



(11)

EP 4 495 493 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
22.01.2025 Bulletin 2025/04

(21) Application number: **23770475.4**

(22) Date of filing: **03.03.2023**

(51) International Patent Classification (IPC):
F24F 1/56 ^(2011.01) **F24F 1/16** ^(2011.01)
F24F 1/22 ^(2011.01) **F24F 13/20** ^(2006.01)

(52) Cooperative Patent Classification (CPC):
F24F 1/16; F24F 1/22; F24F 1/56; F24F 2130/20

(86) International application number:
PCT/JP2023/008101

(87) International publication number:
WO 2023/176518 (21.09.2023 Gazette 2023/38)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **18.03.2022 JP 2022044697**

(71) Applicant: **Fujitsu General Limited**
Kawasaki-shi, Kanagawa 213-8502 (JP)

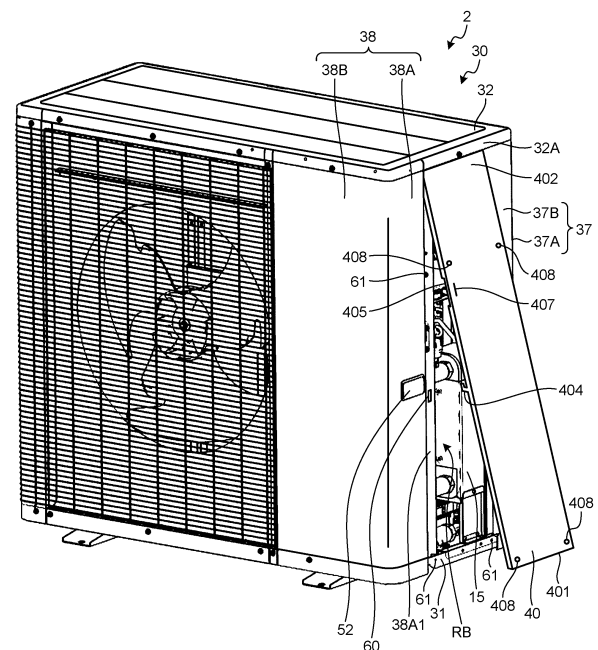
(72) Inventor: **SATO, Shota**
Kawasaki-shi, Kanagawa 213-8502 (JP)

(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(54) **OUTDOOR UNIT OF HEAT PUMP CYCLE DEVICE, AND HEAT PUMP CYCLE DEVICE**

(57) An outdoor machine (2) of a heat pump cycle apparatus according to the present embodiment includes a housing (30) whose inside is divided into a heat exchange chamber (RA) that houses an outdoor heat exchanger (13) and an outdoor fan (17) that blows air to the outdoor heat exchanger (13), and a machine chamber (RB) that houses an electrical unit (25) that controls an operation of the outdoor fan (17), in which the housing (30) is formed with a blowout port (41) for blowing out air heat-exchanged with a refrigerant in the outdoor heat exchanger (13) to the outside of the housing (30) by rotation of the outdoor fan (17), and when a surface on which the blowout port (41) is formed is a front surface of the housing (30), the housing (30) has a detachable service panel (40) on the right side surface located on a side of the machine chamber (RB).

FIG.8



Description

Field

[0001] The present invention relates to an outdoor machine of a heat pump cycle apparatus including a machine chamber in which a compressor and an electrical unit are housed in a housing, and the heat pump cycle apparatus. Background

[0002] In general, an outdoor machine of a heat pump cycle apparatus includes a housing whose inside is divided into a heat exchange chamber and a machine chamber, in which a heat exchanger, a fan, and the like are housed in the heat exchange chamber of the housing, and a compressor, an electrical unit, and the like are housed in the machine chamber of the housing. In this type of outdoor machine, there is known an outdoor machine in which, when a side on which a blowout port for blowing out air to the outside of the housing is formed is a front surface, the housing includes a detachable service panel on a machine chamber side of the front surface of the housing, and the service panel can be removed to perform work during construction or maintenance of the outdoor machine (for example, refer to Patent Literature 1).

Citation List

Patent Literature

[0003] Patent Literature 1: JP 2016-70616 A

Summary

Technical Problem

[0004] Some outdoor machines of this type require piping and wiring work on a rear surface side of a housing. In an outdoor machine including a service panel on a front surface of a housing as in Patent Literature 1, when, for example, a wiring port is provided on a rear surface side of the housing and wiring is passed through the wiring port into the housing during construction or maintenance, a worker inserts the wiring forward from the rear surface side of the housing, goes around to the front surface side of the housing from which the service panel is removed, and visually checks a tip of the wiring. In this case, if it is not possible for the tip of the wiring to be confirmed, it is needed to insert the wiring by going around to the rear surface side of the housing again, and the work of repeatedly moving back and forth between the front and rear of the housing occurs, and the workability of the worker decreases.

[0005] The disclosed technique has been made in view of the above, and an object of the disclosed technique is to provide an outdoor machine of a heat pump cycle apparatus and the heat pump cycle apparatus capable of improving workability of a worker during construction

and maintenance.

Solution to Problem

[0006] According to an aspect of an embodiment, an outdoor machine of a heat pump cycle apparatus comprising a housing whose inside is divided into a heat exchange chamber that houses a heat exchanger and a fan that blows air to the heat exchanger, and a machine chamber that houses an electrical unit, wherein the housing is formed with a blowout port for blowing out air heat-exchanged with a refrigerant in the heat exchanger to an outside of the housing by rotation of the fan, and when a surface on which the blowout port is formed is a front surface of the housing, the housing has a detachable service panel on a side surface located on a side of the machine chamber.

[0007] According to an aspect of an embodiment, a heat pump cycle apparatus comprising an outdoor machine disposed outdoors and an indoor machine disposed indoors, wherein the outdoor machine has a housing whose inside is divided into a heat exchange chamber that houses a heat exchanger and a fan that blows air to the heat exchanger, and a machine chamber that houses an electrical unit that controls an operation of the fan, the housing is formed with a blowout port for blowing out air heat-exchanged with a refrigerant in the heat exchanger to an outside of the housing by rotation of the fan, and when a surface on which the blowout port is formed is a front surface of the housing, the housing has a detachable service panel on a side surface of the housing located on a side of the machine chamber.

Advantageous Effects of Invention

[0008] According to an aspect of the outdoor machine of the heat pump cycle apparatus and the heat pump cycle apparatus disclosed in the present application, the workability of a worker during construction and maintenance can be improved.

Brief Description of Drawings

[0009]

FIG. 1 is a circuit configuration diagram illustrating an example of a refrigerant circuit and a water circuit of a heat pump cycle apparatus according to the present embodiment.

FIG. 2 is an external perspective view of an outdoor machine as viewed from the front surface side.

FIG. 3 is an external perspective view of the outdoor machine as viewed from the rear surface side.

FIG. 4 is a perspective view illustrating an internal structure of the outdoor machine.

FIG. 5 is a partially enlarged perspective view of an electrical unit fixed to a partition plate in a machine chamber.

FIG. 6 is a view of the outdoor machine from which a service panel is removed as viewed from the right side surface side.

FIG. 7 is a view of the service panel as viewed from the inner surface side facing the inside of a housing.

FIG. 8 is a perspective view of the outdoor machine illustrating an initial movement of attaching the service panel to the housing.

FIG. 9 is a schematic cross-sectional view for explaining the movement of attaching the service panel to the housing.

FIG. 10 is a schematic cross-sectional view for explaining the movement of attaching the service panel to the housing.

FIG. 11 is a schematic cross-sectional view for explaining the movement of attaching the service panel to the housing.

Description of Embodiments

[0010] In the following, embodiments of an outdoor machine of an air conditioner disclosed in the present application will be described in detail with reference to the drawings. Note that the disclosed technique is not limited by the present embodiment. In addition, the embodiments described below may be appropriately modified within a range in which no contradiction occurs. Embodiments

<Configuration of Heat Pump Cycle Apparatus>

[0011] FIG. 1 is a circuit configuration diagram illustrating an example of a refrigerant circuit and a water circuit of a heat pump cycle apparatus according to the present embodiment. The heat pump cycle apparatus 1 includes an outdoor machine 2 and an indoor machine 3, and the outdoor machine 2 and the indoor machine 3 are connected to each other by a water pipe to form a water circuit 4. The heat pump cycle apparatus 1 performs cooling or heating of a room (space) in which the indoor machine 3 is disposed by circulating cold water or hot water in the water circuit 4 of the outdoor machine 2 and the indoor machine 3. Note that, although the heat pump cycle apparatus 1 illustrated in FIG. 1 includes one indoor machine 3, the heat pump cycle apparatus may include a plurality of indoor machines 3 connected in parallel to the outdoor machine 2.

[0012] As illustrated in FIG. 1, the outdoor machine 2 has a compressor 11, a four-way valve 12, an outdoor heat exchanger (heat exchanger) 13, an outdoor expansion valve 14, a water-refrigerant heat exchanger 15, an accumulator 16, and an outdoor fan (fan) 17. The compressor 11, the four-way valve 12, the outdoor heat exchanger 13, the outdoor expansion valve 14, the water-refrigerant heat exchanger 15, and the accumulator 16 are connected to each other by a refrigerant pipe 18 to form a refrigerant circuit 10. The refrigerant circuit 10 is completed inside the outdoor machine 2 to consti-

tute a refrigeration cycle. In addition to the refrigerant pipe 18, a water pipe 19 is connected to the water-refrigerant heat exchanger 15. The water pipe 19 extends to the outside of the outdoor machine 2 and is connected to an indoor unit 23 (described later) of the indoor machine 3 to form the water circuit 4.

[0013] The compressor 11 is, for example, a capability variable compressor of a high-pressure container type capable of changing an operation capacity, and compresses a sucked low-pressure gas refrigerant to discharge a high-pressure gas refrigerant. The four-way valve 12 is connected to a refrigerant discharge side of the compressor 11, and the accumulator 16 is connected to a refrigerant suction side of the compressor.

[0014] The four-way valve 12 is a valve for switching the direction in which the refrigerant flows in the refrigerant circuit 10, and include a first port 12A to a fourth port 12D. The first port 12A is connected to the refrigerant discharge side of the compressor 11. The second port 12B is connected to one refrigerant inlet/outlet 13A of the outdoor heat exchanger 13. The third port 12C is connected to the refrigerant inflow side of the accumulator 16. The fourth port 12D is connected to one refrigerant inlet/outlet 15A of the water-refrigerant heat exchanger 15.

[0015] As the outdoor heat exchanger 13, for example, a fin-tube heat exchanger is used. The outdoor heat exchanger 13 exchanges heat between a refrigerant and the outside air taken into the outdoor machine 2 by the rotation of the outdoor fan 17. The other refrigerant inlet/outlet 13B of the outdoor heat exchanger 13 is connected to the other refrigerant inlet/outlet 15B of the water-refrigerant heat exchanger 15 via the outdoor expansion valve 14. The outdoor heat exchanger 13 functions as a condenser when the heat pump cycle apparatus 1 performs cooling operation, to condense (liquefy) the gas refrigerant. In addition, the outdoor heat exchanger 13 functions as an evaporator when the heat pump cycle apparatus 1 performs heating operation, to evaporate (vaporize) the liquid refrigerant.

[0016] The outdoor expansion valve 14 is provided between the other refrigerant inlet/outlet 13B of the outdoor heat exchanger 13 and the other refrigerant inlet/outlet 15B of the water-refrigerant heat exchanger 15. The outdoor expansion valve 14 is, for example, an electronic expansion valve, and decompresses (expands) the liquid refrigerant passing through the outdoor expansion valve 14 by adjusting the valve opening degree.

[0017] As the water-refrigerant heat exchanger 15, for example, a plate heat exchanger is used. The water-refrigerant heat exchanger 15 exchanges heat between the refrigerant circulating in the refrigerant circuit 10 and the water circulating in the water circuit 4. The water-refrigerant heat exchanger 15 functions as an evaporator when the heat pump cycle apparatus 1 performs cooling operation or defrosting operation, to evaporate (vaporize) the liquid refrigerant. The water-refrigerant heat ex-

changer 15 functions as a condenser when the heat pump cycle apparatus 1 performs heating operation, to condense (liquefy) the gas refrigerant. The water-refrigerant heat exchanger 15 has a water inlet 15C and a water outlet 15D, and the water pipe 19 is connected to each of the water inlet 15C and the water outlet 15D to constitute a part of the water circuit 4. In addition, for example, a circulation pump 21 for circulating water in the water circuit 4 is provided on the water inlet 15C side, and an air vent valve 22 for venting air entering the water circuit 4 is provided on the water outlet 15D side.

[0018] The refrigerant inflow side of the accumulator 16 is connected to the third port 12C of the four-way valve 12, and the refrigerant outflow side of the accumulator is connected to the refrigerant inflow side of the compressor 11. The accumulator 16 is formed as a hollow pressure container, separates the refrigerant flowing into the inside thereof into a gas refrigerant and a liquid refrigerant, and causes only the gas refrigerant to be sucked into the compressor 11.

[0019] The outdoor fan 17 is disposed near the outdoor heat exchanger 13 and blows air toward the outdoor heat exchanger 13. Specifically, the outdoor fan 17 takes the outside air into the outdoor machine 2 from a suction port 44 and a suction opening 46, which will be described later, of the outdoor machine 2 and discharges the outside air heat-exchanged with the refrigerant in the outdoor heat exchanger 13 to the outside of the outdoor machine 2 from a blowout port 41, which will be described later.

[0020] On the other hand, the indoor machine 3 has an indoor unit 23. As the indoor unit 23, for example, a floor heating device or a radiator is used. One refrigerant inlet/outlet 23A of the indoor unit 23 is connected to the water outlet 15D of the water-refrigerant heat exchanger 15. The other refrigerant inlet/outlet 23B of the indoor unit 23 is connected to the water inlet 15C of the water-refrigerant heat exchanger 15 via the circulation pump 21. Thus, the indoor unit 23 is connected to the water-refrigerant heat exchanger 15 by the water pipe 19 to constitute the water circuit 4, and the water circulating in the water circuit 4 dissipates or absorbs heat in the indoor unit 23, thereby heating or cooling the air-conditioned space in which the indoor machine 3 is installed.

<Movement during Operation>

[0021] The flow of refrigerant and the flow of water during the operation of the heat pump cycle apparatus 1 will now be described. Note that, in FIG. 1, the dashed arrows indicate the flow of the refrigerant during the heating operation, and the solid arrows indicate the flow of the refrigerant during the cooling operation.

[0022] When the heat pump cycle apparatus 1 performs heating operation, the four-way valve 12 is switched so that the first port 12A communicates with the fourth port 12D and the second port 12B communicates with the third port 12C. Thus, the refrigerant

circuit 10 enters a heating cycle in which the water-refrigerant heat exchanger 15 functions as a condenser and the outdoor heat exchanger 13 functions as an evaporator.

[0023] When the compressor 11 is driven in the above-described state of the refrigerant circuit 10, the refrigerant discharged from the compressor 11 flows into the four-way valve 12, and flows from the four-way valve 12 into the water-refrigerant heat exchanger 15. The high-temperature gas refrigerant flowing into the water-refrigerant heat exchanger 15 is condensed by exchanging heat with the water circulating in the water circuit 4 of the water-refrigerant heat exchanger 15 by the movement of the circulation pump 21. On the other hand, the water circulating in the water circuit 4 is heated by the refrigerant in the water-refrigerant heat exchanger 15 to become hot water. The hot water flows into the indoor unit 23 of the indoor machine 3 through the water pipe 19 of the water circuit 4. The hot water then dissipates heat in the indoor unit 23, thereby heating the room in which the indoor machine 3 is installed.

[0024] The liquid refrigerant heat-exchanged with water and condensed in the water-refrigerant heat exchanger 15 is decompressed while passing through the outdoor expansion valve 14, and then flows into the outdoor heat exchanger 13. The refrigerant flowing into the outdoor heat exchanger 13 exchanges heat with the outside air flowing into the outdoor machine 2 by the rotation of the outdoor fan 17 and evaporates. The gas refrigerant evaporated in the outdoor heat exchanger 13 passes through the four-way valve 12 and the accumulator 16 in this order, and is sucked into the compressor 11 and compressed again.

[0025] When the heat pump cycle apparatus 1 performs cooling operation or defrosting operation, the four-way valve 12 is switched so that the first port 12A communicates with the second port 12B and the third port 12C communicates with the fourth port 12D. Thus, the refrigerant circuit 10 enters a cooling cycle in which the water-refrigerant heat exchanger 15 functions as an evaporator and the outdoor heat exchanger 13 functions as a condenser.

[0026] When the compressor 11 is driven in the above-described state of the refrigerant circuit 10, the refrigerant discharged from the compressor 11 flows into the four-way valve 12, and flows from the four-way valve 12 into the outdoor heat exchanger 13. The high-temperature gas refrigerant flowing into the outdoor heat exchanger 13 is condensed by exchanging heat with the outdoor air taken into the outdoor machine 2 by the rotation of the outdoor fan 17. Note that, when the defrosting operation is performed, the frost generated in the outdoor heat exchanger 13 is melted by the heat of the refrigerant flowing into the outdoor heat exchanger 13.

[0027] The liquid refrigerant condensed in the outdoor heat exchanger 13 is decompressed while passing through the outdoor expansion valve 14, and then flows into the water-refrigerant heat exchanger 15. The liquid

refrigerant flowing into the water-refrigerant heat exchanger 15 is evaporated by exchanging heat with the water circulating in the water circuit 4 of the water-refrigerant heat exchanger 15 by the operation of the circulation pump 21. On the other hand, the water circulating in the water circuit 4 is cooled by the refrigerant in the water-refrigerant heat exchanger 15 to become cold water. The cold water flows into the indoor unit 23 of the indoor machine 3 through the water pipe 19 of the water circuit 4. The cold water then absorbs heat from the indoor air in the indoor unit 23, thereby cooling the room in which the indoor machine 3 is installed. Note that, when the defrosting operation is performed, the circulation of water in the water circuit 4 is stopped by stopping the circulation pump 21 in order to suppress a decrease in the indoor temperature.

[0028] The gas refrigerant evaporated in the water-refrigerant heat exchanger 15 passes through the four-way valve 12 and the accumulator 16 in this order, and is sucked into the compressor 11 and compressed again.

<Structure of Outdoor Machine>

[0029] The external appearance and the internal structure of the outdoor machine 2 will now be described. FIG. 2 is an external perspective view of the outdoor machine as viewed from the front surface side, and FIG. 3 is an external perspective view of the outdoor machine as viewed from the rear surface side. FIG. 4 is a perspective view illustrating the internal structure of the outdoor machine. FIG. 5 is a partially enlarged perspective view of an electrical unit fixed to a partition plate in a machine chamber. Note that directions such as front and rear, up and down, and left and right described below indicate directions when the outdoor machine 2 is viewed from the front surface side in a state in which the outdoor machine 2 is installed, with a direction in which air is blown out from the blowout port 41, which will be described later, as the front.

[0030] As illustrated in FIGS. 2 and 3, the outdoor machine 2 includes a housing 30 having a rectangular parallelepiped box shape in which the dimension in the left-right direction (width direction) is larger than the dimension in the front-rear direction (depth direction). The housing 30 includes a bottom plate (bottom surface panel) 31 disposed so as to face the installation surface, a top surface panel 32 disposed above the bottom plate 31 in the height direction, and a side surface panel portion 33 that connects the bottom plate 31 and the top surface panel 32 and partitions the inside and the outside of the housing 30.

[0031] As illustrated in FIG. 4, the inside of the housing 30 is divided into a heat exchange chamber RA and a machine chamber RB by a partition plate 34 erected on the bottom plate 31. In the heat exchange chamber RA, the outdoor heat exchanger 13 is housed on the rear surface side of the heat exchange chamber RA, and the outdoor fan 17 is housed on the front surface side. The

outdoor heat exchanger 13 is formed by being bent in an L-shape when viewed from the upper surface (the top surface panel 32 side), and is supported by the bottom plate 31 along the left side surface side from the rear surface side of the heat exchange chamber RA.

[0032] The outdoor fan 17 is attached to a pair of support members 35, 35 erected on the bottom plate 31. The outdoor fan 17 is a so-called axial-flow fan, and draws outside air into the heat exchange chamber RA from the outside of the outdoor machine 2, that is, from the suction port 44 (described later) formed on the rear surface side of the outdoor heat exchanger 13 and a suction opening 46 (described later) formed on the left side surface side, by rotational driving of the outdoor fan 17 by a fan motor not illustrated. Then, the air after heat exchange in the outdoor heat exchanger 13 is blown out forward from the blowout port 41 (described later) formed on the front surface side of the heat exchange chamber RA. As described above, the outdoor machine 2 is a front blow-out type outdoor machine that blows out the heat-exchanged air from the front surface side.

[0033] In the lower space of the machine chamber RB, circuit components such as the compressor 11, the accumulator 16, the four-way valve 12 (FIG. 1), and the outdoor expansion valve 14 (FIG. 1) that constitute a part of the refrigerant circuit 10 are disposed, and the circuit components are connected to each other by the refrigerant pipe 18. The compressor 11 and the accumulator 16 are fixed to the bottom plate 31. In the lower space of the machine chamber RB, circuit components such as the water-refrigerant heat exchanger 15, the air vent valve 22, and the circulation pump 21 that constitute a part of the water circuit 4 are disposed, and the circuit components are connected to each other by the water pipe 19. In this embodiment, the water-refrigerant heat exchanger 15 is disposed near a corner portion between the rear surface side and the right side surface side in the lower space of the machine chamber RB (housing 30), and a connection port 47 of the water pipe 19, which will be described later, is provided on the rear surface side.

[0034] In the upper space of the machine chamber RB, an electrical unit 25 having electrical components for controlling the operation of the outdoor machine 2 and the indoor machine 3 is disposed. The electrical unit 25 includes a first control board 27, a second control board 28, and a terminal portion 26 for connecting wires (hereinafter also referred to as electric wires) such as a power supply line and a control line, and is fixed to the partition plate 34. As illustrated in FIG. 5, circuit components such as the four-way valve 12, a sensor 20, and the refrigerant pipe 18 that constitute a part of the refrigerant circuit 10 are disposed in the upper space of the machine chamber RB, and thus the electrical unit 25 is disposed so as to avoid these circuit components. Specifically, the electrical unit 25 includes a first support member 61 formed in an L-shape when the machine chamber RB is viewed from the upper surface, and a second support member 62 and a third support member 63 each formed in a linear

shape. The electrical unit 25 also includes a fourth support member 64 formed in a linear shape and disposed below the second support member 62, and a fifth support member 65 formed in a linear shape and disposed below the third support member 63. The first support member 61 to the third support member 63 are connected in a rectangular frame shape and are fixed to the partition plate 34 and a first right side surface portion 37B of a rear surface panel 37. The fourth support member 64 and the fifth support member 65 are connected in an L-shape and are fixed to the partition plate 34 and the first right side surface portion 37B of the rear surface panel 37. In addition, the second support member 62 and the fourth support member 64 support the first control board 27, and the third support member 63 and the fifth support member 65 support the second control board 28 and the terminal portion 26. Thus, the electrical unit 25 can be disposed in the upper space of the machine chamber RB while avoiding interference with the circuit components of the refrigerant circuit 10. In this embodiment, the second control board 28 and the terminal portion 26 are disposed near the right side surface side in the upper space of the machine chamber RB so as to face the right side surface side.

[0035] The side surface panel portion 33 of the housing 30 will now be described. The side surface panel portion 33 is formed by combining a plurality of panel members. In the present embodiment, as illustrated in FIGS. 2 and 3, the side surface panel portion 33 includes a front surface panel 36, a rear surface panel 37, a right side surface panel 38, a left side surface panel 39, and a service panel 40. The front surface panel 36, the rear surface panel 37, the right side surface panel 38, and the left side surface panel 39 are each formed in an L-shape that includes two adjacent surfaces of the housing 30 and a corner portion interposed between the two surfaces when the housing 30 is viewed from the upper surface.

[0036] Specifically, the front surface panel 36 integrally includes a first front surface portion 36A forming a part of the front surface of the housing 30 and a first left side surface portion 36B forming a part of the left side surface of the housing 30. The rear surface panel 37 integrally includes a first rear surface portion 37A forming a part of the rear surface of the housing 30 and a first right side surface portion 37B forming a part of the right side surface of the housing 30. The right side surface panel 38 integrally includes a second right side surface portion 38A forming a part of the right side surface of the housing 30 and a second front surface portion 38B forming a part of the front surface of the housing 30. The left side surface panel 39 integrally includes a second left side surface portion 39A forming a part of the left side surface of the housing 30 and a second rear surface portion 39B forming a part of the rear surface of the housing 30.

[0037] The first front surface portion 36A of the front surface panel 36 is disposed on the front surface side of the heat exchange chamber RA, and the second front surface portion 38B of the right side surface panel 38 is

disposed on the front surface side of the machine chamber RB. The first front surface portion 36A and the second front surface portion 38B are disposed side by side in the left-right direction and form the front surface of the housing 30. The first front surface portion 36A is formed with the blowout port 41 through which the air heat-exchanged in the heat exchange chamber RA is blown out. The blowout port 41 has, for example, a circular bell mouth 41A, and a portion of the outdoor fan 17 is disposed within the bell mouth 41A. A net-like fan guard 42 that covers the blowout port 41 is provided in front of the front surface panel 36. The fan guard 42 is formed in an L-shape when the fan guard 42 is viewed from above, and is disposed along the first front surface portion 36A to the first left side surface portion 36B of the front surface panel 36. The fan guard 42 is fixed to the front surface panel 36 with a predetermined interval between an upper end portion (end portion on the upper side) 42A of the fan guard 42 and the top surface panel 32. In addition, a water shielding plate 43 extending in the left-right (width) direction is provided above the blowout port 41 in the first front surface portion 36A.

[0038] The first rear surface portion 37A of the rear surface panel 37 and the second rear surface portion 39B of the left side surface panel 39 are disposed side by side in the left-right direction with an interval therebetween, and form a rear surface of the housing 30. The outdoor heat exchanger 13 is disposed so as to be exposed between the first rear surface portion 37A and the second rear surface portion 39B, and the exposed area serves as the suction port 44. A net-like fin guard 45 is provided behind the suction port 44. In addition, the first rear surface portion 37A is disposed on the rear surface side of the machine chamber RB, and a pair of connection ports 47 and 47 for connection to the above-described water pipe 19 of the water circuit 4 and a wiring port 48 for introducing wires (electric wires) connected to the above-described electrical unit 25 into the housing 30 are provided at a lower portion of the first rear surface portion 37A.

[0039] The second right side surface portion 38A of the right side surface panel 38 and the first right side surface portion 37B of the rear surface panel 37 are disposed side by side in the front-rear direction with an interval therebetween, and form a right side surface (a side surface on the machine chamber RB side) connecting the front surface and the rear surface of the housing 30. The above-described service panel 40 is detachably disposed between the second right side surface portion 38A and the first right side surface portion 37B. By removing the service panel 40, the inside of the machine chamber RB can be accessed, and maintenance of the electrical unit 25 and various circuit components can be easily performed.

[0040] The second left side surface portion 39A of the left side surface panel 39 and the first left side surface portion 36B of the front surface panel 36 are disposed side by side in the front-rear direction and form a left side

surface connecting the front surface and the rear surface of the housing 30. The second left side surface portion 39A faces a portion of the outdoor heat exchanger 13, and the second left side surface portion 39A is formed with a plurality of suction openings 46.

[0041] Since the outdoor machine 2 is a heavy object, a plurality of handle portions 51, 52, 53 for transporting the outdoor machine 2 is provided on the side surface panel portion 33 of the housing 30. The handle portions 51 to 53 are each disposed near the corner portions of the housing 30. In other words, the plurality of handle portions 51 to 53 is each provided on the rear surface panel 37, the right side surface panel 38, and the left side surface panel 39 excluding the service panel 40. In addition, in a case where the service panel 40 is removed and the device in the machine chamber RB is operated, for example, even if a situation occurs in which the wiring does not reach the terminal portion 26 at the time of connection, the outdoor machine 2 can be easily moved by using the handle portions 51 to 53.

<Service Panel>

[0042] The service panel 40 will now be described. FIG. 6 is a view of the outdoor machine from which the service panel is removed as viewed from the right side surface side. FIG. 7 is a view of the service panel as viewed from the inner surface side facing the inside of the housing. As described above, the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment includes, in the machine chamber RB provided in the housing 30, the circuit components such as the water-refrigerant heat exchanger 15, the air vent valve 22, and the circulation pump 21. The water-refrigerant heat exchanger 15 is supported on the bottom plate 31, and is disposed near the corner portion between the rear surface side and the right side surface side in the lower space of the machine chamber RB. The connection port 47 for connecting to the water pipe 19 and the wiring port 48 for introducing electric wires into the housing 30 are provided at a lower portion of the first rear surface portion 37A of the rear surface panel 37 forming a part of the rear surface of the housing 30. In addition, in the upper space of the machine chamber RB, the electrical unit 25 having the terminal portion 26 to which electric wires introduced into the housing 30 is connected through the wiring port 48 is provided.

[0043] Therefore, in order to perform various works on the electrical unit 25 and circuit components in the machine chamber RB at the time of construction and maintenance of the outdoor machine 2, the housing 30 includes the service panel 40 that covers a portion of the machine chamber RB and is detachable from the housing 30. In the present embodiment, the service panel 40 is provided on the right side surface side (the side surface side on the machine chamber RB side) of the housing 30. Specifically, as illustrated in FIG. 6, the right side surface panel 38 includes a first support portion 38A1 formed

integrally with the second right side surface portion 38A, and the rear surface panel 37 includes a second support portion 37B1 formed integrally with the first right side surface portion 37B. A working opening 55 is formed between the first support portion 38A1 and the second support portion 37B1. The opening 55 is formed up to a position where the bottom plate 31 of the machine chamber RB is exposed. The service panel 40 is supported by the housing 30 (the first support portion 38A1 and the second support portion 37B1) so as to cover the opening 55. The first support portion 38A1 and the second support portion 37B1 are portions that function as both side edges of the opening 55 covered by the service panel 40, and the first support portion 38A1 and the second support portion 37B1 are each formed with slits 60 and 60 that are long in the up-down direction. The opening 55 is an area covered by an inner surface 40A (described later) of the service panel 40 when the service panel 40 is attached to the housing 30. In addition, in the present embodiment, since the service panel 40 is disposed on the right side surface side of the housing 30, the dividing lines between the service panel 40 and the right side surface panel 38 and between the service panel 40 and the rear surface panel 37 are not visible from the front surface side, and thus the designability of the outdoor machine 2 is not impaired.

[0044] The service panel 40 is disposed at least in the lower portion of the housing 30 so as to correspond to the area where the water-refrigerant heat exchanger 15 is disposed, but the service panel may be disposed so as to extend from the lower portion to the upper portion of the housing 30 as in the present embodiment. Here, the lower portion of the housing 30 refers to an area where the water-refrigerant heat exchanger 15 is disposed, for example, an area from the bottom plate 31 of the housing 30 to the upper surface of the water-refrigerant heat exchanger 15. The upper portion of the housing 30 refers to an area where the electrical unit 25 is disposed, for example, an area from the top surface panel 32 of the housing 30 to a lower end portion of the electrical unit 25. In the present embodiment, the service panel 40 is disposed so as to extend from the bottom plate 31 to the top surface panel 32 of the housing 30. Therefore, only by removing one service panel 40, the inside of the machine chamber RB is exposed from the bottom plate 31 to the top surface panel 32 of the housing 30.

[0045] Specifically, as illustrated in FIG. 6, the terminal portion 26 and the second control board 28 in the electrical unit 25 are disposed in the upper portion of the machine chamber RB so as to be visible through the opening 55. On the second control board 28, for example, a 7-segment display unit (not illustrated) for displaying error information and various settings is mounted, and a DIP switch and a push switch for performing capacity setting and the like are mounted. Therefore, the worker can easily access the second control board 28 of the electrical unit 25 by removing the service panel 40, and the setting of the device and the acquisition of error

information at the time of construction and maintenance is facilitated. The second control board 28 is provided with, for example, connectors of the circulation pump 21 of the water circuit 4 and a flow rate sensor/water temperature thermistor (not illustrated). Therefore, when the outdoor machine 2 is manufactured, a part of the water circuit 4 including the water-refrigerant heat exchanger 15 and the circulation pump 21 can be easily installed later in a different process or in a different plant. Further, the worker can introduce the electric wires into the housing 30 through the wiring port 48 in a state of facing the opening 55, and can perform the work while visually recognizing the electric wires when connecting the introduced electric wires to the terminal portion 26, so that the wiring work can be easily performed. Thus, the workability of a worker at the time of construction or maintenance can be improved without the need to move between the front surface side and the rear surface side of the housing 30 many times.

[0046] The circuit components such as the water-refrigerant heat exchanger 15, the circulation pump 21, and the air vent valve 22 are disposed in the lower portion of the machine chamber RB so as to be visible through the opening 55. Therefore, the worker can access, for example, the air vent valve 22 by removing the service panel 40, and the work of venting the air entering the water-refrigerant heat exchanger 15 and the water circuit 4 is facilitated.

[0047] The electrical unit 25 and the air vent valve 22 are disposed side by side in the up-down direction, and the circuit components of the water circuit 4 including the air vent valve 22 are disposed below the electrical unit 25. Therefore, the worker can access both the terminal portion 26 of the electrical unit 25 and the air vent valve 22 by removing the service panel 40, and can perform both wiring work and maintenance work on the electrical unit 25 and work for venting air entering the water-refrigerant heat exchanger 15 and the water circuit 4. In addition, since the circuit components of the water circuit 4 including the air vent valve 22 are disposed below the electrical unit 25, even if, for example, water drips from the water pipe 19 or the like in the machine chamber RB, the water does not splash on the electrical unit 25, and a failure of the electrical unit 25 can be prevented.

[0048] The outdoor machine 2 also includes a guide tube 57 that guides electric wires connected to the terminal portion 26 of the electrical unit 25 into the housing 30. One end (not illustrated) of the guide tube 57 penetrates the first rear surface portion 37A located on the machine chamber RB side and is connected to the wiring port 48. The other end 57A of the guide tube 57 is disposed so as to be visible through the opening 55. Thus, the worker can easily guide the electric wires from the rear surface side of the housing 30 into the opening 55 (the side surface side of the housing 30) which can be visually recognized by the worker via the guide tube 57, and can easily perform the work of connecting the electric wires to the terminal portion 26. In addition, as compared with the

case where the service panel is provided on the front surface side of the housing, the guide tube can be shortened, so that the workability can be improved and the cost can be reduced.

<Attachment Structure of Service Panel>

[0049] As illustrated in FIG. 7, the service panel 40 is formed in a rectangular shape elongated in the height direction. A lower end portion 401, an upper end portion 402, and both side edge portions 403 and 403 of the service panel 40 are each formed by being bent to the inner surface 40A side, and the strength of the service panel 40 is increased. The service panel 40 also includes claw portions (fixing portions) 404 and 404 on both side edge portions 403 and 403. When the service panel 40 is attached to the housing 30, the claw portions 404 and 404 protrude toward the inside of the housing 30. In the housing 30, slits 60 into which the claw portions 404 can be inserted are provided in the first support portion 38A1 and the second support portion 37B1 which are edge portions of the opening 55 covered by the service panel 40.

[0050] The claw portions 404 and 404 are provided at a central portion of the service panel 40 in the height direction. Specifically, the service panel 40 has bent portions 406 and 406 formed at the central portion of the both side edge portions 403 and 403 in the height direction and formed by bending a part of the side edge portions 403 and 403 so as to be substantially parallel to the inner surface 40A of the service panel 40. The claw portions 404 and 404 are formed integrally with the bent portions 406 and 406, and each extend substantially parallel to the side edge portions 403 and 403. The claw portions 404 are each formed in an L-shape protruding in a direction perpendicular to the inner surface 40A of the service panel 40 and having a tip protruding upward. The claw portion 404 includes an upper end portion 404A that protrudes upward and can engage with the housing 30 after being inserted into the slit 60, and a lower end portion 404B that does not protrude downward and is supported by a support portion (lower end) 60A, which will be described later, of the slit 60 when being inserted into the slit 60. In addition, the claw portion 404 includes an abutting portion 404C that abuts on a regulating portion (upper end) 60B, which will be described later, of the slit 60 after being inserted into the slit 60.

[0051] The claw portions 404 are provided at positions where the distances between the lower end portion 401 of the service panel 40 and the lower end portion 404B of each claw portion 404 are the same dimension H1. With this configuration, since the distances between the lower end portion 401 of the service panel 40 and the lower end portion 404B of each claw portion 404 are the same dimension H1, the worker can easily attach the service panel 40.

[0052] In the present embodiment, the service panel 40 is formed with a handle for safely handling the service

panel 40 in an inconspicuous shape. Specifically, the handle is formed by processing the inner surface 40A side of the service panel 40 so as not to be visible from the external appearance. For example, on one (front side) side edge portion 403 of the service panel 40, a handle 405 is formed at a position above the claw portion 404. The handle 405 is formed such that a part of the side edge portion 403 is folded back to the inner surface 40A side and can be safely gripped by the worker. In addition, the lower end portion 401 of the service panel 40 is formed such that the lower end portion is entirely folded back to the inner surface 40A side and can be safely gripped by the worker. According to this configuration, the worker can safely hold the service panel 40 when attaching or detaching the service panel 40, for example, by holding the lower end portion 401 with the right hand and holding the handle 405 formed on a part of the side edge portion 403 with the left hand. Note that, since the handle of the service panel 40 is not visible from the external appearance, the appearance is improved. On the other hand, when the service panel 40 is attached to the housing 30, it is difficult to recognize the position of the handle, and it may be difficult for the worker to remove the service panel 40. Therefore, as illustrated in FIG. 3, a mark 407 indicating the position of the handle 405 is provided on an outer surface 40B of the service panel 40.

[0053] A procedure for attaching the service panel 40 to the housing 30 will now be described.

[0054] FIG. 8 is a perspective view of the outdoor machine illustrating an initial movement of attaching the service panel to the housing, and FIGS. 9 to 11 are schematic cross-sectional views for explaining the movement of attaching the service panel to the housing. The top surface panel 32 of the housing 30 has an edge portion 32A that extends to be bent downward. As illustrated in FIG. 8, the worker inserts, in a state of holding the service panel 40, the upper end portion 402 of the service panel 40 into the inner side of the edge portion 32A of the top surface panel 32.

[0055] As illustrated in FIG. 9, the worker then moves the service panel 40 so as to approach the first support portion 38A1 and the second support portion 37B1, with the upper end portion 402 of the service panel 40 as the center of rotation. The dimension H3 of the claw portion 404 in the height direction is smaller than the dimension H2 of the slit 60 in the height direction. Therefore, as illustrated in FIG. 10, the claw portion 404 is inserted into the slit 60. The slit 60 includes a support portion 60A that supports the service panel 40 by abutting on the lower end portion 404B of the claw portion 404 at the lower end of the slit 60. Thus, the service panel 40 is supported by the support portion (lower end) 60A of the slit 60. In addition, since the state where the upper end portion 402 of the service panel 40 is then inserted into the inside of the edge portion 32A of the top surface panel 32 is maintained, the upper end portion 402 of the service panel 40 and the edge portion 32A of the top surface panel 32 overlap each other by a dimension H4 in the

height direction. Therefore, the service panel 40 can be prevented from falling off and falling from the housing 30. Further, since the service panel 40 is prevented from being tilted toward the worker side, the service panel 40 can be temporarily supported by the housing 30, and another work can be performed by releasing the hand from the service panel 40.

[0056] As illustrated in FIG. 11, when the worker lifts the service panel 40 upward with respect to the housing 30, the abutting portion 404C of the claw portion 404 abuts on the regulating portion (upper end) 60B of the slit 60, thereby regulating further lifting of the service panel 40. The upper end portions 404A of the claw portions 404 are then each engaged with the first support portion 38A1 and the second support portion 37B1, so that a through-hole 408 of the service panel 40 and a screw hole 161 of the housing 30 can be positioned. Finally, the worker fixes the service panel 40 and the housing 30 to each other with screws 162 (fixing portions) to complete the attachment work. In this case, a sealing material not illustrated is provided between the first support portion 38A1 and the second support portion 37B1, and the inner surface 40A of the service panel 40. The sealing material is, for example, foamed rubber such as spongy rubber (so-called sponge rubber) produced by kneading a foaming agent into raw rubber and vulcanizing the raw rubber. Such a sealing material has compression recoverability. Therefore, when the service panel 40 is lifted upward in a state where the sealing material is compressed, the abutting portion 404C of the claw portion 404 is pressed against the regulating portion 60B of the slit 60 due to the recoverability (repulsive force) of the sealing material between the first support portion 38A1 and the second support portion 37B1, and the service panel 40. Thus, a friction force is generated between the claw portion 404 and the regulating portion 60B, and a friction force of the sealing material itself is added, so that the service panel 40 is maintained in a state of being lifted upward. In this manner, the service panel 40 is temporarily fixed to the housing 30 and does not fall. Therefore, at the time of screwing, the worker does not need to hold the service panel 40 with one hand, and can easily perform the work. Note that, when the service panel 40 is removed from the housing 30, the above-described attachment procedure may be performed in reverse.

[0057] As described above, the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment has the housing 30 whose inside is divided into the heat exchange chamber RA that houses the outdoor heat exchanger 13 and the outdoor fan 17 that blows air to the outdoor heat exchanger 13, and the machine chamber RB that houses the electrical unit 25 that controls the operation of the outdoor fan 17, in which the housing 30 is formed with, by the rotation of the outdoor fan 17, the suction port 44 that draws air heat-exchanged with a refrigerant in the outdoor heat exchanger 13 into the housing 30 and the blowout port 41 for blowing out the heat-exchanged air to the outside of the

housing 30, and when a surface on which the blowout port 41 is formed is a front surface of the housing 30, when a surface on which the suction port 44 is formed is a rear surface of the housing 30, and when surfaces connecting the front surface and the rear surface of the housing 30 are a right side surface and a left side surface of the housing 30, the housing 30 includes a detachable service panel 40 on the right side surface side located on the machine chamber RB side. According to this configuration, the worker can easily access the electrical unit 25 through the opening 55 exposed by removing the service panel 40. Further, the worker can easily perform, in a state of facing the opening 55, the work of, for example, introducing the electric wires into the housing 30 from the rear surface side of the housing 30 and connecting the introduced electric wires to the electrical unit 25. Thus, the workability of a worker at the time of construction or maintenance can be improved without the need to move between the front surface side and the rear surface side of the housing 30 many times.

[0058] In the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment, the electrical unit 25 includes the terminal portion 26 to which electric wires for connection to the indoor machine 3 of the heat pump cycle apparatus 1 is connected, and the terminal portion 26 is disposed to face the inner surface 40A of the service panel 40 mounted on the housing 30, so that, when the service panel 40 is opened, the worker can access the terminal portion 26 provided in the electrical unit 25 and for example, can easily connect the electric wires passed from the rear surface side of the housing 30 to the terminal portion 26.

[0059] The outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment includes, in the machine chamber RB, the water-refrigerant heat exchanger 15 that exchanges heat between a refrigerant and water, and the air vent valve 22 for venting air entering the water circuit 4 that circulates water in the water-refrigerant heat exchanger 15 to the outside, in which the air vent valve 22 is disposed to face the inner surface 40A of the service panel 40 mounted on the housing 30. According to this configuration, the worker can access the air vent valve 22 by removing the service panel 40, and the work of venting the air entering the water-refrigerant heat exchanger 15 and the water circuit 4 is facilitated.

[0060] In the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment, since the electrical unit 25 and the air vent valve 22 are disposed side by side, the worker can access both the electrical unit 25 and the air vent valve 22 by removing the service panel 40, and can perform both wiring work and maintenance work on the electrical unit 25 and work for venting air entering the water-refrigerant heat exchanger 15 and the water circuit 4.

[0061] In the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment, the electrical unit 25 includes the second control board 28

that controls the water circuit 4, and the second control board 28 is disposed to face the inner surface 40A of the service panel 40 mounted on the housing 30. When the service panel 40 is opened, the worker can access the second control board 28 provided in the electrical unit 25, and for example, can easily perform connection of the circulation pump 21 and the flow rate sensor/water temperature thermistor included in the water circuit 4 to the second control board 28.

[0062] In the outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment, since the air vent valve 22 is disposed below the electrical unit 25, for example, even if water drips from the air vent valve 22 or the like, the possibility of failure of the electrical unit 25 can be reduced.

[0063] The outdoor machine 2 of the heat pump cycle apparatus 1 according to the present embodiment includes the guide tube 57 that guides electric wires connected to the electrical unit 25 into the housing 30, in which one end of the guide tube 57 penetrates the rear surface side of the housing 30 located on the machine chamber RB side, and the other end 57A of the guide tube 57 is disposed to face the inner surface 40A of the service panel 40 mounted on the housing 30. Therefore, by removing the service panel 40, the worker can easily guide the electric wires from the rear surface side of the housing 30 into the opening 55 which can be visually recognized by the worker via the guide tube 57, and can easily perform the work of connecting the electric wires to the electrical unit 25.

[0064] As described above, an embodiment of the outdoor machine of the heat pump cycle apparatus according to the present disclosure has been described, but the embodiment is not limited thereto. For example, in the present embodiment, a configuration in which the air vent valve 22 is disposed below the electrical unit 25 has been described, but the embodiment is not limited thereto, and for example, a configuration in which the air vent valve and the electrical unit are disposed side by side in the machine chamber may be adopted.

Reference Signs List

[0065]

- 1 HEAT PUMP CYCLE APPARATUS
- 2 OUTDOOR MACHINE
- 3 INDOOR MACHINE
- 4 WATER CIRCUIT
- 13 OUTDOOR HEAT EXCHANGER
- 15 WATER-REFRIGERANT HEAT EXCHANGER
- 17 OUTDOOR FAN (FAN)
- 21 CIRCULATION PUMP
- 22 AIR VENT VALVE
- 25 ELECTRICAL UNIT
- 26 TERMINAL PORTION
- 27 FIRST CONTROL BOARD
- 28 SECOND CONTROL BOARD

30 HOUSING
 31 BOTTOM PLATE
 32 TOP SURFACE PANEL
 32A EDGE PORTION
 34 PARTITION PLATE
 37 REAR SURFACE PANEL
 37A FIRST REAR SURFACE PORTION
 37B FIRST RIGHT SIDE SURFACE PORTION
 37B1 SECOND SUPPORT PORTION
 38 RIGHT SIDE SURFACE PANEL
 38A SECOND RIGHT SIDE SURFACE PORTION
 38A1 FIRST SUPPORT PORTION
 38B SECOND FRONT SURFACE PORTION
 40 SERVICE PANEL
 40A INNER SURFACE
 40B OUTER SURFACE
 41 BLOWOUT PORT
 44 SUCTION PORT
 48 WIRING PORT
 55 OPENING
 57 GUIDE TUBE
 57A OTHER END
 60 SLIT
 60A SUPPORT PORTION
 401 LOWER END PORTION
 402 UPPER END PORTION
 403 SIDE EDGE PORTION
 404 CLAW PORTION (FIXING PORTION)
 404A UPPER END PORTION
 404B LOWER END PORTION
 RA HEAT EXCHANGE CHAMBER
 RB MACHINE CHAMBER

Claims

1. An outdoor machine of a heat pump cycle apparatus comprising

a housing whose inside is divided into a heat exchange chamber that houses a heat exchanger and a fan that blows air to the heat exchanger, and

a machine chamber that houses an electrical unit,

wherein

the housing is formed with a blowout port for blowing out air heat-exchanged with a refrigerant in the heat exchanger to an outside of the housing by rotation of the fan, and when a surface on which the blowout port is formed is a front surface of the housing,

the housing has a detachable service panel on a side surface located on a side of the machine chamber.

2. The outdoor machine of the heat pump cycle apparatus according to claim 1, wherein the electrical unit

includes a terminal portion to which electric wires for connection to an indoor machine of the heat pump cycle apparatus is connected, and the terminal portion is disposed to face an inner surface of the service panel mounted on the housing.

3. The outdoor machine of the heat pump cycle apparatus according to claim 1 or 2, comprising,

in the machine chamber, a water-refrigerant heat exchanger that exchanges heat between a refrigerant and water, and an air vent valve for venting air entering a water circuit that circulates water in the water-refrigerant heat exchanger to an outside, wherein the air vent valve is disposed to face an inner surface of the service panel mounted on the housing.

4. The outdoor machine of the heat pump cycle apparatus according to claim 3, wherein the electrical unit includes a control board that controls the water circuit, and the control board is disposed to face an inner surface of the service panel mounted on the housing.

5. The outdoor machine of the heat pump cycle apparatus according to claim 3, wherein the electrical unit and the air vent valve are disposed side by side.

6. The outdoor machine of the heat pump cycle apparatus according to claim 3 or 4, wherein the air vent valve is disposed below the electrical unit.

7. The outdoor machine of the heat pump cycle apparatus according to any one of claims 1 to 5, comprising

a guide tube that guides electric wires connected to the electrical unit into the housing, wherein

one end of the guide tube penetrates a rear surface of the housing located on a side of the machine chamber, and an other end of the guide tube is disposed to face an inner surface of the service panel mounted on the housing.

8. A heat pump cycle apparatus comprising an outdoor machine disposed outdoors and an indoor machine disposed indoors, wherein

the outdoor machine has a housing whose inside is divided into a heat exchange chamber that houses a heat exchanger and a fan that blows air to the heat exchanger, and a machine chamber that houses an electrical unit that controls an operation of the fan, the housing is formed with a blowout port for

blowing out air heat-exchanged with a refrigerant in the heat exchanger to an outside of the housing by rotation of the fan, and when a surface on which the blowout port is formed is a front surface of the housing,

5

the housing has a detachable service panel on a side surface of the housing located on a side of the machine chamber.

10

15

20

25

30

35

40

45

50

55

FIG.1

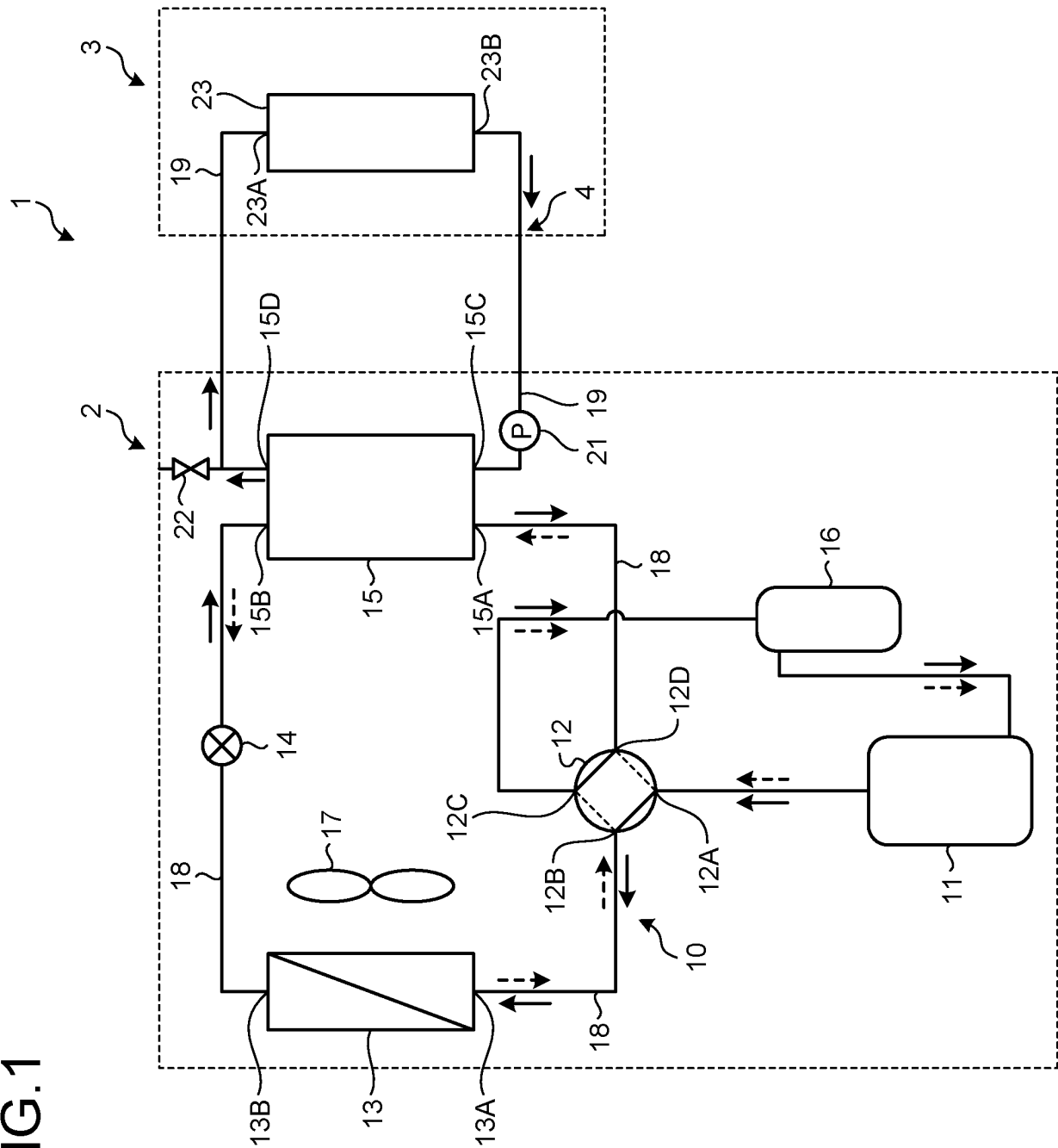


FIG.2

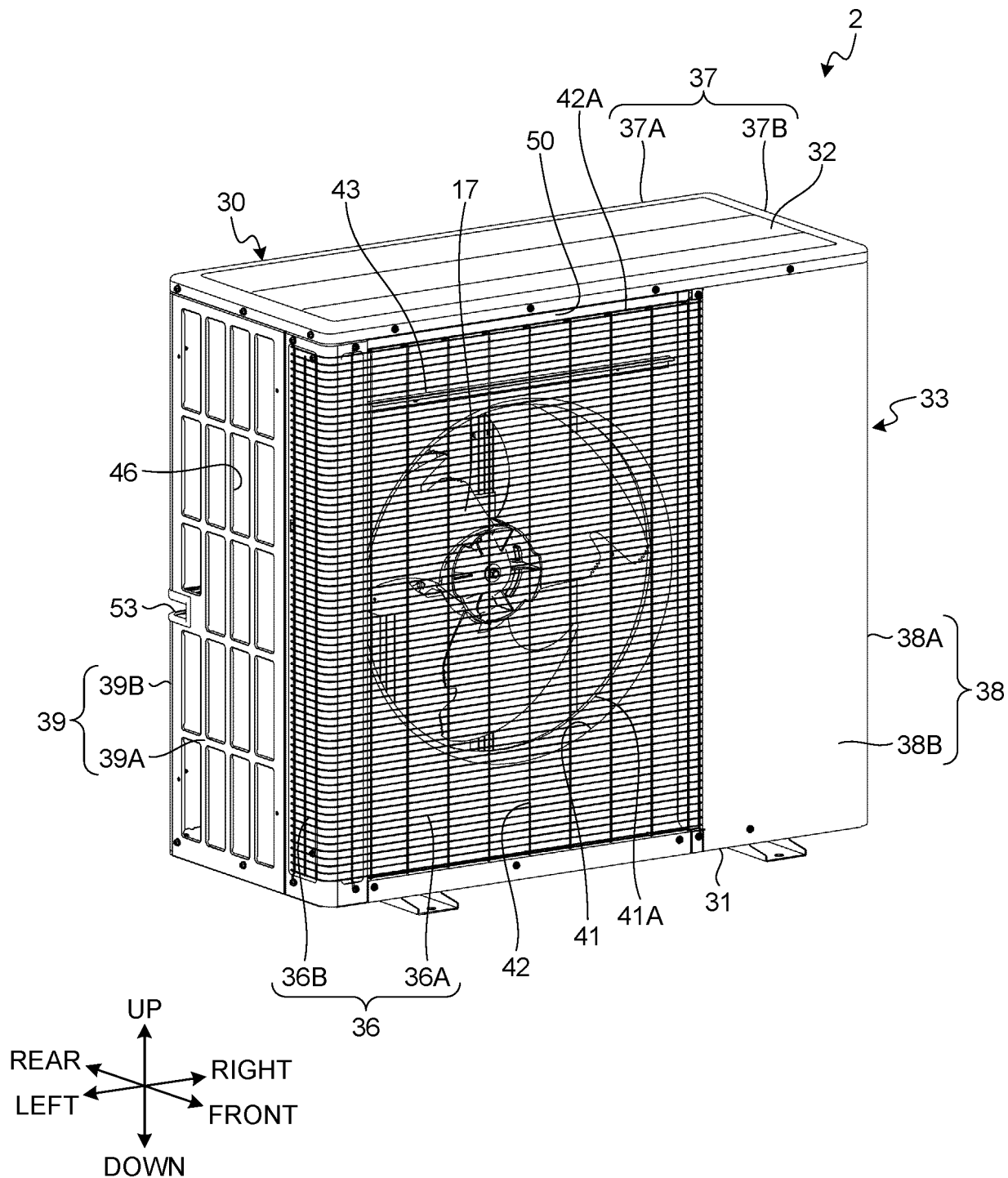


FIG.3

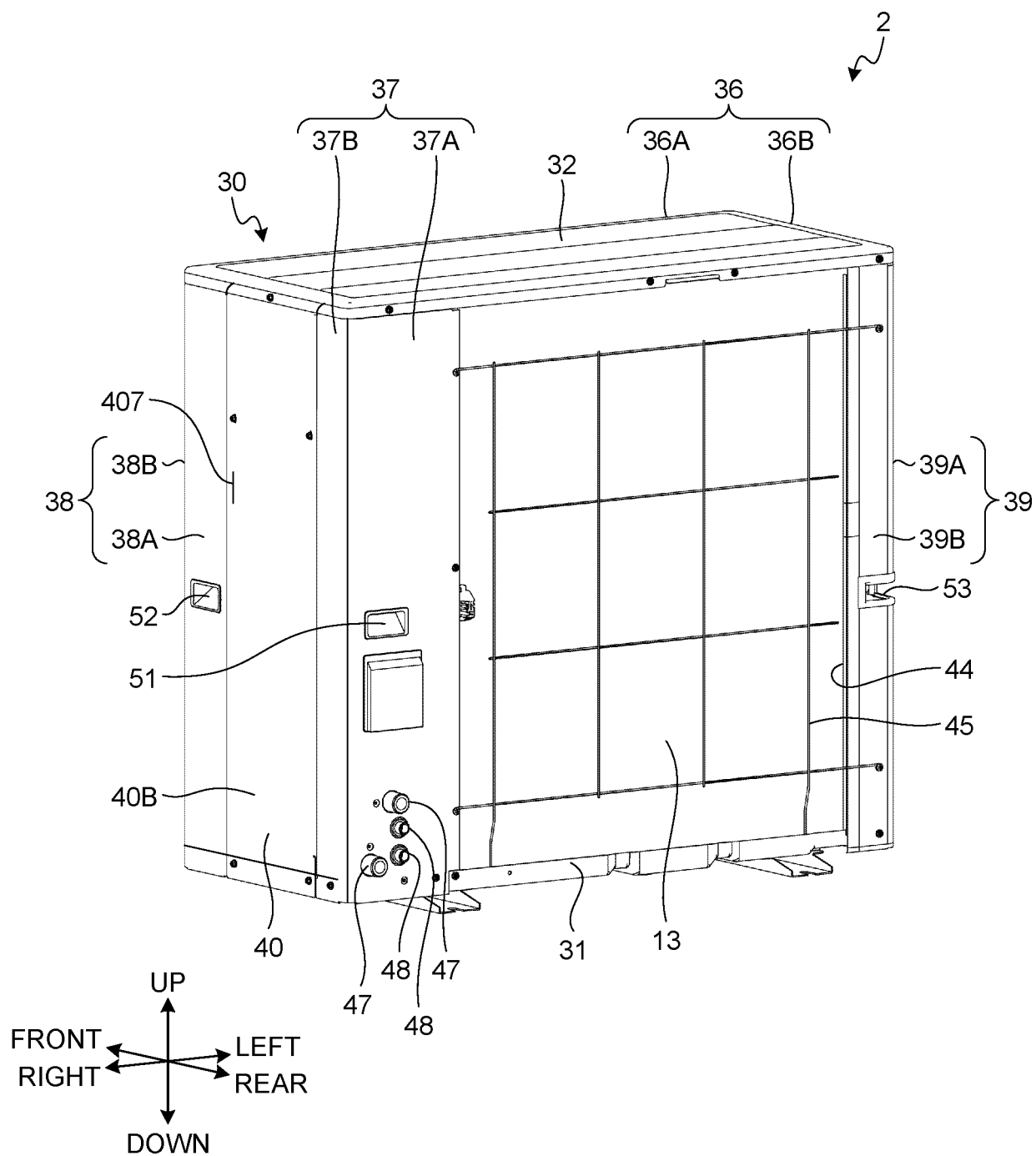


FIG.4

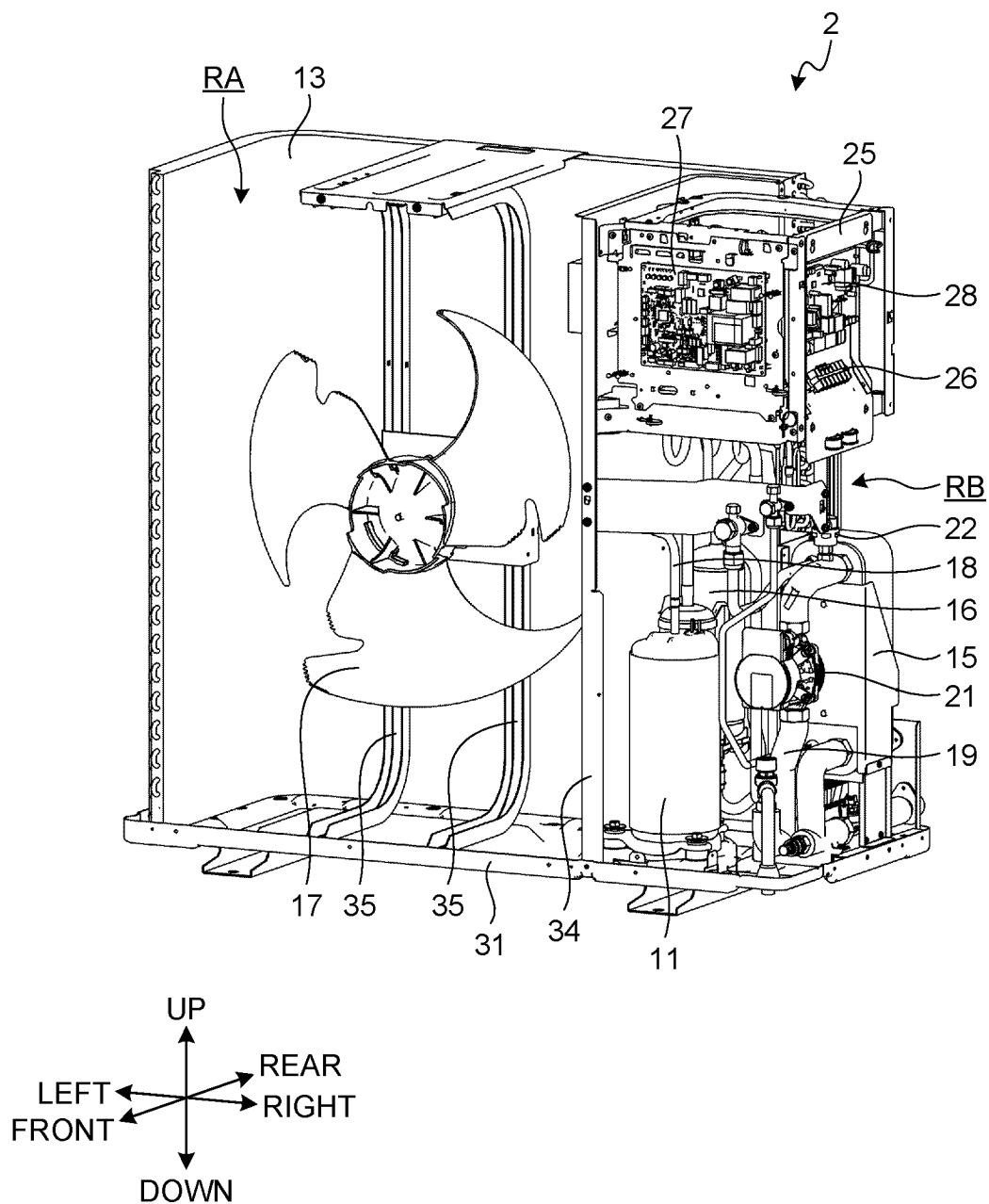


FIG.5

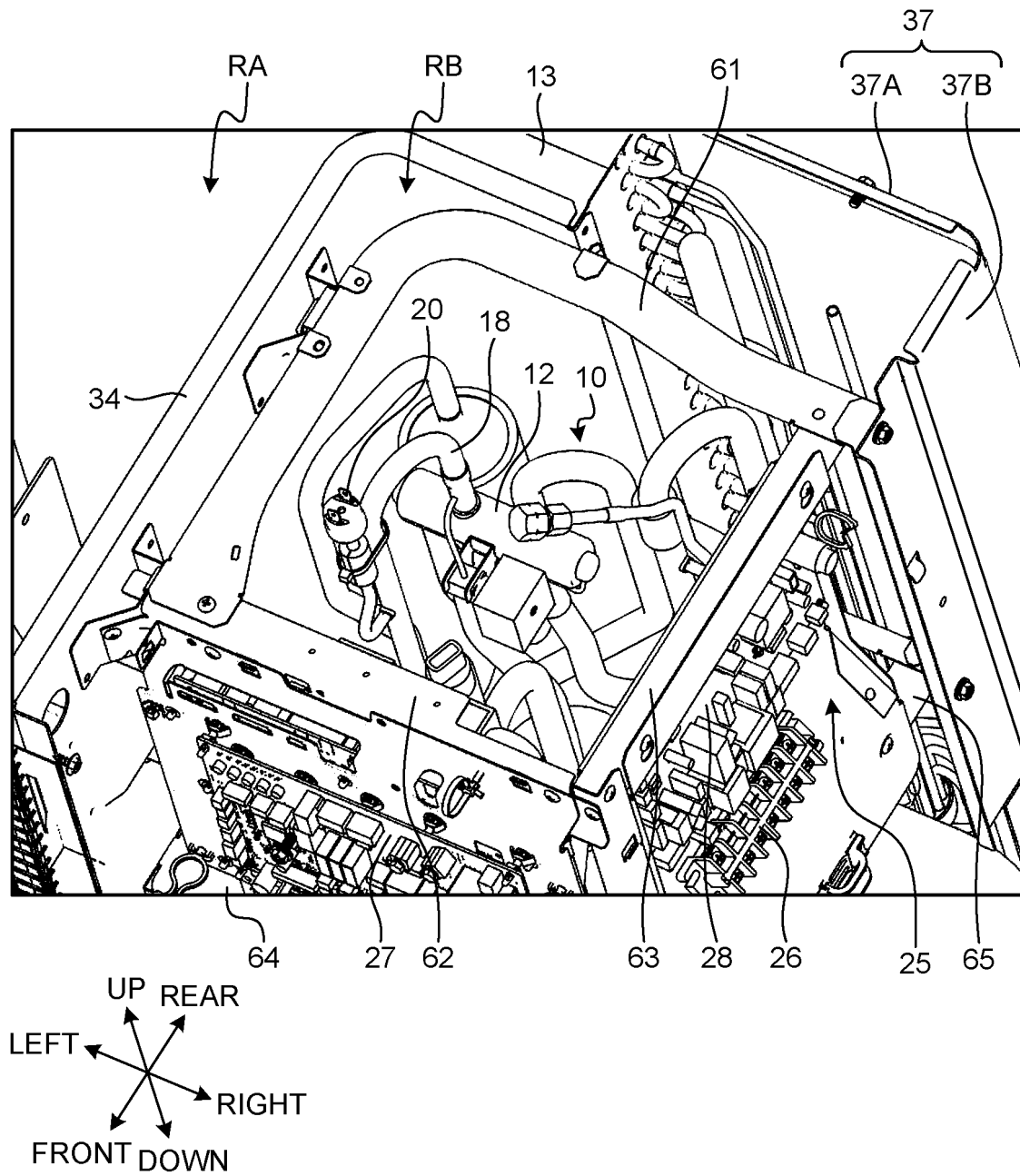


FIG.6

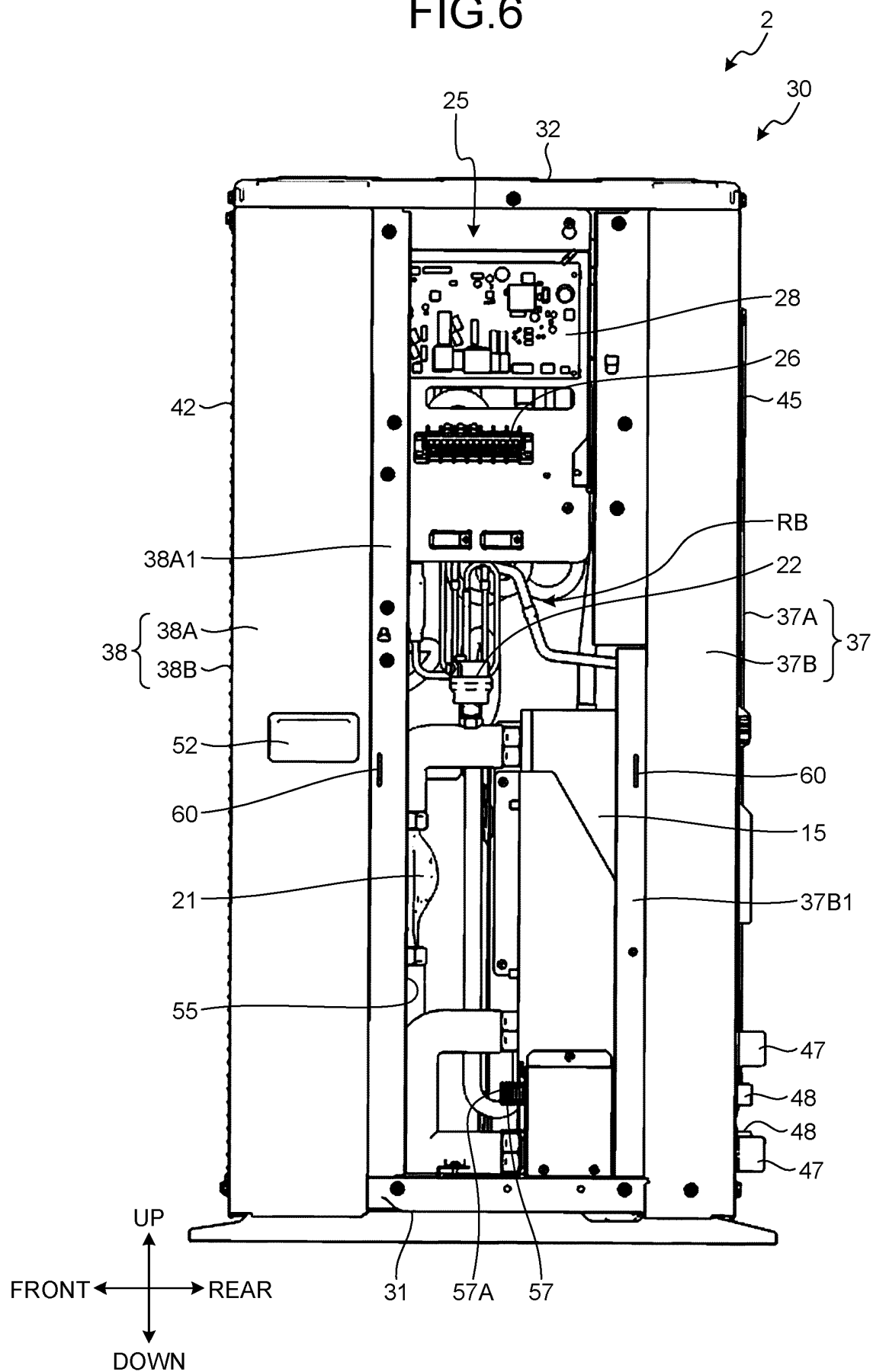


FIG.7

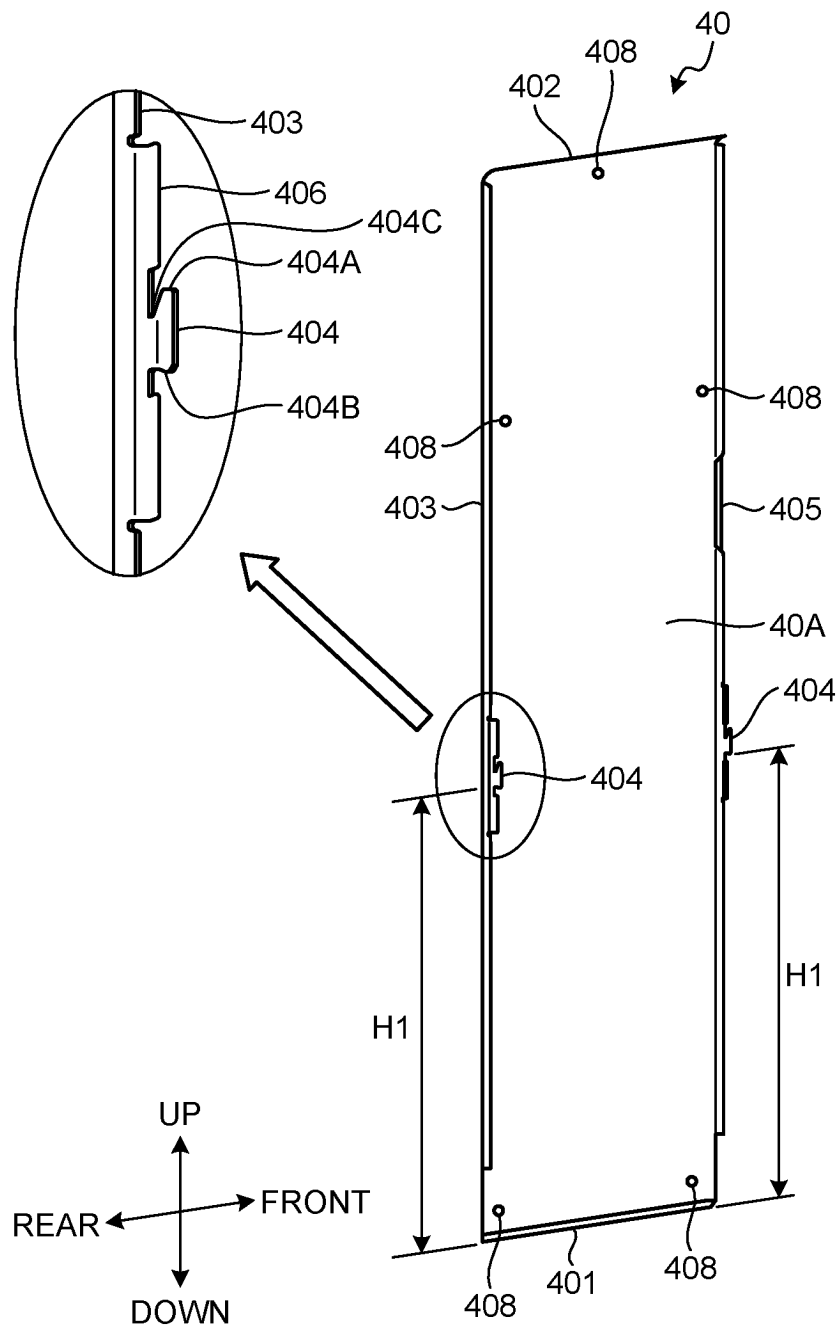


FIG.8

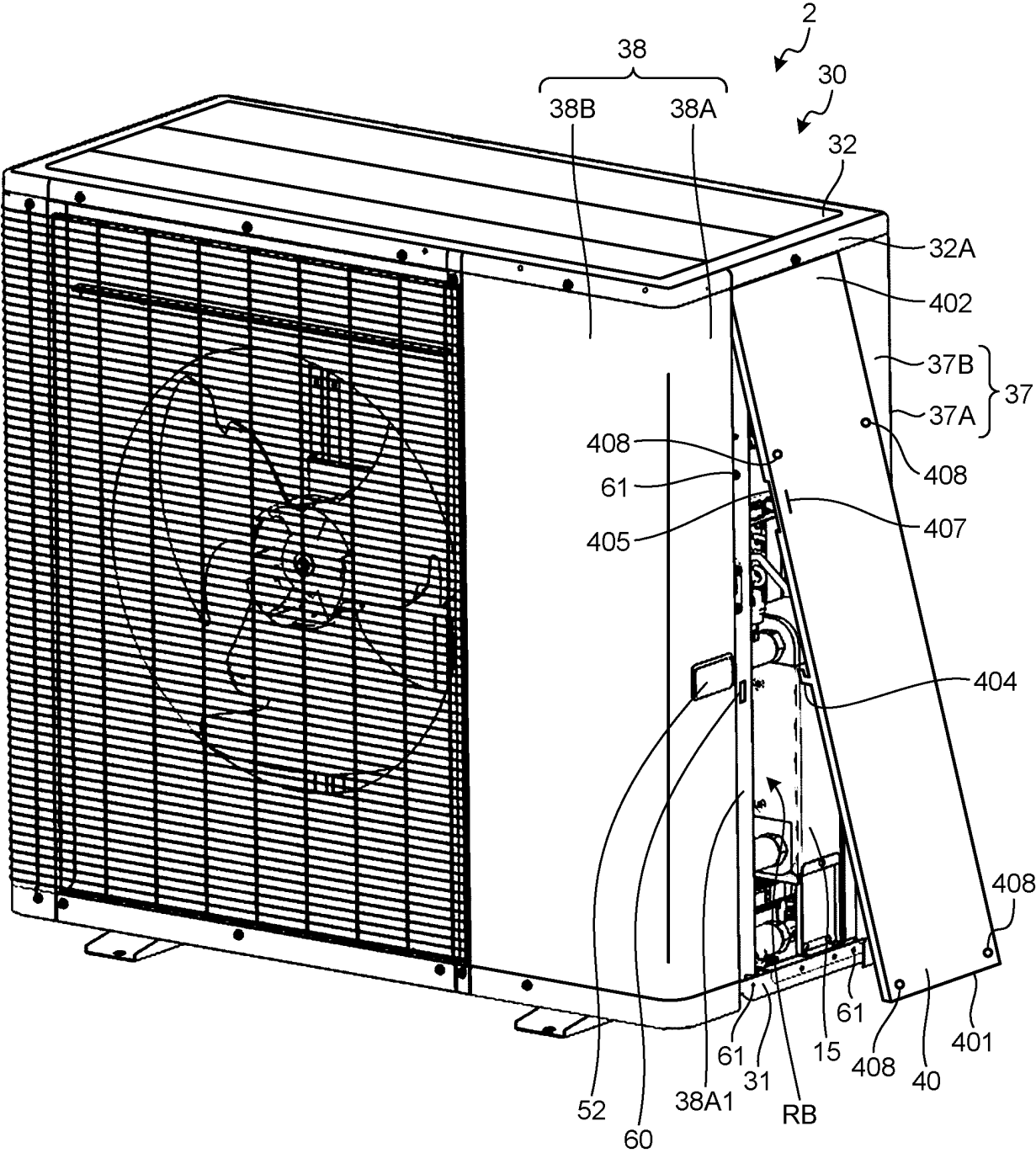


FIG.9

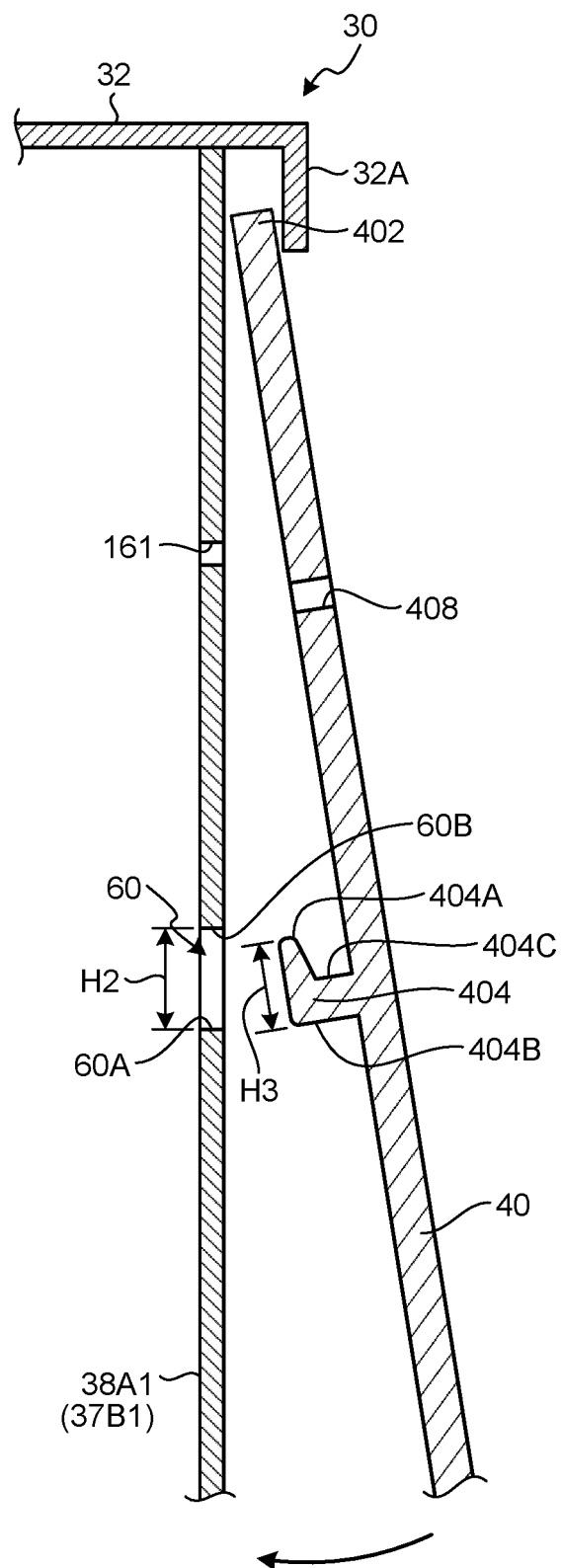


FIG.10

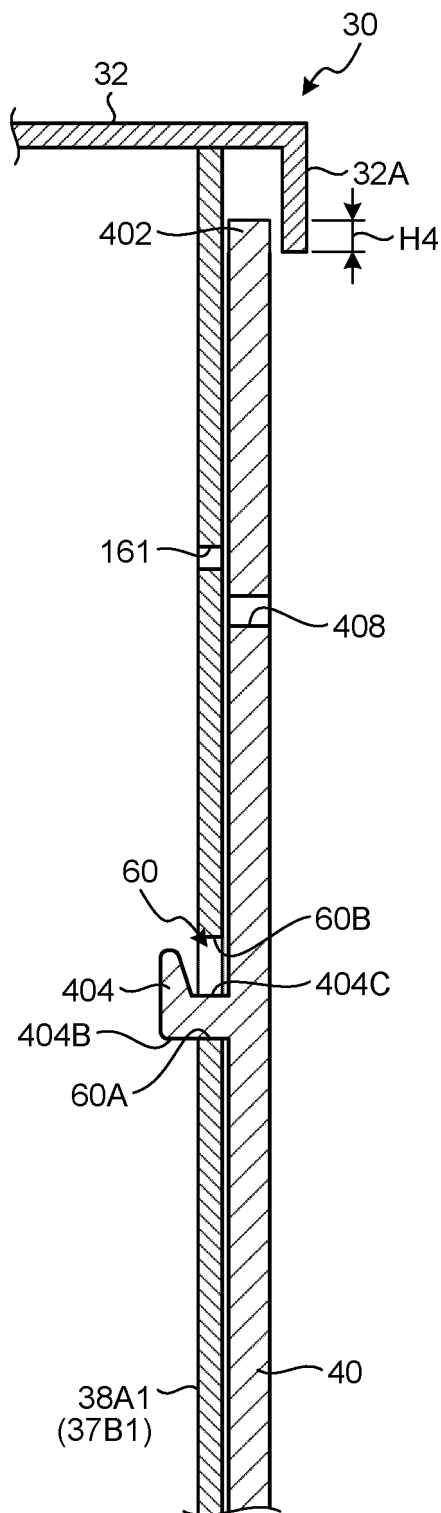
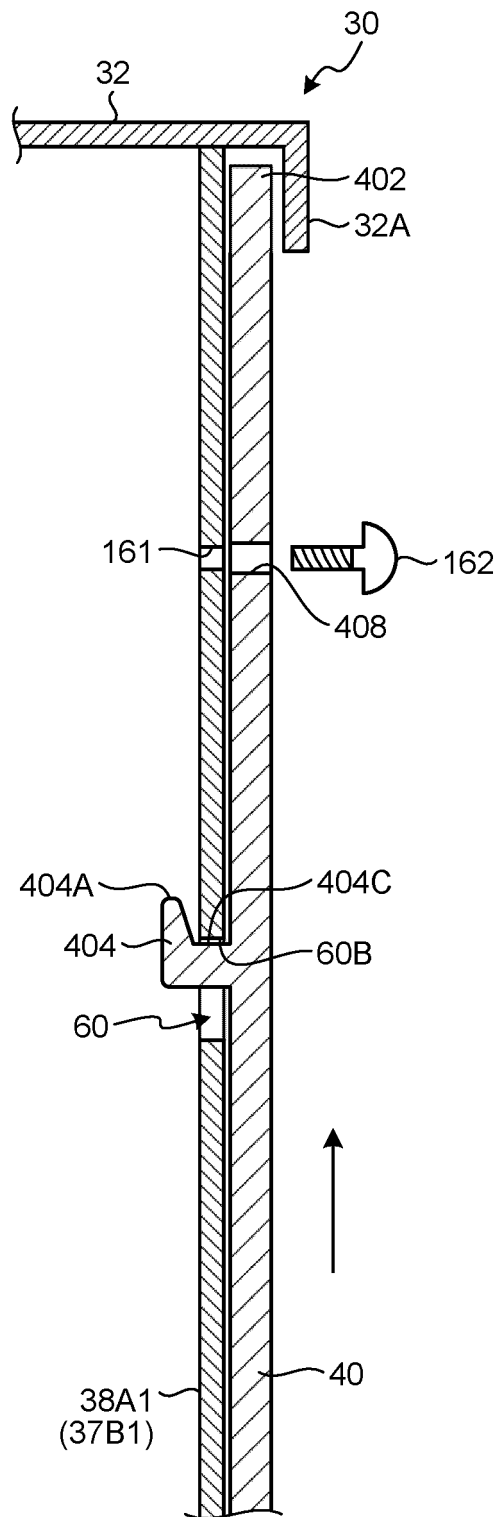


FIG.11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/008101

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/56(2011.01)i; **F24F 1/16**(2011.01)i; **F24F 1/22**(2011.01)i; **F24F 13/20**(2006.01)i
FI: F24F1/56; F24F1/22; F24F1/16; F24F13/20 202

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; F24F1/16; F24F1/22; F24F13/20

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

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	JP 5-322225 A (MITSUBISHI ELECTRIC CORP.) 07 December 1993 (1993-12-07) paragraphs [0013]-[0036]	1-8
Y	JP 2007-78220 A (MITSUBISHI ELECTRIC CORP.) 29 March 2007 (2007-03-29) paragraphs [0008]-[0015]	1-8
Y	JP 2011-7407 A (PANASONIC CORP.) 13 January 2011 (2011-01-13) paragraphs [0011]-[0031]	2-7
Y	WO 2011/99629 A1 (TOSHIBA CARRIER CORP.) 18 August 2011 (2011-08-18) paragraphs [0012]-[0097]	3-7
Y	JP 5-157291 A (MITSUBISHI ELECTRIC CORP.) 22 June 1993 (1993-06-22) paragraphs [0001]-[0014]	7

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

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

23 March 2023

Date of mailing of the international search report

16 May 2023

Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915
Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2023/008101

5

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP	5-322225	A	07 December 1993	(Family: none)	
JP	2007-78220	A	29 March 2007	(Family: none)	
JP	2011-7407	A	13 January 2011	(Family: none)	
WO	2011/99629	A1	18 August 2011	CN 102753895	A
				KR 10-2012-0116973	A
				CN 105004027	A
JP	5-157291	A	22 June 1993	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2016070616 A [0003]