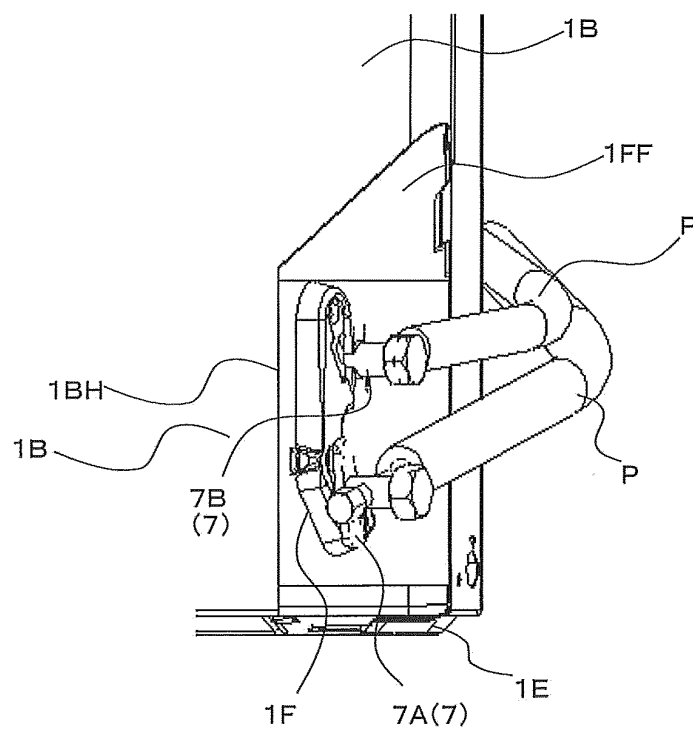


FIG. 5B

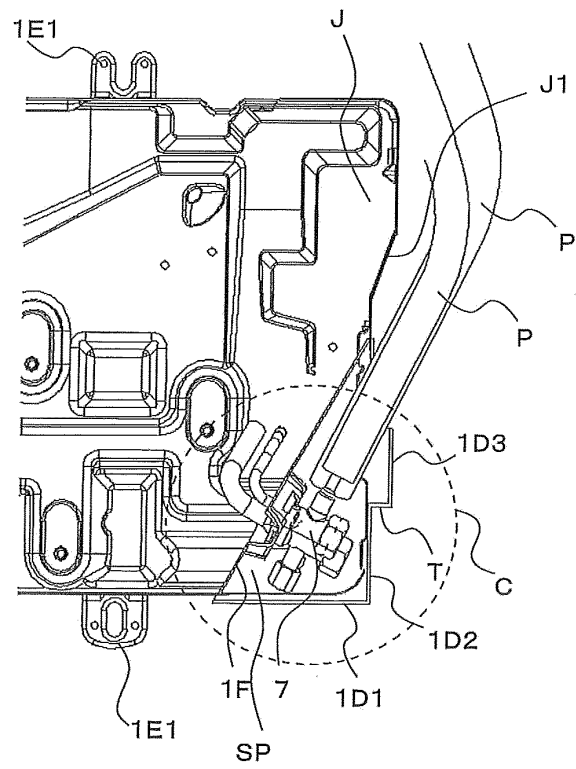


FIG. 5C

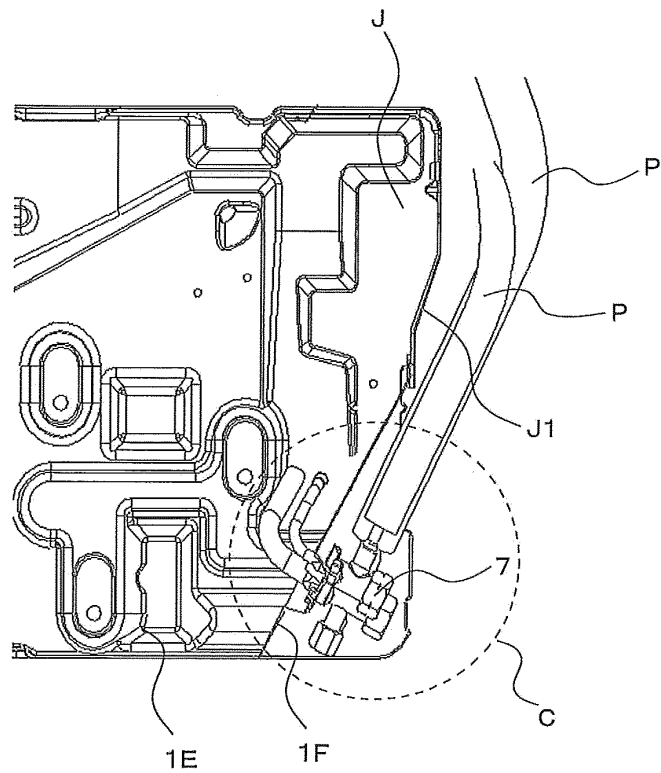


FIG. 6

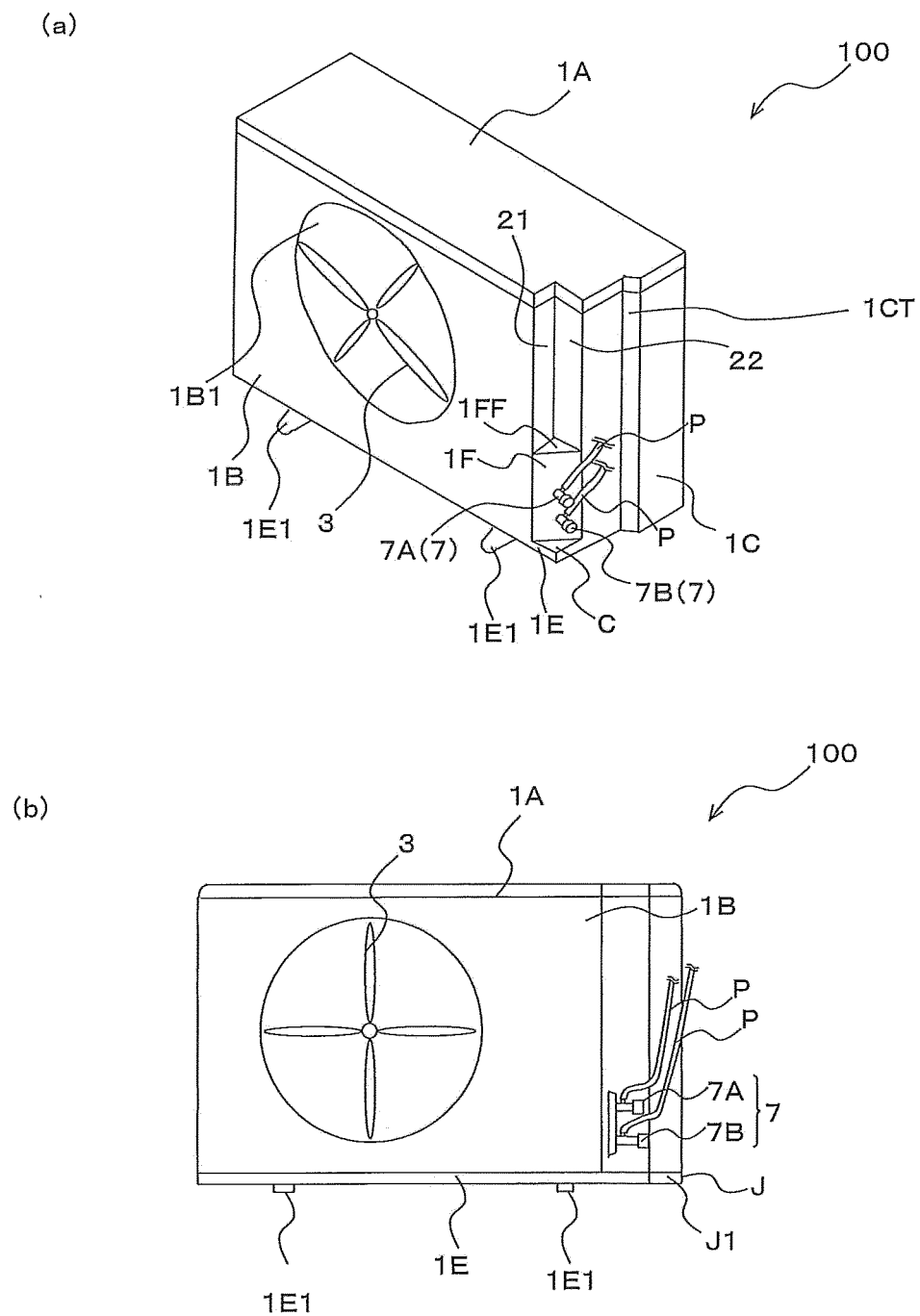
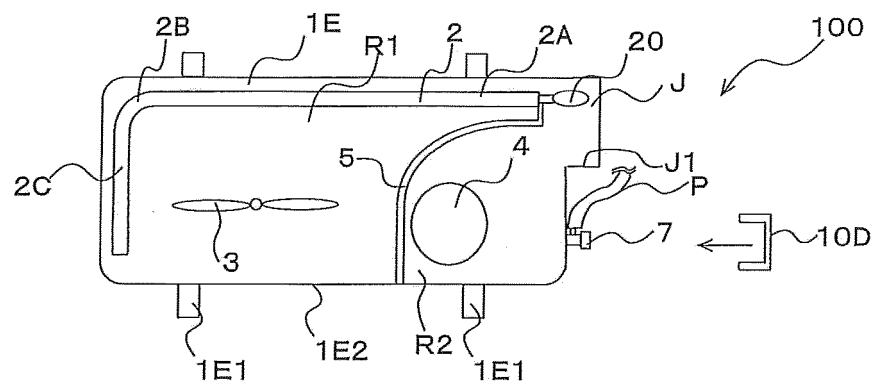
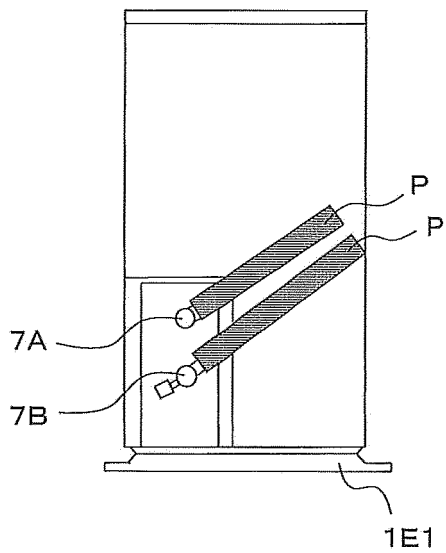


FIG. 7A

(a)



(b1)



(b2)

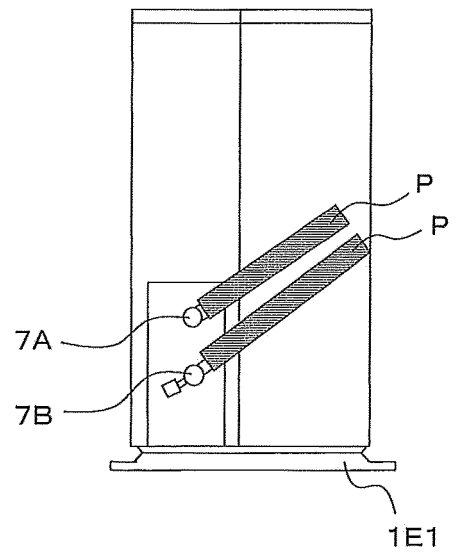
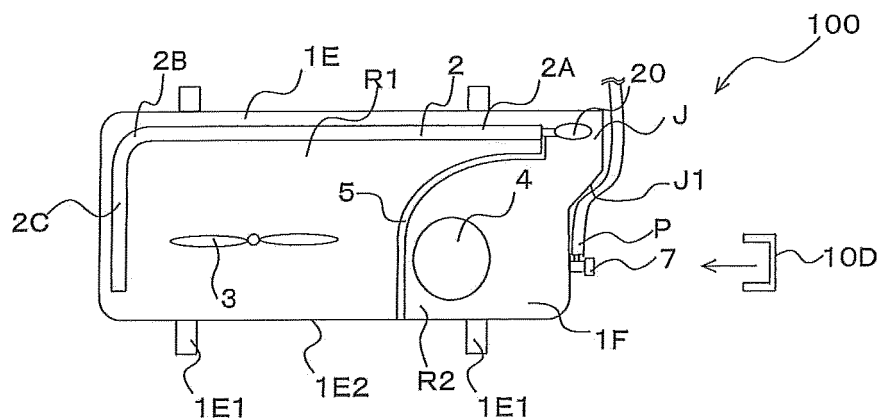
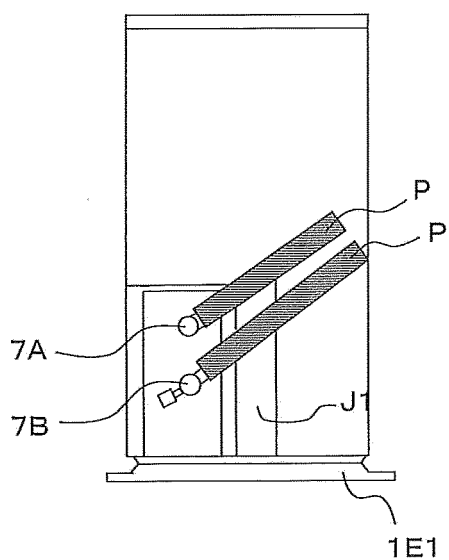


FIG. 7B

(a)



(b1)



(b2)

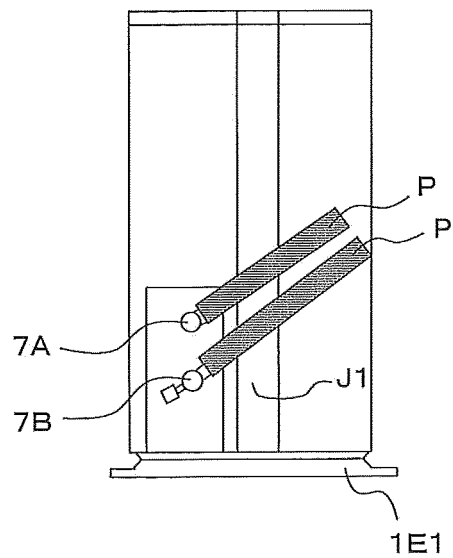


FIG. 7C

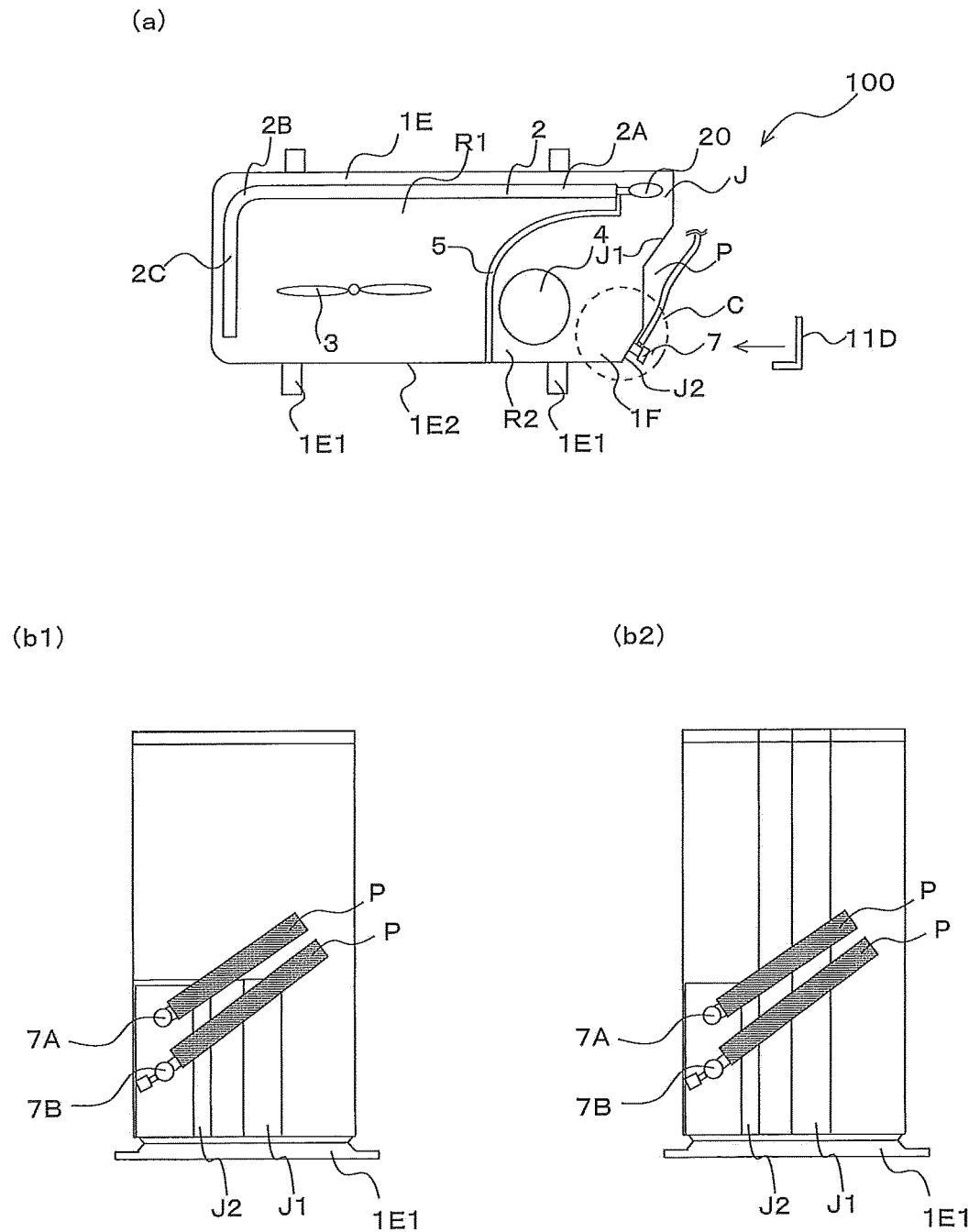
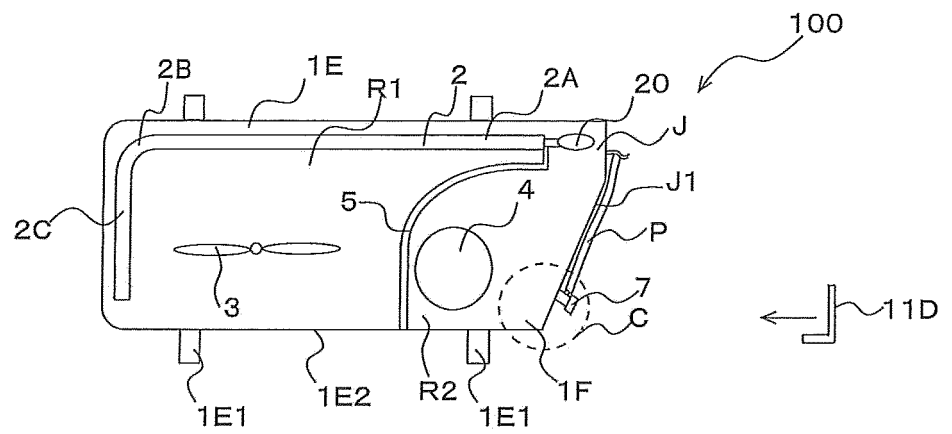
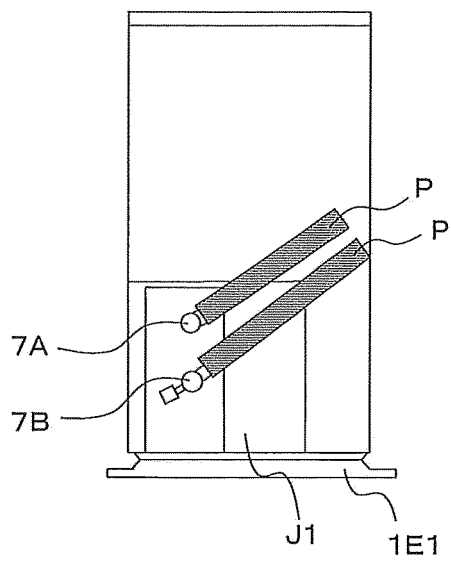


FIG. 7D

(a)



(b1)



(b2)

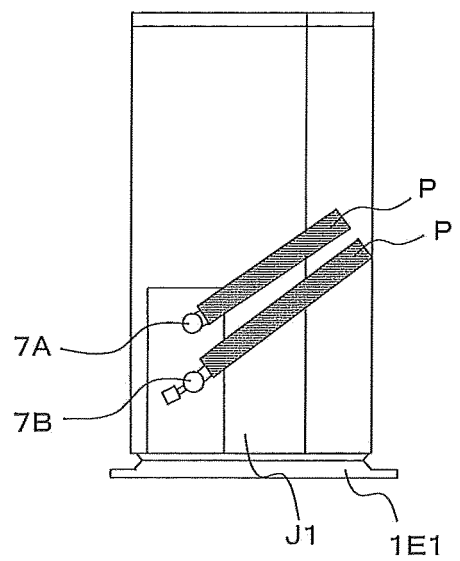
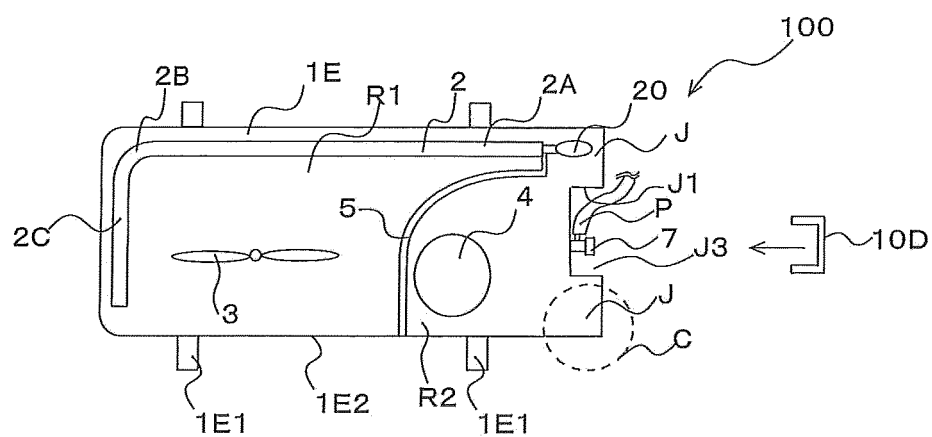
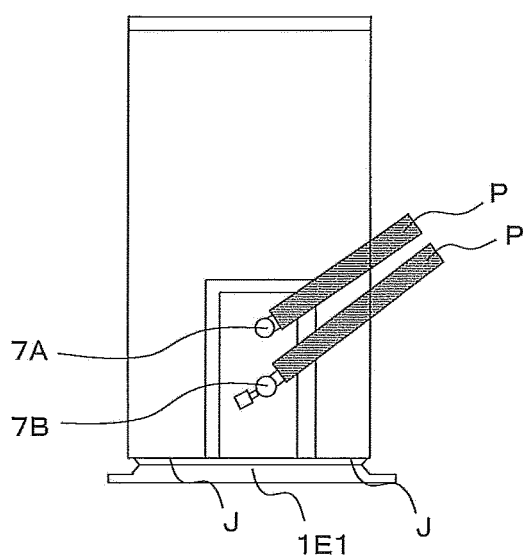


FIG. 7E

(a)



(b1)



(b2)

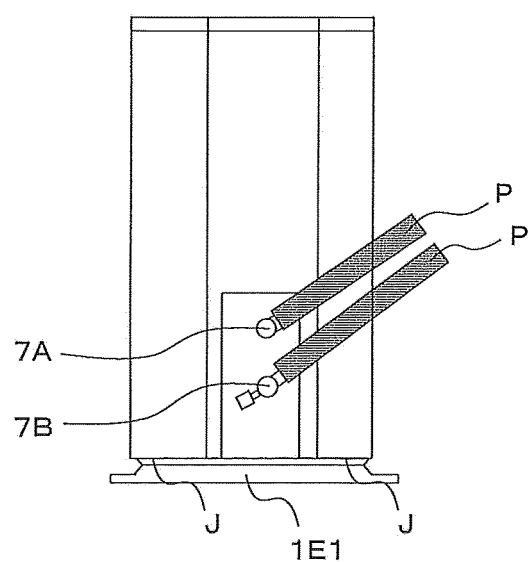
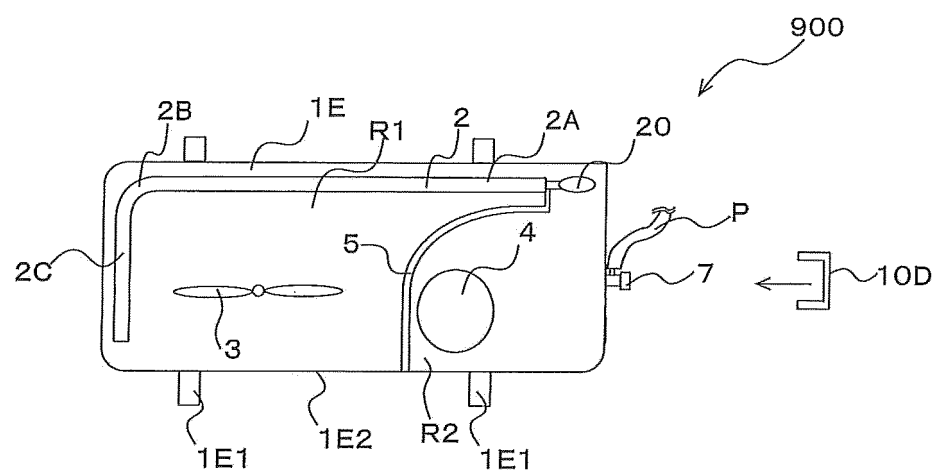


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/084490

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/56(2011.01)i, F24F1/14(2011.01)i, F24F1/32(2011.01)i, F24F1/34(2011.01)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)

F24F1/56, F24F1/14, F24F1/32, F24F1/34

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	1996-2015
Kokai Jitsuyo Shinan Koho	1971-2015	Toroku Jitsuyo Shinan Koho	1994-2015

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 2006-138524 A (Matsushita Electric Industrial Co., Ltd.), 01 June 2006 (01.06.2006), paragraphs [0004], [0009], [0011], [0020] to [0021]; fig. 1, 6 & EP 1657441 A2 & CN 1773114 A & ES 2290839 T	1, 4 2-3, 5-8
Y	JP 10-205829 A (Fujitsu General Ltd.), 04 August 1998 (04.08.1998), paragraphs [0005] to [0013]; fig. 1 (Family: none)	1, 4
A	JP 5-296496 A (Mitsubishi Electric Corp.), 09 November 1993 (09.11.1993), paragraphs [0019] to [0020]; fig. 4, 5 (Family: none)	1, 2

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of mailing of the international search report
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Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/084490

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 120459/1987(Laid-open No. 25635/1989) (Toshiba Corp.), 13 February 1989 (13.02.1989), entire text; all drawings; particularly, page 5, line 2 to page 8, line 15; fig. 1, 2 (Family: none)	1, 4, 6-8
A	JP 2003-254563 A (Sanyo Electric Co., Ltd.), 10 September 2003 (10.09.2003), paragraphs [0012] to [0023], [0039] to [0047]; fig. 2, 4, 7 to 10 (Family: none)	1, 4, 6-8
A	JP 2007-120900 A (Daikin Industries, Ltd.), 17 May 2007 (17.05.2007), paragraphs [0015] to [0035]; fig. 1 & US 2009/0044554 A1 & EP 1953463 A1 & WO 2007/052539 A1 & KR 10-2008-0045294 A & CN 101292120 A & AU 2006309867 A	1, 4
A	JP 2004-251586 A (Matsushita Electric Industrial Co., Ltd.), 09 September 2004 (09.09.2004), entire text; all drawings (Family: none)	1, 4, 6-8
A	US 2010/0011803 A1 (JOHNSON CONTROLS TECHNOLOGY CO.), 21 January 2010 (21.01.2010), paragraphs [0027] to [0031], [0056] to [0059]; fig. 3, 9A, 9B (Family: none)	1, 4

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

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Patent documents cited in the description

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