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(54) OUTDOOR UNIT OF AIR CONDITIONER

(57) The disclosure provides an outdoor unit of an air conditioner, which achieves stable support of even a large electric component box. The outdoor unit corresponds to an outdoor unit of an air conditioner, and includes a fan motor, a partition plate, a first support member, a second support member, and an electric component box. The fan motor drives a fan. The partition plate zones a fan chamber accommodating the fan. The first support member supports the fan motor. The first support member and the second support member support the electric component box.

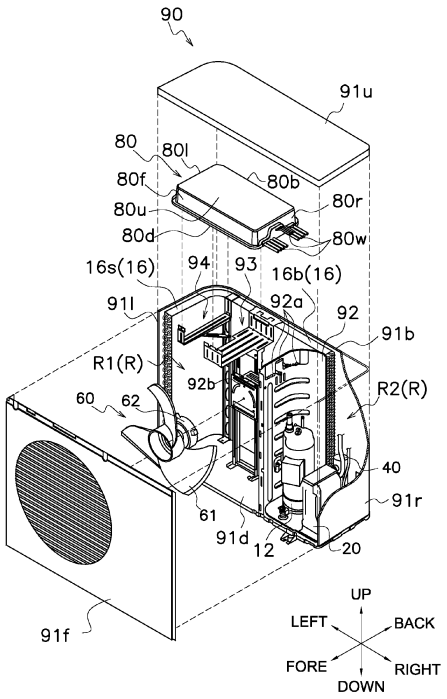

FIG. 2

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

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

Description of the Related Art

[0002] Japanese Laid-Open Patent Publication No. 2006-226644 discloses an outdoor unit of an air conditioner. The outdoor unit includes an electric component box supported by supports for a fan motor and a partition plate (shielding plate) zoning a fan chamber (chamber accommodating a fan).

[0003] In the outdoor unit according to Japanese Laid-Open Patent Publication No. 2006-226644, the electric component box is supported by the supports for the fan motor and the partition plate zoning the fan chamber. Disposition of the supports and the partition plate is influenced by sizes of other components. This may lead to difficulty in securing a span between supporting positions, and difficulty in stable support of a large electric component box. The present disclosure provides an outdoor unit of an air conditioner, which achieves stable support of even a large electric component box.

SUMMARY OF THE INVENTION

[0004] An outdoor unit according to a first aspect corresponds to an outdoor unit of an air conditioner, and includes a fan motor, a partition plate, a first support member, a second support member, and an electric component box. The fan motor drives a fan. The partition plate zones a fan chamber accommodating the fan. The first support member supports the fan motor. The first support member and the second support member support the electric component box.

[0005] The outdoor unit supports the electric component box by means of the first support member supporting the fan motor and the second support member provided separately from the partition plate. Unlike the partition plate, the second support member is positioned relatively freely without being influenced by sizes of other components. The outdoor unit can thus freely position the second support member in accordance with a size of the electric component box so as to stably support even the electric component box having a large size.

[0006] An outdoor unit according to a second aspect is the outdoor unit according to the first aspect, in which the second support member is disposed opposite to the partition plate with the first support member being interposed therebetween.

[0007] An outdoor unit according to a third aspect is the outdoor unit according to the first or second aspect, in which the first support member and the second support member are aligned in a longitudinal direction of the electric component box.

[0008] The outdoor unit can thus stably support even the electric component box elongated horizontally.

[0009] An outdoor unit according to a fourth aspect is the outdoor unit according to any one of the first to third aspects, in which the first support member has a first supporting stand. The second support member includes a second supporting stand. The first supporting stand and the second supporting stand support a bottom surface of the electric component box.

[0010] The outdoor unit can thus stably support the electric component box by means of the first supporting stand and the second supporting stand.

[0011] An outdoor unit according to a fifth aspect is the outdoor unit according to the fourth aspect, in which the first supporting stand and the second supporting stand each have an opposed surface opposed to a side surface of the electric component box.

[0012] The opposed surface regulates horizontal movement of the electric component box. The outdoor unit can thus stably support the electric component box.

[0013] An outdoor unit according to a sixth aspect is the outdoor unit according to the fifth aspect, in which the opposed surface is provided with a projection regulating movement of the electric component box.

[0014] The projection is configured to set the electric component box at a stable position on the first supporting stand. The outdoor unit can thus stably support the electric component box.

[0015] An outdoor unit according to a seventh aspect is the outdoor unit according to any one of the first to sixth aspects, in which the partition plate supports the electric component box.

[0016] The electric component box is supported by the partition plate as well as by the first support member and the second support member. The outdoor unit can thus stably support the electric component box.

[0017] An outdoor unit according to an eighth aspect is the outdoor unit according to the seventh aspect, in which the partition plate includes a third support member. The third support member supports the bottom surface of the electric component box.

[0018] The electric component box is supported by the third support member as well as by the first support member and the second support member. The outdoor unit can thus stably support the electric component box.

[0019] An outdoor unit according to a ninth aspect is the outdoor unit according to the fourth aspect, and further includes a first heat exchanger. The first supporting stand and the second supporting stand each have a bottom surface disposed below an upper end of the first heat exchanger in a vertical direction.

[0020] The electric component box has an upper surface that is accordingly inhibited from projecting upward from the upper end of the first heat exchanger. This inhibits increase in size of the outdoor unit.

[0021] An outdoor unit according to a tenth aspect is

the outdoor unit according to the ninth aspect, in which the electric component box is supported to have the upper surface positioned below the upper end of the first heat exchanger in the vertical direction.

[0022] The upper surface of the electric component box accordingly does not project upward from the upper end of the first heat exchanger. This effectively inhibits increase in size of the outdoor unit.

[0023] An outdoor unit according to an eleventh aspect is the outdoor unit according to any one of the first to tenth aspects, in which the electric component box is 15 kg or more in weight.

[0024] The outdoor unit can stably support even the electric component box large enough to have 15 kg or more in weight.

[0025] An outdoor unit according to a twelfth aspect is the outdoor unit according to any one of the first to eleventh aspects, in which the electric component box is a rectangular parallelepiped and has six surfaces each closed by 90% or more in terms of area.

[0026] The outdoor unit can inhibit any refrigerant leaking from a refrigerant circuit from flowing into the electric component box.

[0027] An outdoor unit according to a thirteenth aspect is the outdoor unit according to any one of the first to twelfth aspects, in which the first support member and the second support member are each disposed to have a longitudinal direction matching the vertical direction. The first support member and the second support member are disposed such that a first center axis of the first support member and a second center axis of the second support member sandwich a horizontal center portion of the electric component box in a front view.

[0028] This inhibits a gravity center of the electric component box from being largely separated from a space between the first support member and the second support member. The outdoor unit can thus stably support the electric component box.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1 is a schematic configuration diagram of an air conditioner 100;

FIG. 2 is an exploded view of an outdoor unit 90;

FIG. 3 is a front view of the outdoor unit 90;

FIG. 4 is a plan view of the outdoor unit 90;

FIG. 5 is a perspective view of a third support member 92b;

FIG. 6 is a perspective view of a first support member 93;

FIG. 7 is a perspective view of a second support member 94; and

FIG. 8 is a front view of the outdoor unit 90, depicting positional relationship among a first center axis CL1 and a second center axis CL2, and a center portion 80c.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

(1) Entire configuration

[0030] FIG. 1 is a schematic configuration diagram of an air conditioner 100 including an outdoor unit 90 according to an embodiment. As depicted in FIG. 1, the air conditioner 100 is configured to cool or heat a heating medium flowing in a heating medium circuit 30 by means of a refrigerant flowing in a refrigerant circuit 10, and condition air by means of the heating medium cooled or heated by the refrigerant. The heating medium flowing in the heating medium circuit 30 is water (hereinafter, the heating medium circuit 30 may be called a water circuit 30) in the present embodiment. Water flowing in the water circuit 30 should not be limited to pure water, but may alternatively be brine or the like. Examples of the brine include, for example, an aqueous solution of calcium chloride, an aqueous solution of ethylene glycol, an aqueous solution of propylene glycol, etc. The following description exemplifies a case where the air conditioner 100 is configured to execute cooling operation and heating operation.

[0031] The air conditioner 100 principally includes the outdoor unit 90 and a utilization facility 34.

(2) Detailed configurations

(2-1) Outdoor unit

[0032] The outdoor unit 90 is disposed in an outdoor space such as on a roof of a building or around the building. FIG. 2 is an exploded view of the outdoor unit 90. FIG. 3 is a front view of the outdoor unit 90. FIG. 4 is a plan view of the outdoor unit 90.

[0033] The outdoor unit 90 principally includes a case 91, a partition plate 92, a first support member 93, a second support member 94, the refrigerant circuit 10, part of the water circuit 30 (including a gas-liquid separator 40 connected to the water circuit 30), a fan unit 60, and an electric component box 80.

[0034] For convenience, FIG. 3 does not depict a front surface 91f (to be described later) of the case 91 and the fan unit 60. FIG. 4 does not depict an upper surface 91u (to be described later) of the case 91. Upright, transverse, and anteroposterior directions to be referred to in the following description correspond to directions indicated by arrows in FIG. 2 to FIG. 7.

(2-1-1) Case

[0035] The case 91 accommodates, in an internal space R, the partition plate 92, the first support member 93, the second support member 94, the refrigerant circuit 10, part of the water circuit 30 (including the gas-liquid separator 40 connected to the water circuit 30), the fan unit 60, and the electric component box 80. The case 91

has a substantially rectangular parallelepiped shape, and has the upper surface 91u, the front surface 91f, a rear surface 91b, a left surface 911, a right surface 91r, and a bottom surface 91d.

[0036] The upper surface 91u has a substantially rectangular shape and covers the space R from above. The front surface 91f has a substantially rectangular shape and covers the space R from ahead. The front surface 91f is provided, at around the center, with a circular opening (grill) allowing an air flow generated by the fan unit 60 to pass therethrough. The rear surface 91b has a substantially rectangular shape and covers the space R from behind. The left surface 91l has a substantially rectangular shape and covers the space R from left. The right surface 91r has a substantially rectangular shape and covers the space R from right. The bottom surface 91d has a rectangular shape and covers the space R from below.

(2-1-2) Partition plate

[0037] The partition plate 92 is a plate-shaped member zoning a fan chamber R1 and a machine chamber R2 in the space R. Specifically, the partition plate 92 is disposed to transversely divide the space R into two portions. In the space R according to the present embodiment, a left portion of the partition plate 92 corresponds to the fan chamber R1 and a right portion of the partition plate 92 corresponds to the machine chamber R2.

[0038] The partition plate 92 is provided with a plurality of openings 92a allowing wires 80w (to be described later) extending from the electric component box 80 to pass therethrough. The openings 92a are positioned to be opposed to a right surface 80r (to be described later) of the electric component box 80 as a side surface close to the partition plate 92.

[0039] The partition plate 92 supports the electric component box 80. Specifically, the partition plate 92 includes a third support member 92b supporting a bottom surface 80d (to be described later) of the electric component box 80. FIG. 5 is a perspective view of the third support member 92b. The third support member 92b is a plate-shaped member having a first surface 92ba and a second surface 92bb.

[0040] The first surface 92ba supports the bottom surface 80d of the electric component box 80. The first surface 92ba extends from the partition plate 92 toward the fan chamber R1 so as to be perpendicular to the upright direction. The second surface 92bb fixes the third support member 92b to the partition plate 92. The second surface 92bb has an end connected to an end edge (a right end in the present embodiment) of the first surface 92ba, and is perpendicular to the transverse direction. The second surface 92bb is fixed to the partition plate 92 and is positioned to allow the first surface 92ba to support the bottom surface 80d of the electric component box 80.

(2-1-3) Refrigerant circuit

[0041] The refrigerant circuit 10 achieves a vapor compression refrigeration cycle. The vapor compression refrigeration cycle includes repeating steps of compressing a gas refrigerant having low temperature and low pressure to have high temperature and high pressure in the refrigeration cycle, causing the refrigerant to radiate heat at a radiator (condenser), causing the refrigerant to expand at an expansion mechanism to have low temperature and low pressure, causing the refrigerant to absorb heat at an evaporator, and compressing again the gas refrigerant having low temperature and low pressure and having absorbed heat at the evaporator.

[0042] As depicted in FIG. 1, the refrigerant circuit 10 principally includes a compressor 12, a flow path switching mechanism 14, a first heat exchanger 16, an expansion mechanism 18, and a second heat exchanger 20. The refrigerant circuit 10 includes a pipe P connecting the compressor 12, the flow path switching mechanism 14, the first heat exchanger 16, the expansion mechanism 18, and the second heat exchanger 20. The pipe P of the refrigerant circuit 10 is accommodated in the machine chamber R2. FIG. 2 to FIG. 4 may not depict part of the refrigerant circuit 10 for convenience.

[0043] Described herein is the refrigerant circuit 10 having a merely exemplary configuration. For example, the refrigerant circuit 10 may further include a receiver configured to reserve a refrigerant, a device configured to subcool a refrigerant, or the like. Exemplarily described herein is a case where the air conditioner 100 is configured to execute cooling operation and heating operation, and the air conditioner 100 accordingly includes the flow path switching mechanism 14. In another exemplary case where the air conditioner 100 is configured to execute only cooling operation or only heating operation, the air conditioner 100 may not include the flow path switching mechanism 14.

[0044] The refrigerant according to the present embodiment is categorized as having flammability in class 2 or higher flammability in class 3 by ISO 817. Examples of the refrigerant herein include R290 (propane) having higher flammability and a lower flammability limit (LFL) of 3.5% or less. The refrigerant should not be limited to these in terms of its type.

(2-1-3-1) Pipes

[0045] As depicted in FIG. 1, the pipe P of the refrigerant circuit 10 includes a suction pipe P1, a discharge pipe P2, a first gas pipe P3, a liquid pipe P4, and a second gas pipe P5.

[0046] The suction pipe P1 connects a suction port of the compressor 12 and the flow path switching mechanism 14. The suction pipe P1 may alternatively be provided with an accumulator (not depicted). The discharge pipe P2 connects a discharge port of the compressor 12 and the flow path switching mechanism 14. The first gas

pipe P3 connects the flow path switching mechanism 14 and a gas side of the first heat exchanger 16. The liquid pipe P4 connects a liquid side of the first heat exchanger 16 and the second heat exchanger 20. The liquid pipe P4 is provided with the expansion mechanism 18. The second gas pipe P5 connects the second heat exchanger 20 and the flow path switching mechanism 14.

(2-1-3-2) Compressor

[0047] The compressor 12 sucks a low-pressure refrigerant in the refrigeration cycle via the suction pipe P1, causes a compression mechanism (not depicted) to compress the refrigerant, and discharges a high-pressure refrigerant obtained by compression in the refrigeration cycle via the discharge pipe P2. The compressor 12 is accommodated in the machine chamber R2. The compressor 12 is exemplarily of a scroll type. The compressor 12 should not be limited in type to the scroll type, but may alternatively be of a screw type, a rotary type, or the like. The compressor 12 exemplary has variable capacity, or may alternatively have a constant capacity.

(2-1-3-3) Flow path switching mechanism

[0048] The flow path switching mechanism 14 is configured to switch a refrigerant flow direction in the refrigerant circuit 10 in accordance with an operating mode of the air conditioner 100. The air conditioner 100 has operating modes including a mode of cooling water in the water circuit 30 by means of a refrigerant (hereinafter, called a cooling mode), and a mode of heating the water in the water circuit 30 (hereinafter, called a heating mode). The flow path switching mechanism 14 is accommodated in the machine chamber R2.

[0049] The flow path switching mechanism 14 according to the present embodiment is configured as a four-way switching valve. The flow path switching mechanism 14 should not be limited to the four-way switching valve, but may alternatively combine a plurality of electromagnetic valves and pipes so as to switch the refrigerant flow direction as follows.

[0050] In the cooling mode, the flow path switching mechanism 14 switches the refrigerant flow direction in the refrigerant circuit 10 such that the refrigerant discharged from the compressor 12 is sent to the first heat exchanger 16. Specifically, in the cooling mode, the flow path switching mechanism 14 causes the suction pipe P1 and the second gas pipe P5 to communicate with each other, and causes the discharge pipe P2 and the first gas pipe P3 to communicate with each other (see solid lines in the flow path switching mechanism 14 in FIG. 1).

[0051] In the heating mode, the flow path switching mechanism 14 switches the refrigerant flow direction in the refrigerant circuit 10 such that the refrigerant discharged from the compressor 12 is sent to the second heat exchanger 20. Specifically, in the heating mode, the flow path switching mechanism 14 causes the suction pipe P1 and the first gas pipe P3 to communicate with each other, and causes the discharge pipe P2 and the second gas pipe P5 to communicate with each other (see broken lines in the flow path switching mechanism 14 in FIG. 1).

(2-1-3-4) First heat exchanger

[0052] The first heat exchanger 16 causes heat exchange between air around the outdoor unit 90 and the refrigerant flowing in the first heat exchanger 16. The first heat exchanger 16 according to the present embodiment is a fin-and-tube heat exchanger of a cross-fin type. The first heat exchanger 16 may not necessarily be configured to cause heat exchange between air and a refrigerant, but may alternatively be configured to cause heat exchange between the refrigerant flowing in the first heat exchanger 16 and fluid (e.g. cooling water or warm water) sent to the first heat exchanger 16. In this case, the first heat exchanger 16 may be, for example, a plate heat exchanger, a microchannel heat exchanger, or the like. The first heat exchanger 16 is accommodated in the fan chamber R1. The first heat exchanger 16 may alternatively be accommodated in the machine chamber R2.

[0053] The first heat exchanger 16 functions as a radiator (condenser) for a refrigerant when the air conditioner 100 is in the cooling mode as its operating mode. Furthermore, the first heat exchanger 16 functions as a heat absorber (evaporator) for a refrigerant when the air conditioner 100 is in the heating mode as its operating mode.

[0054] The first heat exchanger 16 includes a side surface heat exchange unit 16s and a rear surface heat exchange unit 16b. The side surface heat exchange unit 16s is disposed to be opposed to the left surface 91l adjacent to the fan chamber R1. The rear surface heat exchange unit 16b is disposed to be opposed to the rear surface 91b. The first heat exchanger 16 may not alternatively include the side surface heat exchange unit 16s.

[0055] The partition plate 92 according to the present embodiment has a rear end positioned adjacent to a right end of the rear surface heat exchange unit 16b. The right end of the rear surface heat exchange unit 16b is exposed to the machine chamber R2 through a gap between the rear surface 91b of the case 91 and the partition plate 92.

(2-1-3-5) Expansion mechanism

[0056] The expansion mechanism 18 is configured to expand the refrigerant flowing in the liquid pipe P4 to adjust pressure and a flow rate of the refrigerant. The expansion mechanism 18 according to the present embodiment is configured as an electronic expansion valve having an adjustable opening degree. The expansion mechanism 18 is accommodated in the machine chamber R2.

[0057] The expansion mechanism 18 should not be

limited to the electronic expansion valve. Alternatively, the expansion mechanism 18 may be a temperature automatic expansion valve including a temperature sensitive cylinder, or may be a capillary tube.

(2-1-3-6) Second heat exchanger

[0058] The second heat exchanger 20 causes heat exchange between the refrigerant flowing in the refrigerant circuit 10 and water flowing in the water circuit 30. The second heat exchanger 20 according to the present embodiment is configured as a plate heat exchanger. The second heat exchanger 20 should not be limited to the plate heat exchanger in terms of its type, but may be appropriately selected from heat exchangers of types applicable to heat exchange between a refrigerant and water. The second heat exchanger 20 is accommodated in the machine chamber R2.

[0059] The second heat exchanger 20 is connected with the liquid pipe P4 and the second gas pipe P5 of the refrigerant circuit 10. The second heat exchanger 20 is connected with a first pipe W1 and a second pipe W2 of the water circuit 30.

[0060] When the air conditioner 100 is in the cooling mode, the refrigerant flows into the second heat exchanger 20 via the liquid pipe P4 and flows out to the second gas pipe P5. When the air conditioner 100 is in the heating mode, the refrigerant flows into the second heat exchanger 20 via the second gas pipe P5 and flows out to the liquid pipe P4.

[0061] Regardless of whether the air conditioner 100 is in the cooling mode or in the heating mode, water flows into the second heat exchanger 20 via the first pipe W1 and flows out of the second pipe W2. When the air conditioner 100 is in the cooling mode, water flowing from the first pipe W1 is cooled by the refrigerant flowing into the second heat exchanger 20, and flows out to the second pipe W2. When the air conditioner 100 is in the heating mode, water flowing from the first pipe W1 is heated by the refrigerant flowing into the second heat exchanger 20, and flows out to the second pipe W2.

(2-1-4) Water circuit

[0062] The water circuit 30 has a flow of water that exchanges heat with the refrigerant in the second heat exchanger 20. As depicted in FIG. 1, the water circuit 30 principally includes a pump 32, the second heat exchanger 20, the gas-liquid separator 40, and the utilization facility 34. The water circuit 30 connects, by means of a pipe W, the pump 32, the second heat exchanger 20, the gas-liquid separator 40, and the utilization facility 34.

[0063] The pipe W of the water circuit 30 includes the first pipe W1 and the second pipe W2. The first pipe W1 connects the utilization facility 34 and the second heat exchanger 20, to allow water to flow from the utilization facility 34 to the second heat exchanger 20. The second pipe W2 connects the utilization facility 34 and the second heat exchanger 20, to allow water to flow from the second heat exchanger 20 to the utilization facility 34.

[0064] The first pipe W1 is connected with the pump 32. Examples of the pump 32 include a constant speed volute pump, and may also include a variable flow pump. The pump 32 should not be limited to the volute pump, but may be of an appropriately selected type.

[0065] The second pipe W2 is connected with the gas-liquid separator 40 configured to separate gas from inflow water and exhaust the separated gas to outside. The gas-liquid separator 40 is accommodated in the machine chamber R2.

(2-1-5) Fan unit

[0066] The fan unit 60 supplies the first heat exchanger 16 with air that exchanges heat with the refrigerant. The fan unit 60 includes a fan 61 and a fan motor 62. The fan motor 62 drives the fan 61. The fan unit 60 is accommodated in the fan chamber R1 so as to generate an anteroposterior air flow. The fan 61 according to the present embodiment is configured as a propeller fan.

(2-1-6) Electric component box

[0067] The electric component box 80 accommodates a power source circuit, a control device configured to control respective parts of the air conditioner 100, and a printed circuit board (none of which being depicted) provided thereon with electronic components including the above. The electric component box 80 is accommodated in the fan chamber R1.

[0068] The electric component box 80 has a substantially rectangular parallelepiped shape elongated in the horizontal direction, and has an upper surface 80u, a front surface 80f, a rear surface 80b, a left surface 80l, the right surface 80r, and the bottom surface 80d. The electric component box 80 according to the present embodiment has a rectangular parallelepiped shape elongated in the transverse direction. The front surface 80f and the rear surface 80b each exemplify a side surface.

[0069] The upper surface 80u has a substantially rectangular shape and covers an internal space of the electric component box 80 from above. The front surface 80f has a substantially rectangular shape and covers the internal space of the electric component box 80 from ahead. The rear surface 80b has a substantially rectangular shape and covers the internal space of the electric component box 80 from behind. The left surface 80l has a substantially rectangular shape and covers the internal space of the electric component box 80 from left. The right surface 80r has a substantially rectangular shape and covers the internal space of the electric component box 80 from right. The bottom surface 80d has a substantially rectangular shape and covers the internal space of the electric component box 80 from below.

[0070] The electric component box 80 includes the plurality of wires 80w electrically connecting the various

electronic components accommodated in the electric component box 80 and an external power source as well as various devices provided outside the electric component box 80. The wires 80w extend rightward from the right surface 80r close to the partition plate 92.

[0071] The electric component box 80 according to the present embodiment is 15 kg or more in weight. The electric component box 80 needs to inhibit any refrigerant leaking from the refrigerant circuit 10 from flowing into the electric component box 80. Accordingly, the electric component box 80 has six surfaces each preferably closed by 90% or more in terms of area.

(2-1-7) First support member

[0072] The first support member 93 as well as the second support member 94 and the third support member 92b support the fan unit 60 (more specifically, the fan motor 62) and the electric component box 80. FIG. 6 is a perspective view of the first support member 93. The first support member 93 is accommodated in the fan chamber R1. The first support member 93 includes two first supports 93a, a first supporting stand 93b, and a fan motor support member 93c.

[0073] The first supports 93a are disposed on the bottom surface 91d and ahead of the rear surface heat exchange unit 16b of the first heat exchanger 16, to have a longitudinal direction matching the vertical direction (upright direction). The two first supports 93a are disposed in the transverse direction to have a predetermined gap therebetween.

[0074] The first supporting stand 93b supports the electric component box 80. The first supporting stand 93b is fixed to upper ends of the first supports 93a. The first supporting stand 93b has a front surface 93bf, a bottom surface 93bd, and a rear surface 93bb. The front surface 93bf and the rear surface 93bb exemplify opposed surfaces.

[0075] The front surface 93bf is opposed to the front surface 80f of the electric component box 80. The front surface 93bf has a lower end connected to a front end of the bottom surface 93bd. The front surface 93bf is provided with a front first projection 93pf projecting from its surface toward the front surface 80f of the electric component box 80. The front first projection 93pf regulates anteroposterior movement of the electric component box 80 (see FIG. 6).

[0076] The bottom surface 93bd is opposed to the bottom surface 80d of the electric component box 80. In other words, the bottom surface 93bd supports the electric component box 80 from below. The bottom surface 93bd fixed to the first supports 93a at the vicinity of rear end the bottom surface 93bd.

[0077] The rear surface 93bb is opposed to the rear surface 80b of the electric component box 80. The rear surface 93bb has a lower end connected to the rear end of the bottom surface 93bd. The rear surface 93bb is provided with a rear first projection 93pb projecting from its surface toward the rear surface 80b of the electric component box 80. The rear first projection 93pb as well as the front first projection 93pf regulate anteroposterior movement of the electric component box 80 (see FIG. 6).

[0078] The rear surface 93bb further includes a bracket 93bx extending backward from an upper end and engaged with an upper end of the rear surface heat exchange unit 16b. When the bracket 93bx is engaged with the upper end of the rear surface heat exchange unit 16b, the first support member 93 is fixed to the first heat exchanger 16.

[0079] The fan motor support member 93c is a plate-shaped member that fixes the fan motor 62 to the first supports 93a. The fan motor support member 93c is fixed to the two first supports 93a so as to be perpendicular to the anteroposterior direction substantially at upright centers of the first supports 93a.

(2-1-8) Second support member

[0080] The second support member 94 as well as the first support member 93 and the third support member 92b support the electric component box 80. The second support member 94 includes a second support 94a and a second supporting stand 94b. FIG. 7 is a perspective view of the second support member 94. The second support member 94 is accommodated in the fan chamber R1.

[0081] The second support 94a is disposed on the bottom surface 91d and ahead of the rear surface heat exchange unit 16b of the first heat exchanger 16, to have a longitudinal direction matching the vertical direction (upright direction).

[0082] The second supporting stand 94b supports the electric component box 80. The second supporting stand 94b is fixed to an upper end of the second support 94a. The second supporting stand 94b has a front surface 94bf, a bottom surface 94bd, and a rear surface 94bb. The front surface 94bf and the rear surface 94bb exemplify opposed surfaces.

[0083] The front surface 94bf is opposed to the front surface 80f of the electric component box 80. The front surface 94bf has a lower end connected to a front end of the bottom surface 94bd.

[0084] The bottom surface 94bd is opposed to the bottom surface 80d of the electric component box 80. In other words, the bottom surface 94bd supports the electric component box 80 from below. The bottom surface 94bd fixed to the second support 94a at the vicinity of rear end of the bottom surface 94bd. The second support member 94 according to the present embodiment further includes a reinforcing member 94c. The reinforcing member 94c has a pillar shape and supports the bottom surface 94bd from below. The reinforcing member 94c has a first end connected to a lower side of the bottom surface 94bd, and a second end connected to a portion adjacent to an upright center of the second support 94a.

[0085] The rear surface 94bb is opposed to the rear surface 80b of the electric component box 80. The rear

surface 94bb has a lower end connected to the rear end of the bottom surface 94bd.

[0086] The rear surface 94bb further includes a bracket 94bx extending backward from an upper end and engaged with the upper end of the rear surface heat exchange unit 16b. When the bracket 94bx is engaged with the upper end of the rear surface heat exchange unit 16b, the second support member 94 is fixed to the first heat exchanger 16.

(2-1-9) Positional relationship between first support member and second support member

[0087] The first support member 93 and the second support member 94 are aligned in a longitudinal direction of the electric component box 80 (the transverse direction in the present embodiment). The second support member 94 is disposed opposite to the partition plate 92 with the first support member 93 being interposed therebetween.

[0088] The first support member 93 and the second support member 94 are disposed to have the longitudinal direction (the longitudinal direction of the first supports 93a and the second support 94a) matching the vertical direction. The first support member 93 and the second support member 94 are disposed such that a first center axis CL1 as a center axis of the first support member 93 and a second center axis CL2 as a center axis of the second support member 94 sandwich a horizontal center portion 80c of the electric component box 80 in a front view. FIG. 8 is a front view of the outdoor unit 90, depicting positional relationship among the first center axis CL1 and the second center axis CL2, and the center portion 80c. For convenience, FIG. 8 does not depict part of the first supporting stand 93b or the second supporting stand 94b.

[0089] The bottom surface 93bd of the first supporting stand 93b and the bottom surface 94bd of the second supporting stand 94b are disposed below an upper end of the first heat exchanger 16 in the vertical direction (see FIG. 3). The first support member 93 and the second support member 94 preferably support the electric component box 80 such that the upper surface 80u is positioned below the upper end of the first heat exchanger 16 in the vertical direction (see FIG. 3).

(2-2) Utilization facility

[0090] The utilization facility 34 is configured to utilize water cooled or heated in the second heat exchanger 20. Examples of the utilization facility 34 according to the present embodiment include an air handling unit and a fan coil unit configured to cause heat exchange between air and water cooled or heated in the second heat exchanger 20, to condition air. The utilization facility in a heat pump cycle apparatus should not be limited, in terms of its type, to the air handling unit or the fan coil unit, but may be appropriately selected for its purpose of use. In an exemplary case where the heat pump cycle apparatus is used in a plant or the like, the utilization facility 34 may alternatively be a manufacturing facility configured to cool or heat a manufacturing apparatus or a product by means of water cooled or heated in the second heat exchanger 20. In another case where the heat pump cycle apparatus is a water heater, the utilization facility 34 may alternatively be a tank configured reserve water cooled or heated in the second heat exchanger 20. Water reserved in the tank serving as the utilization facility 34 is sent to a device or the like utilizing water by means of a pump (not depicted) or the like.

[0091] FIG. 1 depicts only one utilization facility 34, but the air conditioner 100 may alternatively include a plurality of utilization facilities. In this case, water cooled or heated in the second heat exchanger 20 is sent to the plurality of utilization facilities. When the air conditioner 100 includes the plurality of utilization facilities, the utilization facilities may be of an identical type, or may alternatively include a plurality of types of facilities.

(3) Characteristics

[0092] (3-1)
The outdoor unit 90 of the air conditioner 100 includes the fan motor 62, the partition plate 92, the first support member 93, the second support member 94, and the electric component box 80. The fan motor 62 drives the fan 61. The partition plate 92 zones the fan chamber R1 accommodating the fan 61. The first support member 93 supports the fan motor 62. The first support member 93 and the second support member 94 support the electric component box 80.

[0093] The outdoor unit 90 supports the electric component box 80 by means of the first support member 93 supporting the fan motor 62 and the second support member 94 provided separately from the partition plate 92. Unlike the partition plate 92, the second support member 94 is positioned relatively freely without being influenced by sizes of other components. The outdoor unit 90 can thus freely position the second support member 94 in accordance with a size of the electric component box 80 so as to stably support even the electric component box 80 having a large size.

[0094] (3-2)
The second support member 94 is disposed opposite to the partition plate 92 with the first support member 93 being interposed therebetween.

[0095] (3-3)
The first support member 93 and the second support member 94 are aligned in the longitudinal direction of the electric component box 80.

[0096] The outdoor unit 90 can thus stably support even the electric component box 80 elongated horizontally.

[0097] (3-4)
The first support member 93 includes the first supporting stand 93b. The second support member 94 includes the

second supporting stand 94b. The first supporting stand 93b and the second supporting stand 94b support the bottom surface 80d of the electric component box 80.

[0098] The outdoor unit 90 can thus stably support the electric component box 80 by means of the first supporting stand 93b and the second supporting stand 94b.

[0099] (3-5)

The first supporting stand 93b and the second supporting stand 94b have the opposed surfaces (the front surface 93bf, the rear surface 93bb, the front surface 94bf, and the rear surface 94bb) opposed to the side surfaces (the front surface 80f and the rear surface 80b) of the electric component box 80.

[0100] The opposed surfaces can regulate horizontal movement of the electric component box 80. The outdoor unit 90 can thus stably support the electric component box 80.

[0101] (3-6)

The opposed surfaces (the front surface 93bf and the rear surface 93bb) are provided with the projections (the front first projection 93pf and the rear first projection 93pb) configured to regulate movement of the electric component box 80.

[0102] The projections are configured to set the electric component box 80 at a stable position on the first supporting stand 93b. The outdoor unit 90 can thus stably support the electric component box 80.

[0103] (3-7)

The partition plate 92 supports the electric component box 80.

[0104] The electric component box 80 is supported by the partition plate 92 as well as by the first support member 93 and the second support member 94. The outdoor unit 90 can thus stably support the electric component box 80.

[0105] (3-8)

The partition plate 92 includes the third support member 92b. The third support member 92b supports the bottom surface 80d of the electric component box 80.

[0106] The electric component box 80 is supported by the third support member 92b as well as by the first support member 93 and the second support member 94. The outdoor unit 90 can thus stably support the electric component box 80.

[0107] (3-9)

The outdoor unit 90 further includes the first heat exchanger 16. The bottom surface 93bd of the first supporting stand 93b and the bottom surface 94bd of the second supporting stand 94b are disposed below the upper end of the first heat exchanger 16 in the vertical direction.

[0108] The upper surface 80u of the electric component box 80 is accordingly inhibited from projecting upward from the upper end of the first heat exchanger 16. This inhibits increase in size of the outdoor unit 90.

[0109] (3-10)

The electric component box 80 is supported to have the upper surface 80u positioned below the upper end of the first heat exchanger 16 in the vertical direction.

[0110] The upper surface 80u of the electric component box 80 accordingly does not project upward from the upper end of the first heat exchanger 16. This effectively inhibits increase in size of the outdoor unit 90.

[0111] (3-11)

The electric component box 80 is 15 kg or more in weight.

[0112] The outdoor unit 90 can stably support even the electric component box 80 large enough to have 15 kg or more in weight.

[0113] (3-12)

The electric component box 80 is the rectangular parallelepiped, and has the six surfaces each closed by 90% or more in terms of area.

[0114] The outdoor unit 90 can inhibit any refrigerant leaking from the refrigerant circuit 10 from flowing into the electric component box 80.

[0115] (3-13)

The first support member 93 and the second support member 94 are disposed to have the longitudinal direction matching the vertical direction. The first support member 93 and the second support member 94 are disposed such that the first center axis CL1 of the first support member 93 and the second center axis CL2 of the second support member 94 sandwich the horizontal center portion 80c of the electric component box 80 in a front view.

[0116] This inhibits the gravity center of the electric component box 80 from being largely separated from a space between the first support member 93 and the second support member 94. The outdoor unit 90 can thus stably support the electric component box 80.

[0117] The embodiment of the present disclosure has been described above. Various modifications to modes and details should be available without departing from the object and the scope of the present disclosure recited in the claims.

REFERENCE SIGNS LIST

CITATION LIST

PATENT LITERATURE

[0118] Patent Literature 1: Japanese Laid-Open Patent Publication No. 2006-226644

Claims

1. An outdoor unit (90) of an air conditioner (100), the outdoor unit comprising:

   a fan motor (62) configured to drive a fan (61);
   a partition plate (92) zoning a fan chamber (R1) accommodating the fan;
   a first support member (93) supporting the fan motor;
   a second support member (94); and

an electric component box (80),
wherein the first support member and the second support member support the electric component box.

2. The outdoor unit of the air conditioner according to claim 1, wherein
the second support member is disposed opposite to the partition plate with the first support member being interposed therebetween.

3. The outdoor unit of the air conditioner according to claim 1 or 2, wherein
the first support member and the second support member are aligned in a longitudinal direction of the electric component box.

4. The outdoor unit of the air conditioner according to any one of claims 1 to 3, wherein

the first support member includes a first supporting stand (93b),
the second support member includes a second supporting stand (94b), and
the first supporting stand and the second supporting stand support a bottom surface (80d) of the electric component box.

5. The outdoor unit of the air conditioner according to claim 4, wherein
the first supporting stand and the second supporting stand each have an opposed surface (93bf, 93bb, 94bf, 94bb) opposed to a side surface (80f, 80b) of the electric component box.

6. The outdoor unit of the air conditioner according to claim 5, wherein
the opposed surface (93bf, 93bb) is provided with a projection (93pf, 93pb) regulating movement of the electric component box.

7. The outdoor unit of the air conditioner according to any one of claims 1 to 6, wherein
the partition plate supports the electric component box.

8. The outdoor unit of the air conditioner according to claim 7, wherein

the partition plate includes a third support member (92b), and
the third support member supports a bottom surface (80d) of the electric component box.

9. The outdoor unit of the air conditioner according to claim 4, the outdoor unit further comprising a heat exchanger (16), wherein
a bottom surface (93bd) of the first supporting stand and a bottom surface (94bd) of the second supporting stand are disposed below an upper end of the heat exchanger in a vertical direction.

10. The outdoor unit of the air conditioner according to claim 9, wherein
the electric component box is supported to have an upper surface (80u) positioned below the upper end of the heat exchanger in the vertical direction.

11. The outdoor unit of the air conditioner according to any one of claims 1 to 10, wherein
the electric component box is 15 kg or more in weight.

12. The outdoor unit of the air conditioner according to any one of claims 1 to 11, wherein

the electric component box is a rectangular parallelepiped, and
has six surfaces each closed by 90% or more in terms of area.

13. The outdoor unit of the air conditioner according to any one of claims 1 to 12, wherein

a longitudinal direction of the first support member and the second support member matches the vertical direction, and
the first support member and the second support member are disposed such that a first center axis (CL1) of the first support member and a second center axis (CL2) of the second support member sandwich a horizontal center portion (80c) of the electric component box, in a front view.

Amended claims in accordance with Rule 137(2) EPC.

1. An outdoor unit (90) of an air conditioner (100), the outdoor unit comprising:

a fan motor (62) configured to drive a fan (61);
a partition plate (92) zoning a fan chamber (R1) accommodating the fan;
a first support member (93) supporting the fan motor;
a second support member (94); and
an electric component box (80),
wherein the first support member and the second support member support the electric component box, and
wherein the first support member (93) includes two first supports (93a), **characterized in that**
the second support member is disposed opposite to the partition plate with the first support member being interposed therebetween.

2. The outdoor unit of the air conditioner according to claim 1, wherein
the first support member and the second support member are aligned in a longitudinal direction of the electric component box.

3. The outdoor unit of the air conditioner according to claim 1 or 2, wherein

the first support member includes a first supporting stand (93b),
the second support member includes a second supporting stand (94b), and
the first supporting stand and the second supporting stand support a bottom surface (80d) of the electric component box.

4. The outdoor unit of the air conditioner according to claim 3, wherein
the first supporting stand and the second supporting stand each have an opposed surface (93bf, 93bb, 94bf, 94bb) opposed to a side surface (80f, 80b) of the electric component box.

5. The outdoor unit of the air conditioner according to claim 4, wherein
the opposed surface (93bf, 93bb) is provided with a projection (93pf, 93pb) regulating movement of the electric component box.

6. The outdoor unit of the air conditioner according to any one of claims 1 to 5, wherein
the partition plate supports the electric component box.

7. The outdoor unit of the air conditioner according to claim 6, wherein

the partition plate includes a third support member (92b), and
the third support member supports a bottom surface (80d) of the electric component box.

8. The outdoor unit of the air conditioner according to claim 3, the outdoor unit further comprising a heat exchanger (16), wherein
a bottom surface (93bd) of the first supporting stand and a bottom surface (94bd) of the second supporting stand are disposed below an upper end of the heat exchanger in a vertical direction.

9. The outdoor unit of the air conditioner according to claim 8, wherein
the electric component box is supported to have an upper surface (80u) positioned below the upper end of the heat exchanger in the vertical direction.

10. The outdoor unit of the air conditioner according to any one of claims 1 to 9, wherein
the electric component box is 15 kg or more in weight.

11. The outdoor unit of the air conditioner according to any one of claims 1 to 10, wherein

the electric component box is a rectangular parallelepiped, and
has six surfaces each closed by 90% or more in terms of area.

12. The outdoor unit of the air conditioner according to any one of claims 1 to 11, wherein

a longitudinal direction of the first support member and the second support member matches the vertical direction, and
the first support member and the second support member are disposed such that a first center axis (CL1) of the first support member and a second center axis (CL2) of the second support member sandwich a horizontal center portion (80c) of the electric component box, in a front view.

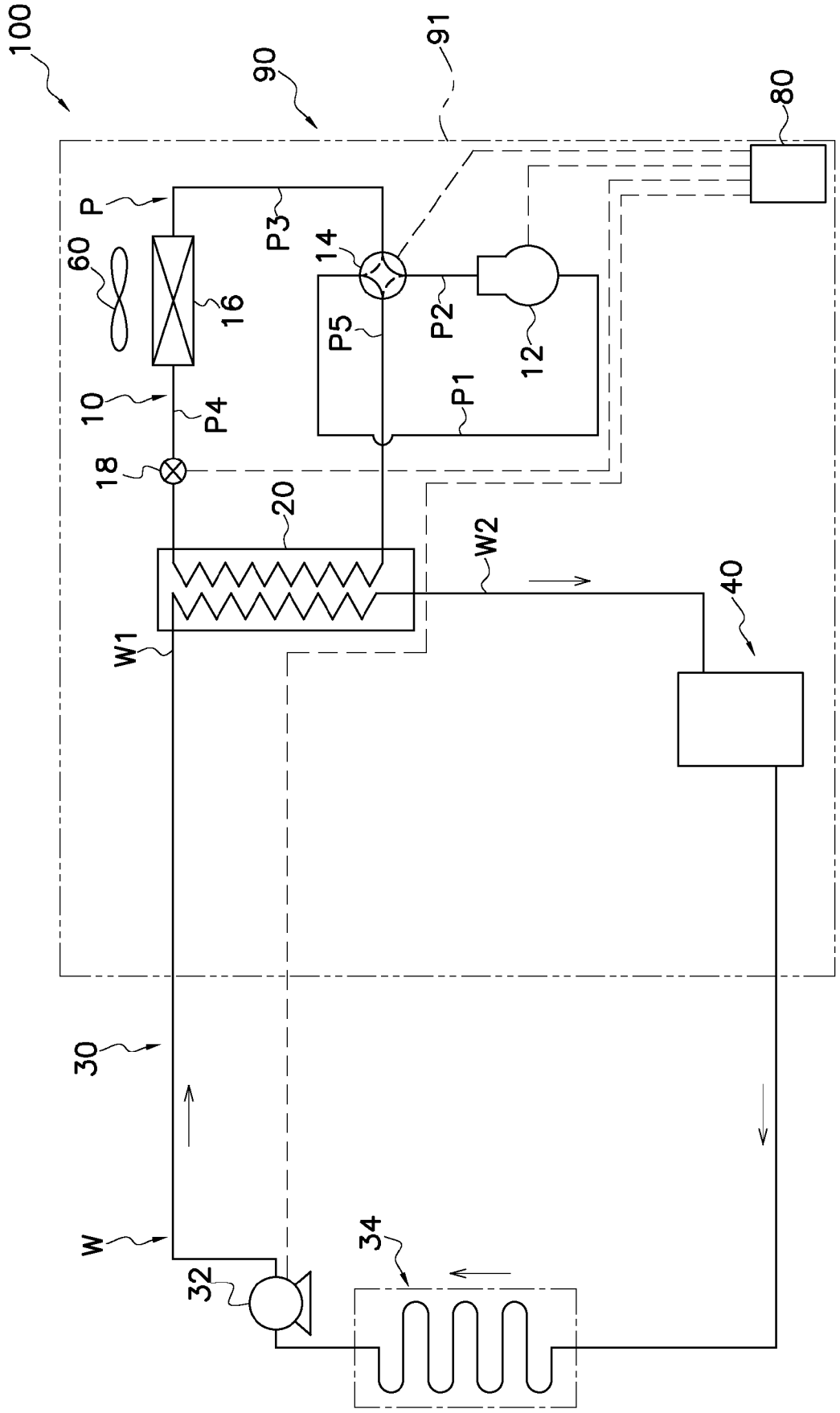

FIG. 1

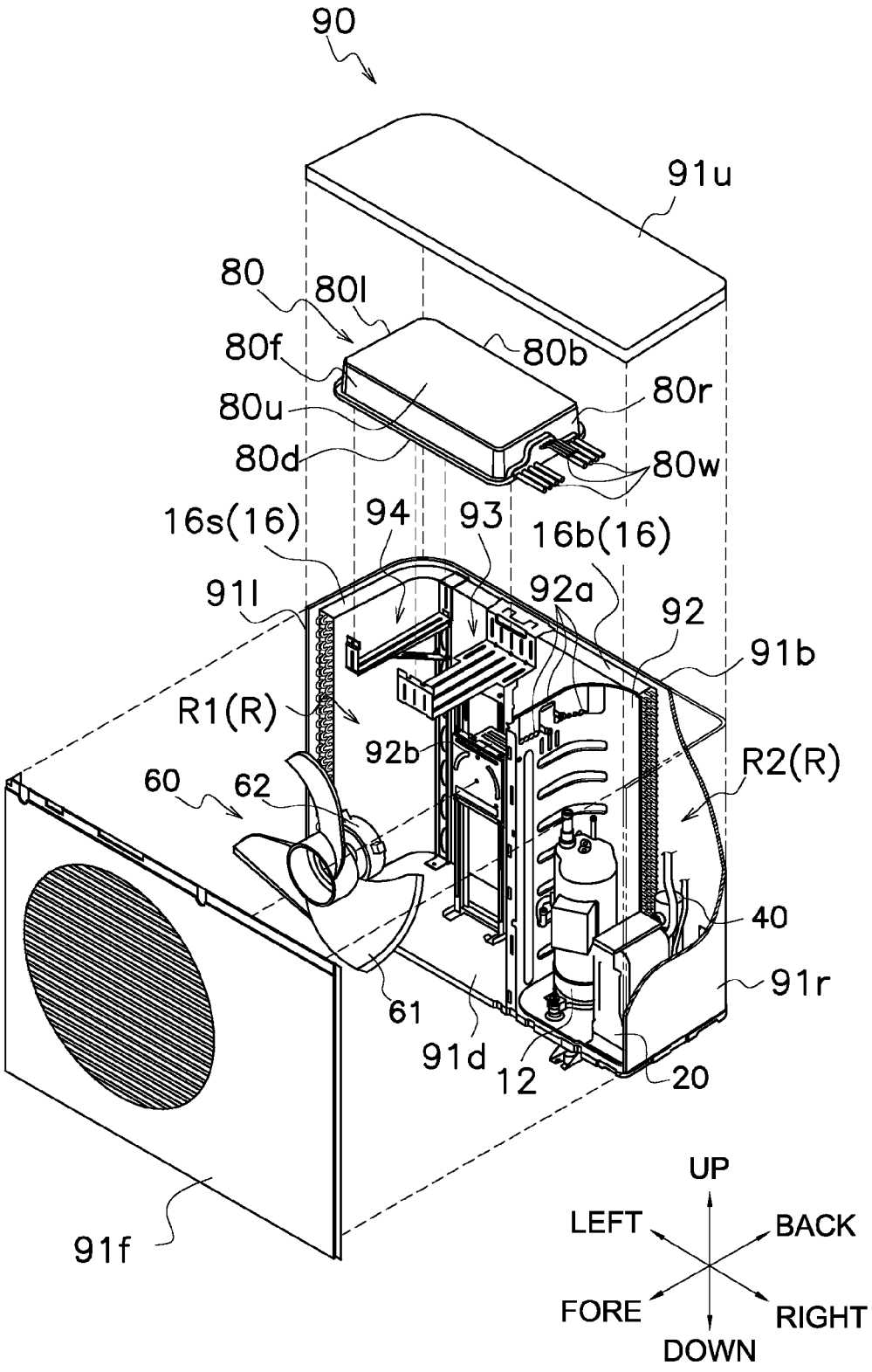
90
91u
80
80l
80f
80b
80r
80u
80d
80w
16s(16)
94
93
16b(16)
91l
92a
92
91b
R1(R)
92b
R2(R)
60
62
40
91r
61
91d
12
20
91f
UP
LEFT
BACK
FORE
RIGHT
DOWN

FIG. 2

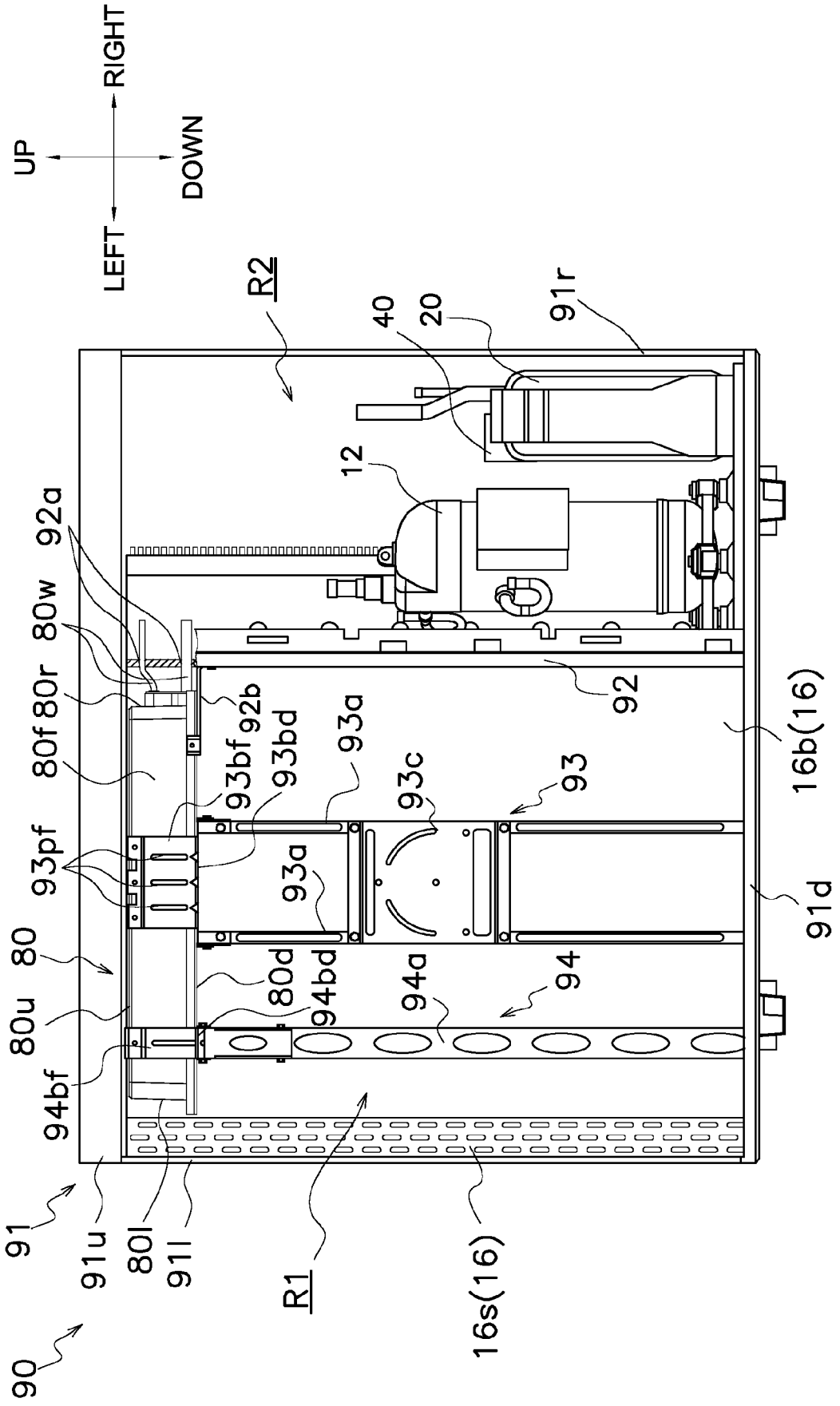
UP
RIGHT
DOWN
LEFT
R2
40
20
91r
12
92a
80w
80r
80f
92b
92
16b(16)
93bf
93bd
93a
93c
93
93pf
93a
91d
80
80u
80d
94bd
94a
94
94bf
91
91u
80l
91l
R1
16s(16)
90

FIG. 3

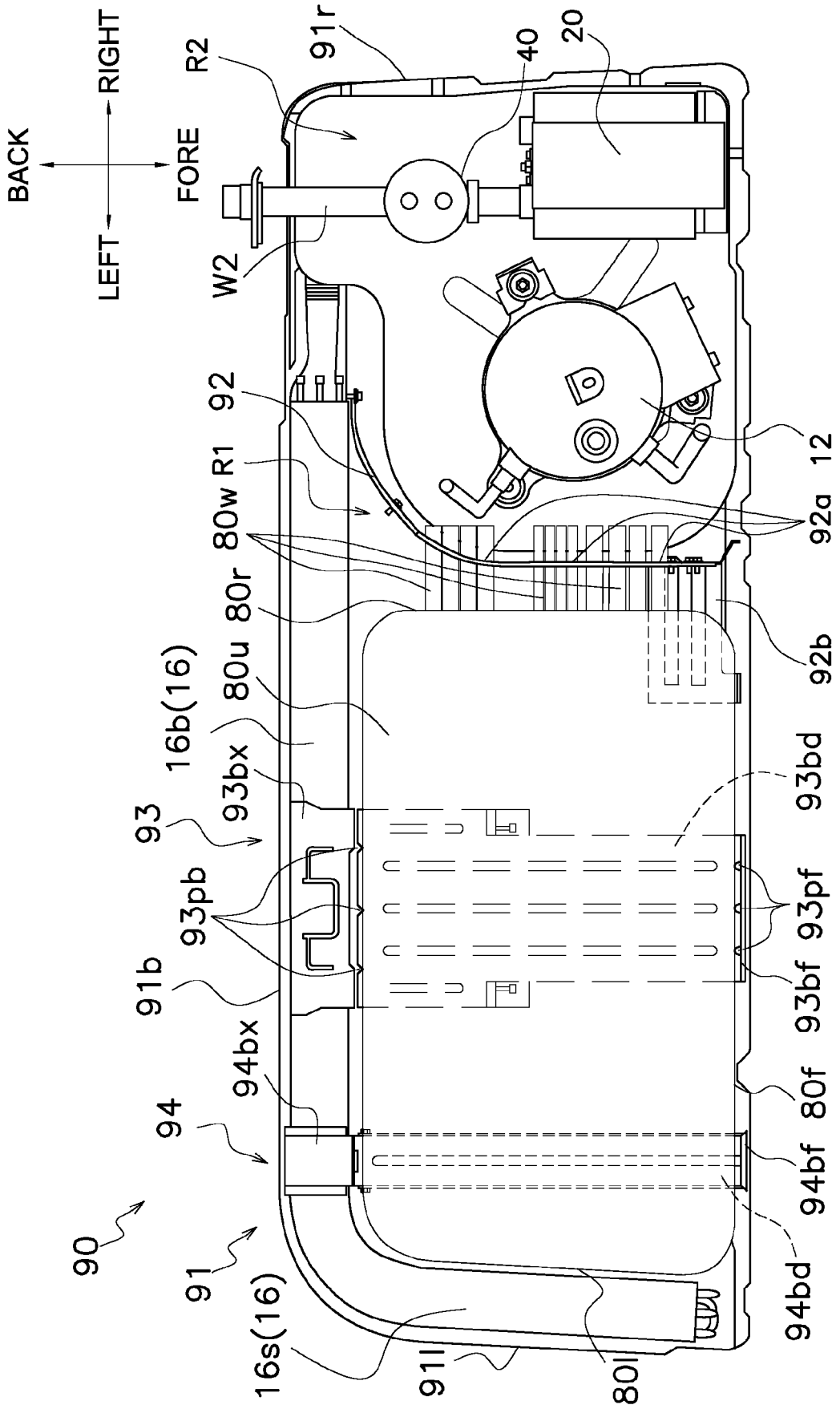
BACK
FORE
LEFT
RIGHT
R2
91r
40
20
W2
92
R1
80w
12
92a
80r
80u
92b
16b(16)
93bx
93bd
93
93pb
93pf
91b
93bf
94bx
80f
94
94bf
90
91
94bd
16s(16)
91l
80l

FIG. 4

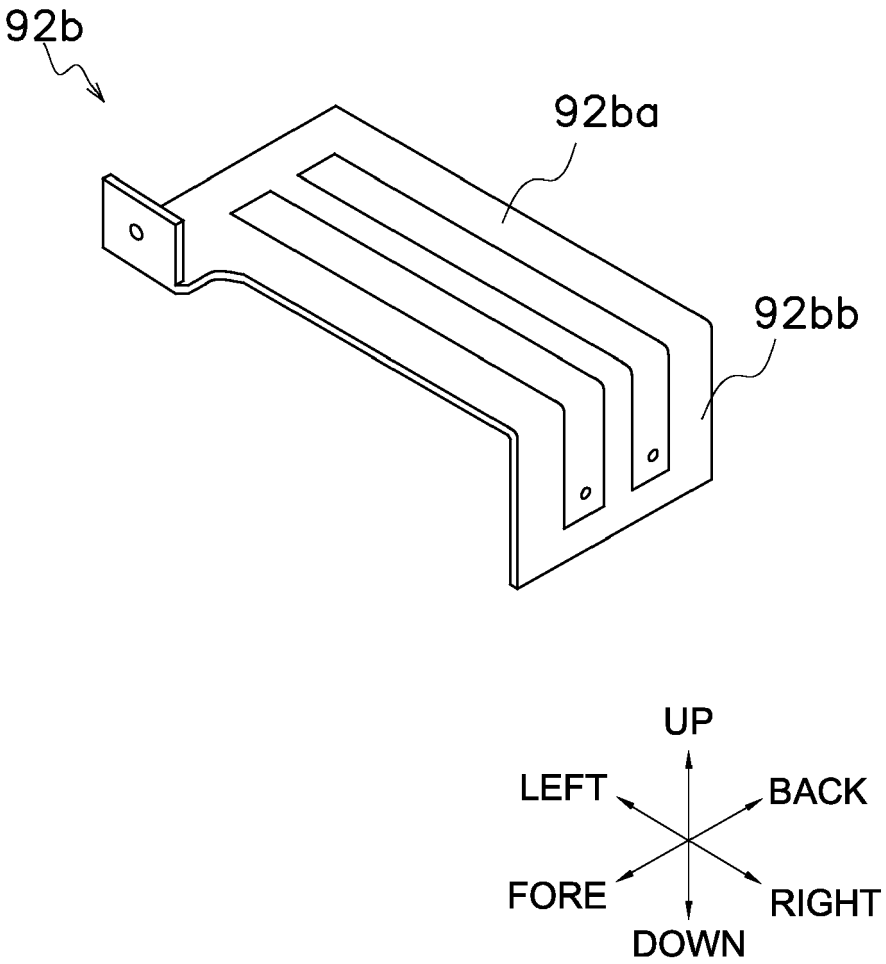

FIG. 5

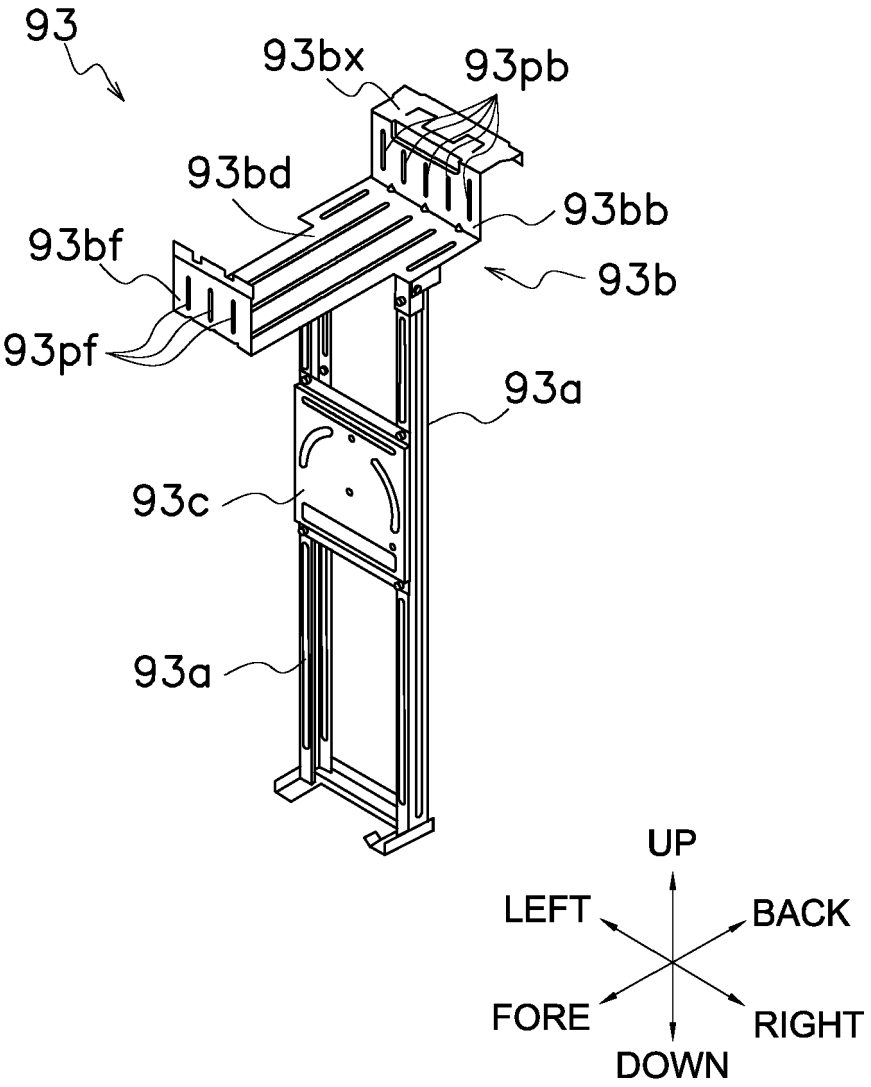
93
93bx
93pb
93bd
93bb
93bf
93b
93pf
93a
93c
93a
UP
LEFT
BACK
FORE
RIGHT
DOWN

FIG. 6

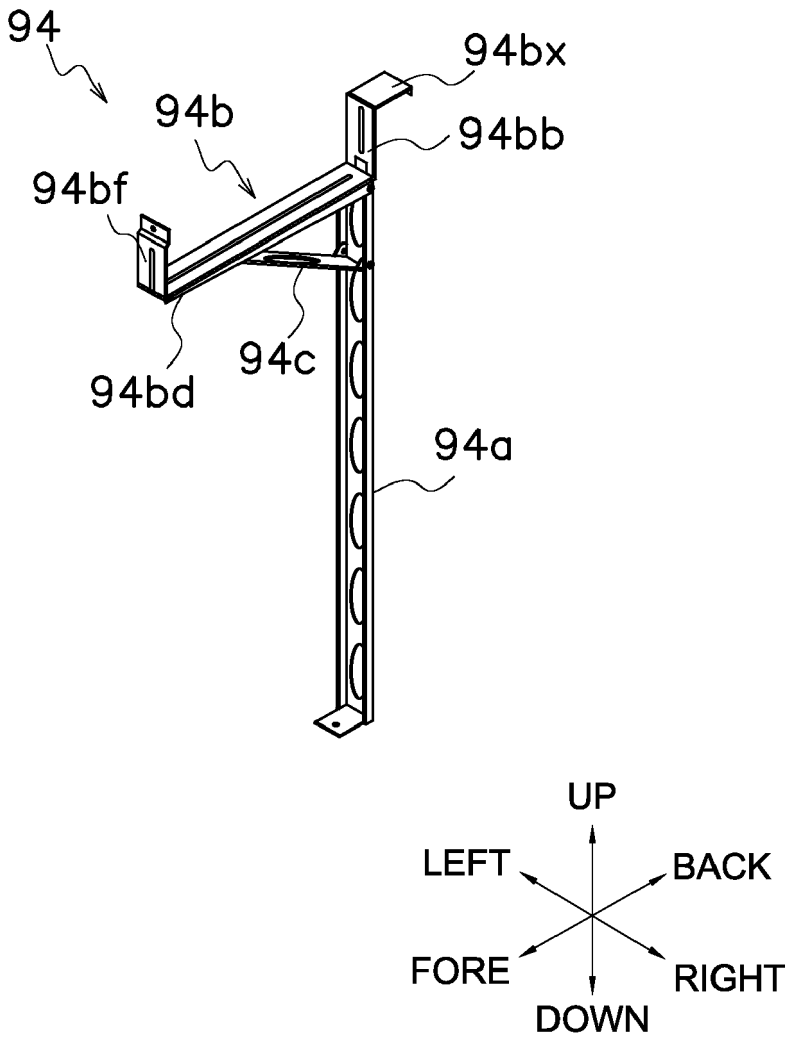
94
94b
94bx
94bb
94bf
94bd
94c
94a
UP
LEFT
BACK
FORE
RIGHT
DOWN

FIG. 7

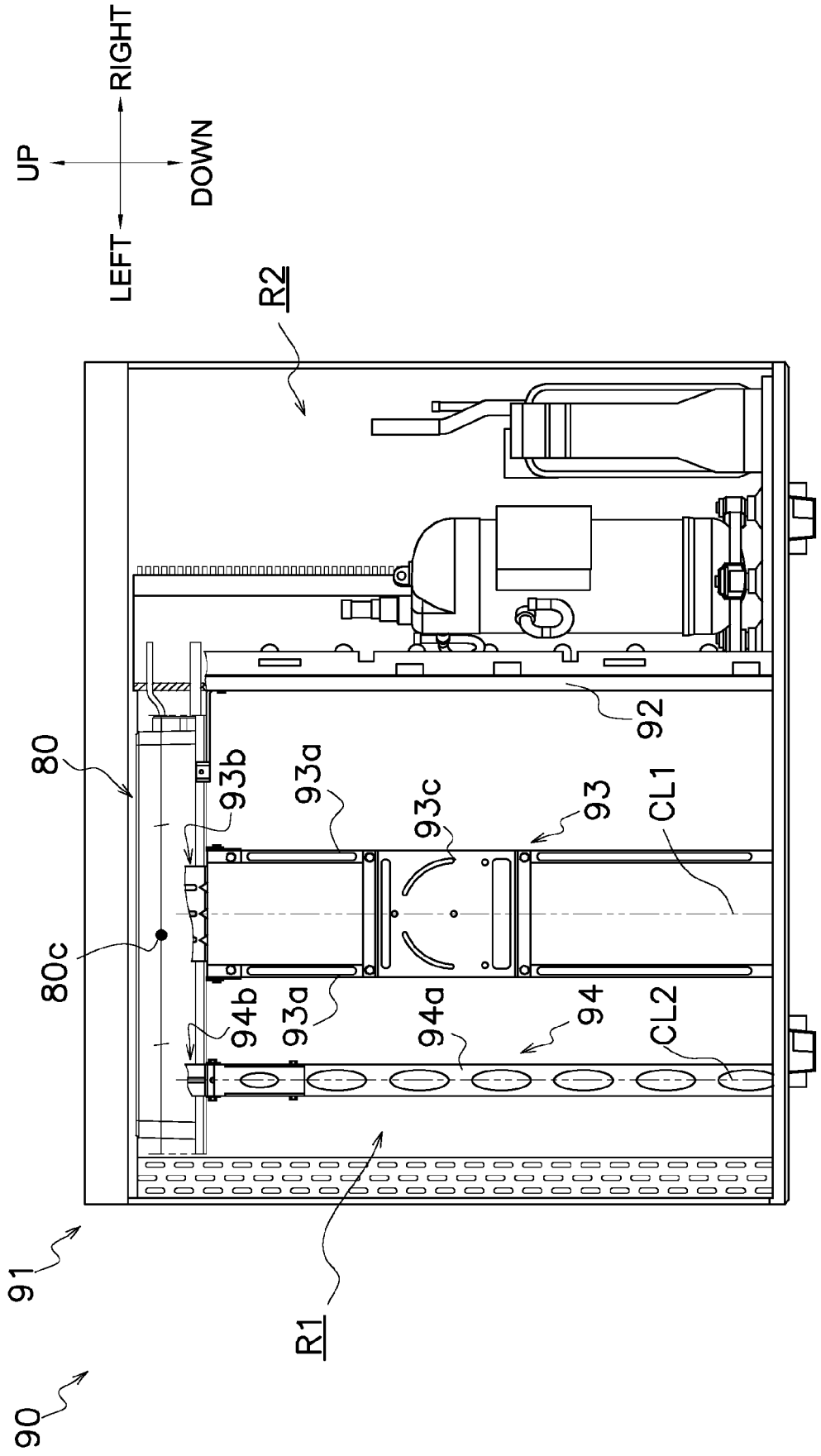
UP
RIGHT
DOWN
LEFT
R2
92
80
93b
93a
93c
93
CL1
80c
94b
93a
94a
94
CL2
91
R1
90

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 23 16 0663

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Place of search	Date of completion of the search	Examiner
Munich	16 August 2023	Anconetani, Mirco

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