(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 345 384 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.04.2024 Bulletin 2024/14

(21) Application number: **23199436.9**

(22) Date of filing: **25.09.2023**

(51) International Patent Classification (IPC):
F24F 1/20 *(2011.01)* ***F24F 1/22*** *(2011.01)*
F24F 11/89 *(2018.01)* ***F24F 13/20*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F24F 1/22; F24F 1/20; F24F 11/89; F24F 13/20

(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: **30.09.2022 JP 2022158774**

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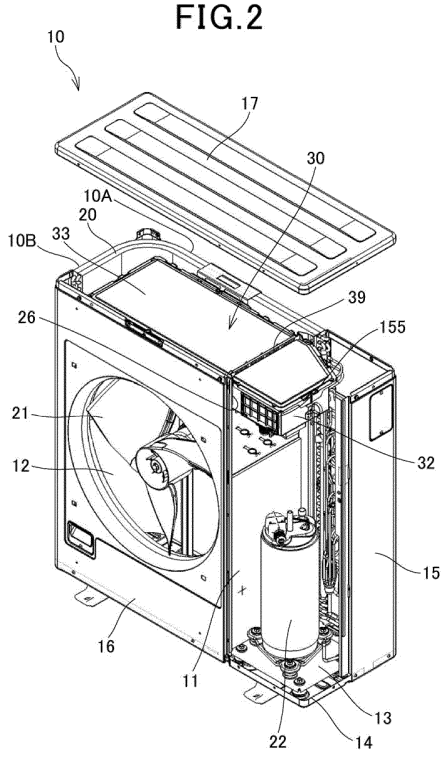
(54) HEAT PUMP APPARATUS

(57) The present disclosure provides a heat pump apparatus capable of efficiently cooling an electrical equipment box. A heat pump apparatus 1 includes a machine room 13 and a blower room 12 each in a housing 10, the machine room 13 being a room in which a compressor 22 and an expansion device 24 are disposed, the blower room 12 being a room in which a heat exchanger 20 and a blower device 21 are disposed, wherein the machine room 13 and the blower room 12 have an electrical equipment box 30 disposed above the rooms, which electrical equipment box 30 includes an electrical equipment box body 32 and a cover member 33, and an upper surface height of the cover member 33 is made lower than a upper end height of the heat exchanger 20.

FIG.2



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a heat pump apparatus.

Description of the Related Art

[0002] European Patent Application Publication No. 3312531 discloses a heat pump apparatus that includes a refrigerant circuit that circulates a flammable refrigerant, a water circuit (heat medium circuit) that causes water (heat medium) to flow, and a water heat exchanger (heat medium heat exchanger) that exchanges heat between the refrigerant and the water, each in a housing. The housing has an upper part in which an electrical equipment box that houses a control board, etc. is disposed.

[0003] The present disclosure provides a heat pump apparatus capable of efficiently cooling an electrical equipment box.

SUMMARY OF THE INVENTION

[0004] A heat pump apparatus of the present disclosure includes a machine room and a blower room each in a housing, the machine room being a room in which a compressor and an expansion device are disposed, the blower room being a room in which a heat exchanger and a blower device are disposed, wherein: the machine room and the blower room have an electrical equipment box disposed above the rooms, the electrical equipment box including an electrical equipment box body and a cover member; and an upper surface height of the cover member is made lower than an upper end height of the heat exchanger.

[0005] According to the present disclosure, the electrical equipment box can be efficiently cooled.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

FIG. 1 is a perspective view showing a heat pump apparatus according to Embodiment 1;
FIG. 2 is an exploded perspective view showing the heat pump apparatus of Embodiment 1;
FIG. 3 is a front view showing a state in which a front panel of the heat pump apparatus of Embodiment 1 is removed;
FIG. 4 is a circuit diagram showing a refrigerant circuit according to Embodiment 1;
FIG. 5 is an exploded perspective view showing an electrical equipment box of Embodiment 1;
FIG. 6 is a vertical cross-sectional view showing the electrical equipment box of Embodiment 1;
FIG. 7 is a plan view showing the electrical equipment box of Embodiment 1; and
FIG. 8 is an enlarged perspective view showing the partition member of Embodiment 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Knowledge on Which the Present Disclosure Is Based)

[0007] At the time when the inventors came up with the present disclosure, there was a technique for preventing ignition of a flammable refrigerant in a heat pump apparatus.

[0008] The heat pump apparatus includes a refrigerant circuit that circulates a flammable refrigerant, a water circuit that causes water to flow, and a water heat exchanger that exchanges heat between the refrigerant and water, each in a housing. The water circuit is provided with refrigerant release valves, such as a pressure relief valve and an air vent valve, which release refrigerant to the outside of the water circuit. With this configuration, if the partition wall that separates the refrigerant circuit and the water circuit in the water heat exchanger is destroyed and a flammable refrigerant mixes into the water circuit, the flammable refrigerant can be discharged to the outside of the water circuit via the pressure relief valve or the air vent valve.

[0009] The above heat pump apparatus has an electrical equipment box disposed above a machine room, and the electrical equipment box is disposed so as to be close to the top plate of the housing. The inventors have found a problem in which the electrical equipment box houses electronic components that generate heat and a blower room becomes hot due to the heat of the heat exchanger, etc., so that the electrical equipment box needs to be cooled. The inventors then have come to constitute the subject of the present disclosure to solve the problem.

[0010] Therefore, the present disclosure provides a heat pump apparatus that efficiently cools the electrical equipment box and speeds up cooling of electronic components.

[0011] Hereinafter, embodiments will be described in detail with reference to the drawings. However, more detailed description than necessary may be omitted. For example, detailed description of well-known matters or redundant description of substantially the same configurations may be omitted. This is to avoid the following description from becoming more redundant than necessary and to facilitate understanding of those skilled in the art.

[0012] Note that the accompanying drawings and the following description are provided to allow those skilled in the art to sufficiently understand the present disclosure, and are not intended to limit the subject described in the claims.

(Embodiment 1)

[0013] Embodiment 1 is to be described below with reference to the drawings.

[1-1. Configuration]

[1-1-1. Configuration of Heat Pump Apparatus]

[0014] FIG. 1 is a perspective view of a heat pump apparatus 1 according to Embodiment 1. FIG. 2 is an exploded perspective view of the heat pump apparatus 1 according to Embodiment 1. FIG. 3 is a front view showing a state in which a front panel 16 of the heat pump apparatus 1 according to Embodiment 1 is removed.

[0015] The heat pump apparatus 1 shown in FIG. 1 is an outdoor unit that can be used for a what is called heat-pump hot-water heater.

[0016] As shown in FIGS. 1 to 3, the heat pump apparatus 1 includes a box-shaped housing 10. In the present embodiment, each part of housing 10 is made of a steel plate.

[0017] Inside the housing 10, there is provided a partition plate 11 extending in the up-down direction. The partition plate 11 partitions the internal space of the housing 10 into a blower room 12 and a machine room 13.

[0018] The housing 10 includes a bottom plate 14 that forms the bottom surface of the housing 10, a pair of side panels 15 that covers the machine room 13 of the housing 10 from the front and rear, a front panel 16 that covers the front surface of the blower room 12, and a top plate 17 that covers the upper surface of the housing 10.

[0019] The front panel 16 is provided with a ventilation portion 18 that is formed like a mesh and allows air to pass through.

[0020] The blower room 12 has a heat exchanger 20 and a blower device 21.

[0021] The heat exchanger 20 of the present embodiment extends almost fully in the height direction of the housing 10, and is formed in a substantially L-shape in plan view of the housing 10 so as to face the rear surface 10A and the side surface 10B of the housing 10.

[0022] The heat exchanger 20 to be used is, for example, a fin-tube heat exchanger.

[0023] The blower device 21 to be used is, for example, an axial fan having a propeller-shaped impeller. The air blower device 21 is disposed so that the axial flow direction faces the ventilation portion 18.

[0024] The machine room 13 houses various devices forming a refrigerant circuit, such as a compressor 22, a water heat exchanger (heat medium heat exchanger) 23, and an expansion device 24 (see FIG. 4), and refrigerant piping 25 connecting these to each other.

[0025] The water heat exchanger 23 to be used is, for example, a plate heat exchanger.

[0026] The upper part of the partition plate 11 has a cutout portion 26, and the cutout portion 26 has the electrical equipment box 30 installed therein.

[1-1-2. Configuration of Refrigerant Circuit]

[0027] FIG. 4 is a circuit diagram showing a refrigerant circuit according to Embodiment 1.

[0028] As shown in FIG. 4, a compressor 22, a four-way valve 27, a water heat exchanger 23, an expansion device 24, and a heat exchanger 20 are annularly connected via predetermined refrigerant piping 25 to form the refrigerant circuit.

[0029] The water heat exchanger 23 is connected to predetermined water supply piping 28, and the water supply piping 28, in the water heat exchanger 23, exchanges heat with the refrigerant that circulates in the refrigerant circuit.

[0030] The refrigerant, which has been compressed by the compressor 22 to have a high-temperature and a high-pressure, flows as indicated by solid arrows in FIG. 4 and is sent to the water heat exchanger 23. The refrigerant then exchanges heat with the water flowing through the water supply piping 28 in the water heat exchanger 23, and is cooled and condensed.

The water receives the heat of the refrigerant and turns into hot water, which is supplied to, for example, a device on the use side (not shown).

[0031] The refrigerant discharged from the water heat exchanger 23 is depressurized by the expansion device 24 to evaporate, undergoes heat exchange in the heat exchanger 20, turns into a gas refrigerant, and is returned to the compressor 22 again.

[0032] The refrigerant circuit is also configured so that it can switch the four-way valve 27 to cause the refrigerant to: flow as indicated by dashed arrows in FIG. 4; exchange heat with the outside air in the heat exchanger 20; be depressurized with expansion device 24; and then be sent to the water heat exchanger 23, so that the water flowing through the water supply piping 28 is cooled. The cooled water is supplied to a use side device (not shown).

[0033] Here, in the present embodiment, the refrigerant to be used is a flammable refrigerant. The flammable refrigerant is R32 or a mixed refrigerant containing 70 weight percent or more of R32, or propane or a mixed refrigerant containing propane.

[0034] Note that the refrigerant to be used may be a nonflammable refrigerant instead of a flammable refrigerant.

[1-1-3. Configuration of Electrical Equipment Box]

[0035] FIG. 5 is an exploded perspective view showing the electrical equipment box 30 of Embodiment 1. FIG. 6 is a vertical cross-sectional view showing the electrical equipment box 30 of Embodiment 1. FIG. 7 is a plan view showing the electrical equipment box 30 of Embodiment 1. As shown in FIG. 2, an electrical equipment box 30 is disposed above the blower room 12 and the machine room 13 across the machine room 13 and the blower room 12.

[0036] The electrical equipment box 30 is installed in

the cutout portion 26 at the upper part of the partition plate 11 and is supported by the partition plate 11. As shown in FIGS. 5 and 6, the electrical equipment box 30 includes a box-shaped electrical equipment box body 32 made of sheet metal and having an opening 31 with an open upper surface, and a cover member 33 formed in a substantially rectangular flat plate shape and made of resin for closing the opening 31. The electrical equipment box body 32 is made of a material with high thermal conductivity, such as a metal material. The cover member 33 is attached to the electrical equipment box body 32 via an O-ring 38.

[0037] Note that, in the present embodiment, the electrical equipment box body 32 is entirely made of a metal material, but may be made of a metal material only in a part located above the blower room 12.

[0038] As shown in FIGS. 5 to 7, the electrical equipment box body 32 includes a rectangular blower-side portion 32A located on the side of the blower room 12, and a substantially trapezoidal machine-side portion 32B located on the side of the machine room 13. The cover member 33 includes a rectangular blower-side portion 33A located on the side of the blower room 12 and a substantially trapezoidal machine-side portion 33B located on the side of the machine room 13.

[0039] The blower-side portion 32A of the electrical equipment box body 32 is provided with a control board 40 made of a printed wiring board.

[0040] Although not shown, the control board 40 has electronic components including a semiconductor chip such as a CPU, transistors, capacitors, and resistors, mounted thereon to form an electric circuit.

[0041] The lower surface of the control board 40 is provided with a heat sink 41 including a plurality of fins, and the control board 40 is installed so as to protrude downward from a bottom surface opening 35 provided on the bottom surface of the blower-side portion 32A. The heat sink 41 is disposed on the bottom surface of the electrical equipment box body 32 in the blower-side portion 32A located near the machine-side portion 32B. In the present embodiment, one end of the heat sink 41 is located at the boundary between the machine-side portion 32B and the blower-side portion 32A. In other words, the one end is located at the boundary partitioned by the partition plate 11.

[0042] The circumferential portion of the bottom surface opening 35 has a sealing material 42 disposed thereon, and the control board 40 is fixed via the sealing material 42 so that the bottom surface opening 35 is closed.

[0043] The machine-side portion 32B of the electrical equipment box body 32 has a main power line relay portion 50 located on the front side and a lead wire relay portion 53 located on the rear side. The main power line relay portion 50 has a terminal block 51 for connecting the main power line, and a cable gland 52 that draws in and seals the main power line. A cable 45 drawn into the cable gland 52 is connected to a predetermined device such as the compressor 22. The lead wire relay portion 53 has a lead wire relay module 55 for drawing in a lead wire.

[0044] The main power line relay portion (space) 50 has the terminal block 51 for connecting a cable (main power line) 45. The main power line relay portion 50 in which the terminal block 51 is disposed is partitioned off by a partition plate 154, and the main power line relay portion 50 is sealed inside the electrical equipment box body 32. The terminal block 51 is disposed on a partition plate 154A formed obliquely and faces a window opening 152 formed on a side surface of the electrical equipment box body 32. The window opening 152 has a window cover body 155 screwed thereto with a sealing material (not shown) interposed therebetween. The window cover body 155 seals off the main power line relay portion 50.

[0045] The cover member 33 is fixed to the upper end of the electrical equipment box body 32 with fixing screws 37A to 37F via an O-ring 38. Thereby, the inside of the electrical equipment box body 32 is made into a sealed space. More specifically, as shown in FIG. 5, the electrical equipment box body 32 has an upper end having a circumferential portion. The circumferential portion has a flange 32F formed by bending a sheet metal. As shown in FIG. 5, an O-ring groove 36 is formed in the circumferential portion of the lower surface of the cover member 33. The O-ring 38 is fitted into the O-ring groove 36, and the cover member 33 is fixed to the flange 32F with six fixing screws 37A, 37B, 37C, 37D, 37E, and 37F. The O-ring 38 is made of foam rubber or chloroprene rubber.

[0046] The cover member 33 is fixed to the flange 32F of the machine-side portion 32B of the electrical equipment box body 32 with four fixing screws 37A to 37D, and is fixed to the flange 32F of the blower-side portion 32A of the electrical equipment box body 32 with two fixing screws 37E and 37F.

[0047] In the electrical equipment box body 32, the ratio of the volume occupied by the machine-side portion 32B is smaller than the ratio of the volume occupied by the blower-side portion 32A. The machine-side portion 32B of the electrical equipment box body 32 is formed into a trapezoidal shape by cutting a corner of the machine-side portion 32B.

[0048] This causes the machine-side portion 32B of the electrical equipment box body 32 to have a shorter length of the sealing portion (the length of the O-ring 38) between the electrical equipment box body 32 and the cover member 33.

[0049] Further, the intervals P1, P2, and P3 between fixing screws 37A, 37B, 37C, and 37D, which fix the machine-side portion 32B, are set shorter than the intervals P4, P5, and P6 between the fixing screws 37D, 37E, and 37F which fix the blower-side portion 32A. Thus, the machine-side portion 32B has a shorter sealing portion length and has shorter intervals P1 to P3 between the fixing screws 37A to 37D. This can improve the sealing performance between the electrical equipment box body 32 and the cover member 33 in the machine-side portion

32B.

[0050] The heat exchanger 20 is formed in an L-shape facing the rear surface 10A and the side surface 10B of the housing 10. There is a shielding member 60 provided between the header pipe of the heat exchanger 20 facing the rear surface 10A of the housing 10 and the machine-side portion 32B of the electrical equipment box body 32, as shown in FIG. 7. The shielding member 60 is thus provided in the vicinity of the sealing portion of the machine-side portion 32B near the header pipe, to prevent the refrigerant from directly colliding with the vicinity of the sealing portion even if the refrigerant blows out from the refrigerant circuit. This can reduce the mass transfer coefficient of the refrigerant permeating into the O-ring 38.

[0051] FIG. 8 is an enlarged perspective view showing a partition member 39 of Embodiment 1.

[0052] The electrical equipment box 30 is disposed so that the upper surface height of the cover member 33 is lower than the upper end height of the heat exchanger 20. The upper surface of the cover member 33 and the lower surface of the top plate 17 of the housing 10 have a space formed therebetween where ventilation is allowed.

[0053] The cover member 33 has a partition member 39 provided on the upper surface thereof, as shown in FIGS. 2 and 8. The partition member 39 is disposed at the boundary between the blower-side portion 33A and the machine-side portion 33B so as to close the space. In other words, the upper surface 39A of the partition member 39 is in contact with the lower surface of the top plate 17. The partition member 39 has a plurality of openings 100 at equal intervals, which partially allow ventilation between the machine room 13 and the blower room 12. When the blower device 21 is driven, the wind in the blower room 12 and the machine room 13 flows in the direction W1.

[0054] In cooling operation, the temperature near the blower-side portion 33A of the cover member 33 is higher than the temperature near the machine-side portion 33B. The relatively low-temperature air in the machine room 13 therefore flows through the openings 100 to the electrical equipment box 30 on the side of the blower room 12.

[0055] When water droplets such as raindrops scatter in the direction W2, the partition member 39 can prevent the water droplets from entering the machine room 13.

[1-2. Operation]

[0056] Next, the operation of the heat pump apparatus 1 configured as above is to be described.

[0057] When the heat pump apparatus 1 is driven, the compressor 22 and the blower device 21 are operated, and the axial fan is also started to operate.

[0058] When hot water is used, the refrigerant, which has been compressed by the compressor 22 to have a high-temperature and a high-pressure, flows as indicated by the solid arrows in FIG. 4. Then, the refrigerant is sent to the water heat exchanger 23, and is cooled in the water heat exchanger 23 by exchanging heat with the water flowing through the water supply piping 28. Meanwhile, the water receives the heat of the refrigerant and turns into hot water and is supplied to a predetermined location.

[0059] The refrigerant discharged from the water heat exchanger 23 is depressurized by the expansion device 24, exchanges heat in the heat exchanger 20, is turned into a gas refrigerant, and is returned to the compressor 22 again.

[0060] When cooled water is used, the four-way valve 27 is switched, so that the refrigerant flows as indicated by the dashed arrows in FIG. 4. Then, the refrigerant exchanges heat with outside air in the heat exchanger 20, is depressurized in the expansion device 24, and is sent to the water heat exchanger 23, to cool the water flowing through the water supply piping 28.

[0061] Operation of the blower device 21 during these operations causes air to flow to the electrical equipment box 30 located in the blower room 12.

[0062] The operation of the blower device 21 causes air to flow to the heat sink 41. Thereby, the heat sink 41 can be cooled, and the control board 40 can be cooled via the heat sink 41.

[0063] The machine room 13 has the water heat exchanger 23 disposed therein. When the heat pump apparatus 1 generates cooled water, the water heat exchanger 23 functions as an evaporator, lowering the ambient temperature around the water heat exchanger 23. This case especially lower the temperature of the air flowing from the machine room 13 to the blower room 12, and the air efficiently cools the cover member 33. Although rainwater can enter the inside of the blower room 12, the rainwater is blocked by the partition member 39, resulting in almost no rainwater entering the machine room 13.

[0064] The electrical equipment box 30 includes an electrical equipment box body 32 and a cover member 33, and the upper surface height of the cover member 33 is set lower than the upper end height of the heat exchanger 20.

[0065] In addition, the electrical equipment box body 32 has a heat sink 41 disposed thereon that protrudes into the blower room 12. This causes air from the blower device 21 and air from the machine room 13, which has a temperature lower than the former air, to flow to the heat sink 41, thereby cooling the control board 40. The electrical equipment box 30 is cooled from both the upper surface and the lower surface, enabling prevention of the temperature rise inside the electrical equipment box 30. Note that the electrical equipment box 30 and the configuration included in the electrical equipment box 30 correspond to an example of "electrical equipment".

[1-3. Effects]

[0066] As described above, in the present embodiment, the heat pump apparatus 1 includes a machine

room 13 in which a compressor 22 and an expansion device 24 are disposed, and a blower room 12 in which a heat exchanger 20 and a blower device 21 are disposed, each in a housing 10. The machine room 13 and the blower room 12 have an electrical equipment box 30 disposed above them. The electrical equipment box 30 includes an electrical equipment box body 32 and a cover member 33, and the upper surface height of the cover member 33 is made lower than the upper end height of the heat exchanger 20.

[0067] This configuration enables efficiently cooling the electrical equipment box 30.

[0068] Further, in the present embodiment, the lower surface of the top plate 17 of the housing 10 and the upper surface of the cover member 33 have a space formed therebetween where ventilation is allowed. The space allows ventilation between the machine room 13 and the blower room 12. The upper surface of the cover member 33 has a partition member 39 disposed thereon and located in the space, which partition member 39 partially has openings 100.

[0069] This configuration enables efficiently cooling the electrical equipment box 30 and preventing water droplets from entering the machine room 13.

[0070] In the present embodiment, the cover member 33 includes a blower-side portion 33A located on the side of the blower room 12 and a machine-side portion 33B located on the side of the machine room 13, and the partition member 39 is disposed on the upper surface of cover member 33 at the boundary between the blower-side portion 33A and the machine-side portion 33B.

[0071] This configuration enables efficiently cooling the electrical equipment box 30 and preventing water droplets from entering the machine-side portion 33B of the electrical equipment box 30.

[0072] In the present embodiment, the electrical equipment box body 32 includes a blower-side portion 32A located on the side of the blower room 12 and a machine-side portion 32B located on the side of the machine room 13, and the heat sink 41 that dissipates heat generated by electrical equipment is disposed in the blower-side portion 32A near the machine-side portion 32B.

[0073] This also causes a flow of air in the machine room 13, which has a lower temperature than air in the blower room 12, through the electrical equipment box 30 and the heat sink 41, enabling prevention of temperature rise of the electrical equipment box 30.

(Other Embodiments)

[0074] As described above, Embodiment 1 has been described as an example of the technique disclosed in the present application. However, the techniques in the present disclosure are not limited to this, and can also be applied to embodiments with modifications, replacements, additions, omissions, etc. It is also possible to combine the components described in above-described Embodiment to form a new embodiment.

[0075] In Embodiment 1 described above, the heat pump apparatus 1 is an outdoor unit that can be used for a what is called heat pump hot water heater. However, the heat pump apparatus 1 is not limited to this, and can be applied to any other various apparatuses each having a refrigerant circuit, such as a water heater and an air conditioner.

[0076] Note that the above-described embodiments are for illustrating the techniques in the present disclosure, and various modifications, replacements, additions, omissions, etc. can be made within the scope of the claims or equivalents thereof.

[Configurations Supported by the Above Embodiments]

[0077] The above embodiments support the following configurations.

(Supplement)

(Technique 1)

[0078] A heat pump apparatus including a machine room and a blower room each in a housing, the machine room being a room in which a compressor and an expansion device are disposed, the blower room being a room in which a heat exchanger and a blower device are disposed, wherein: the machine room and the blower room have an electrical equipment box disposed above the rooms, the electrical equipment box including an electrical equipment box body and a cover member; and an upper surface height of the cover member is made lower than an upper end height of the heat exchanger.

[0079] This configuration allows the electrical equipment box to be cooled both from the upper surface and from the lower surface, enabling efficiently cooling the electrical equipment box.

(Technique 2)

[0080] The heat pump apparatus according to Technique 1, wherein: a space is formed between a lower surface of a top plate of the housing and an upper surface of the cover member, which space allows ventilation between the machine room and the blower room; and a partition member is disposed on the upper surface of the cover member, is located in the space, and partially has an opening.

[0081] This configuration makes it possible to efficiently cool the electrical equipment box and prevent water droplets from entering the machine room with the partition member.

(Technique 3)

[0082] The heat pump apparatus according to Technique 2, wherein the cover member includes a blower-side portion located on a side of the blower room and a

machine-side portion located on a side of the machine room, and the partition member is disposed on an upper surface of the cover member at a boundary between the blower-side portion and the machine-side portion.

[0083] This configuration makes it possible to efficiently cool the electrical equipment box and prevent water droplets from entering the machine-side portion of the electrical equipment box.

(Technique 4)

[0084] The heat pump apparatus according to any one of Techniques 1 to 3, wherein the electrical equipment box body includes a blower-side portion located on a side of the blower room and a machine-side portion located on a side of the machine room, and a heat sink that dissipates heat generated by electrical equipment is disposed on the blower-side portion close to the machine-side portion.

[0085] This configuration also causes a flow of air in the machine room, which has a lower temperature than air in the blower room, through the electrical equipment box and the heat sink, enabling prevention of temperature rise of the electrical equipment box.

[0086] The present disclosure can be suitably used for heat pump apparatuses capable of preventing increase in refrigerant concentration around electrical components housed in an electrical equipment box when a refrigerant leaks.

Reference Signs List

[0087]

1 heat pump apparatus
10 housing
10A rear surface
10B side surface
11 partition plate
12 blower room
13 machine room
14 bottom plate
15 side panel
16 front panel
17 top plate
18 ventilation portion
20 heat exchanger
21 blower device
22 compressor
23 water heat exchanger (heat medium heat exchanger)
24 expansion device
25 refrigerant piping
27 four-way valve
28 water supply piping
30 electrical equipment box
31 opening
32 electrical equipment box body
32A blower-side portion
32B machine-side portion
32F flange
33 cover member
33A blower-side portion
33B machine-side portion
35 bottom surface opening
36 O-ring groove
38 O-ring
39 partition member
39A upper surface
40 control board
41 heat sink
42 sealing material
45 cable (main power line)
50 main power line relay portion (space)
51 terminal block
52 cable gland
53 lead wire relay portion
60 shielding member
100 opening
154 partition plate
154A partition plate
W1 direction
W2 direction

Claims

1. A heat pump apparatus (1) comprising a machine room (13) and a blower room (12) each in a housing (10), the machine room being a room in which a compressor (22) and an expansion device (24) are disposed, the blower room being a room in which a heat exchanger (20) and a blower device (21) are disposed, **characterized in that**

   the machine room and the blower room have an electrical equipment box (30) disposed above the rooms, the electrical equipment box including an electrical equipment box body (32) and a cover member (33), and
   an upper surface height of the cover member is made lower than an upper end height of the heat exchanger.

2. The heat pump apparatus according to claim 1, wherein: a space is formed between a lower surface of a top plate (17) of the housing and an upper surface of the cover member, which space allows ventilation between the machine room and the blower room; and a partition member (39) is disposed on the upper surface of the cover member, is located in the space, and partially has an opening (100).

3. The heat pump apparatus according to claim 2, wherein

the cover member includes a blower-side portion (33A) located on a side of the blower room and a machine-side portion (33B) located on a side of the machine room, and
the partition member is disposed on an upper surface of the cover member at a boundary between the blower-side portion and the machine-side portion.

4. The heat pump apparatus according to claim 1 or 2, wherein the electrical equipment box body includes a blower-side portion (33A) located on a side of the blower room and a machine-side portion (33B) located on a side of the machine room, and a heat sink (41) that dissipates heat generated by electrical equipment is disposed on the blower-side portion close to the machine-side portion.

FIG.1

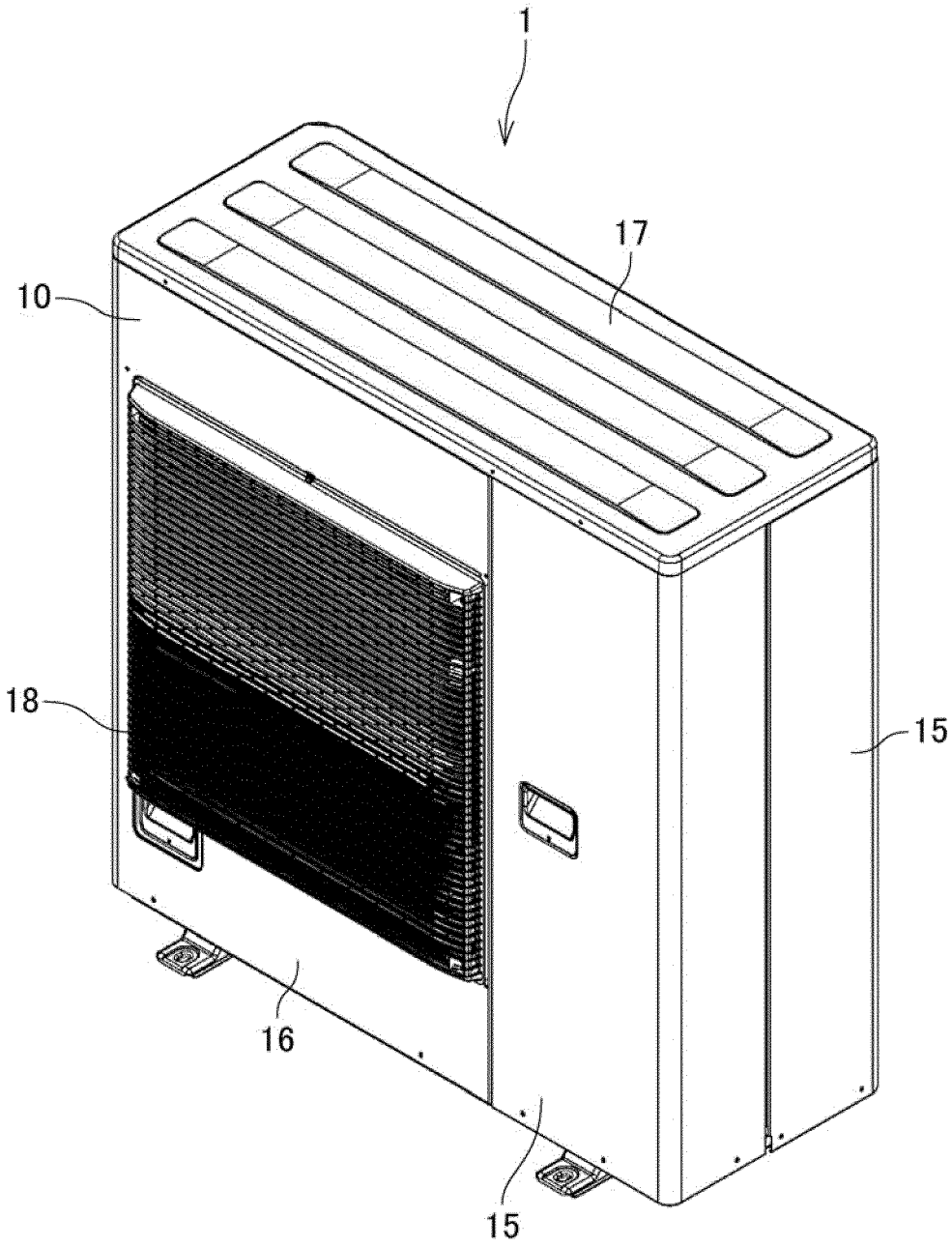


FIG.2

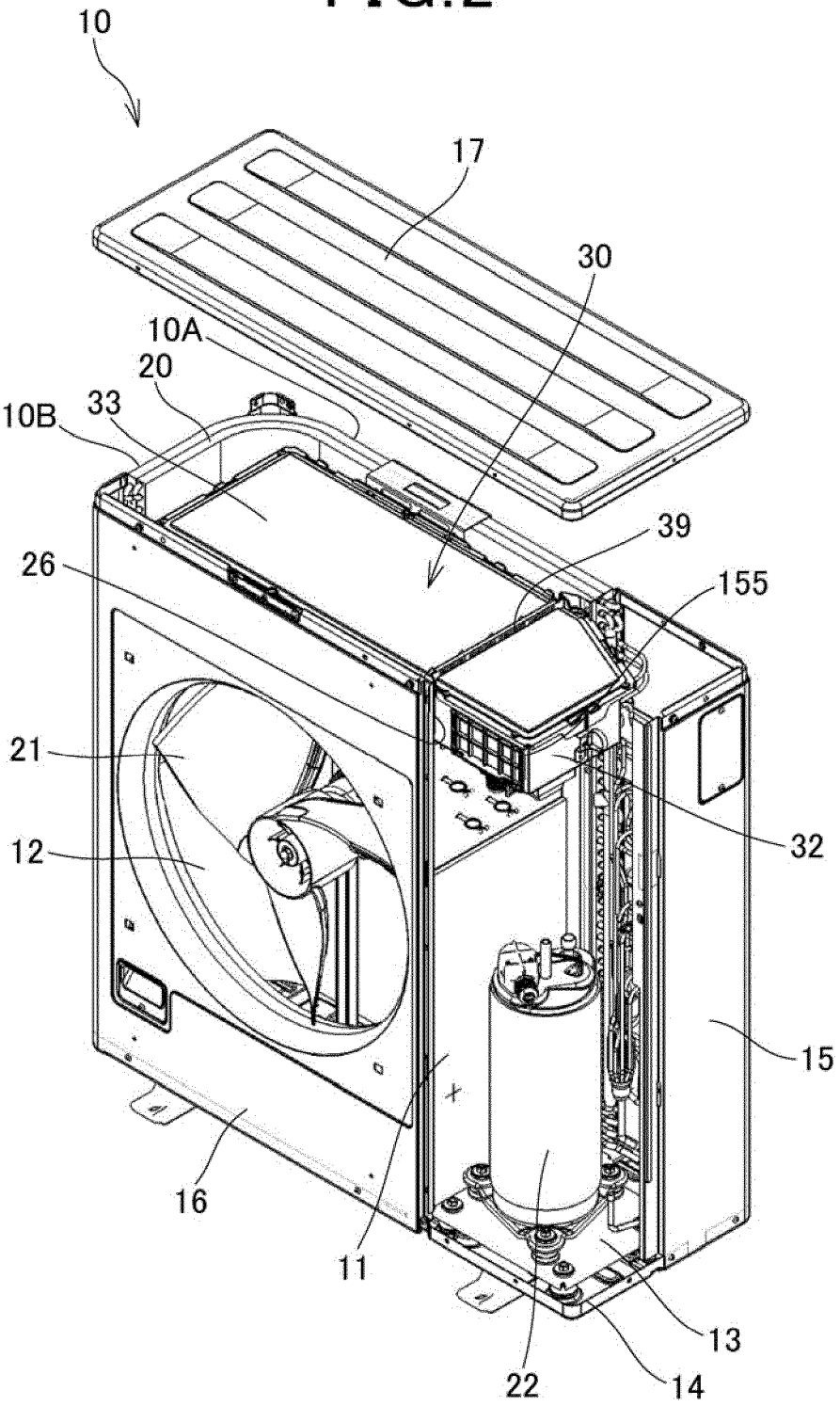


FIG.3

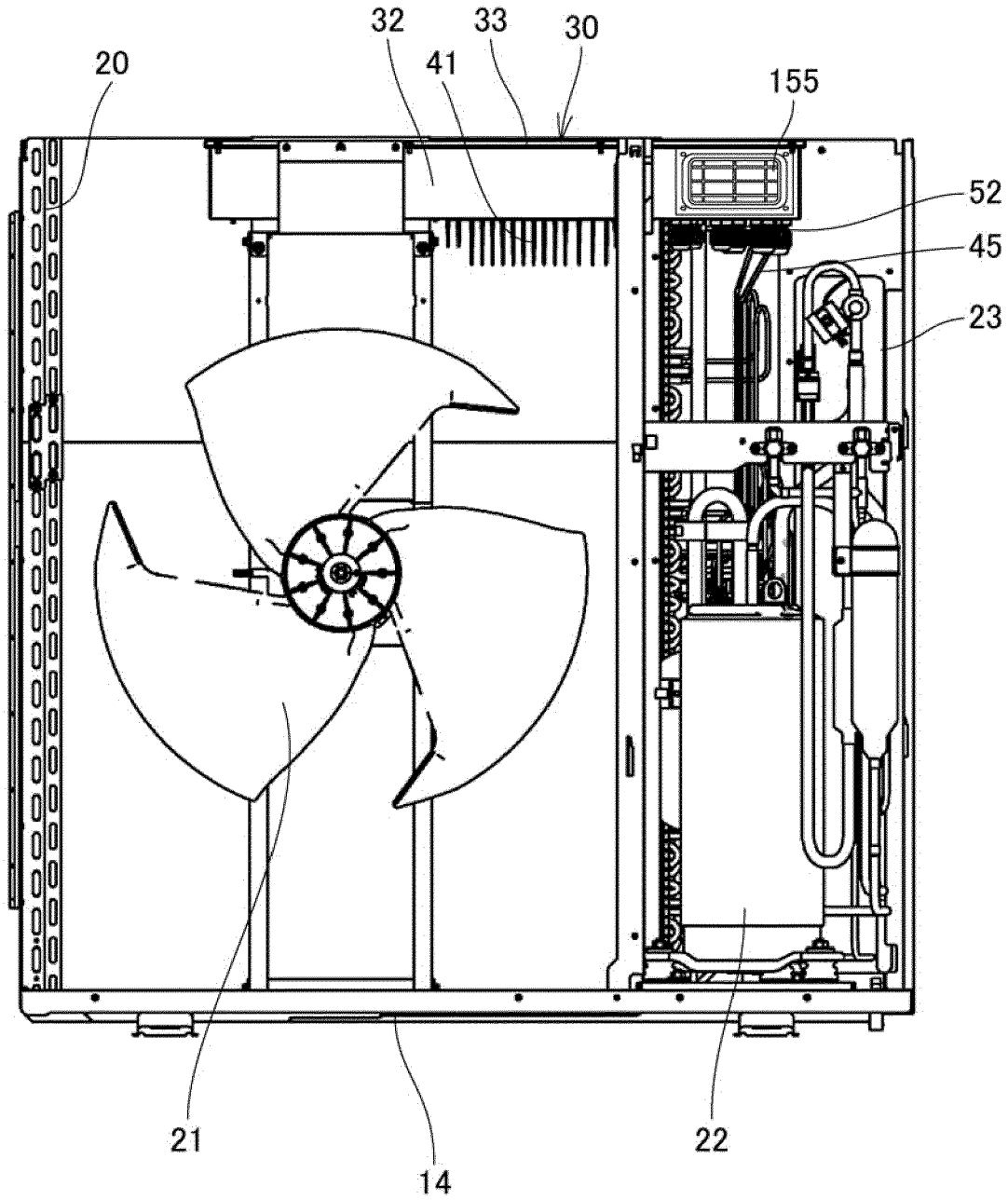


FIG.4

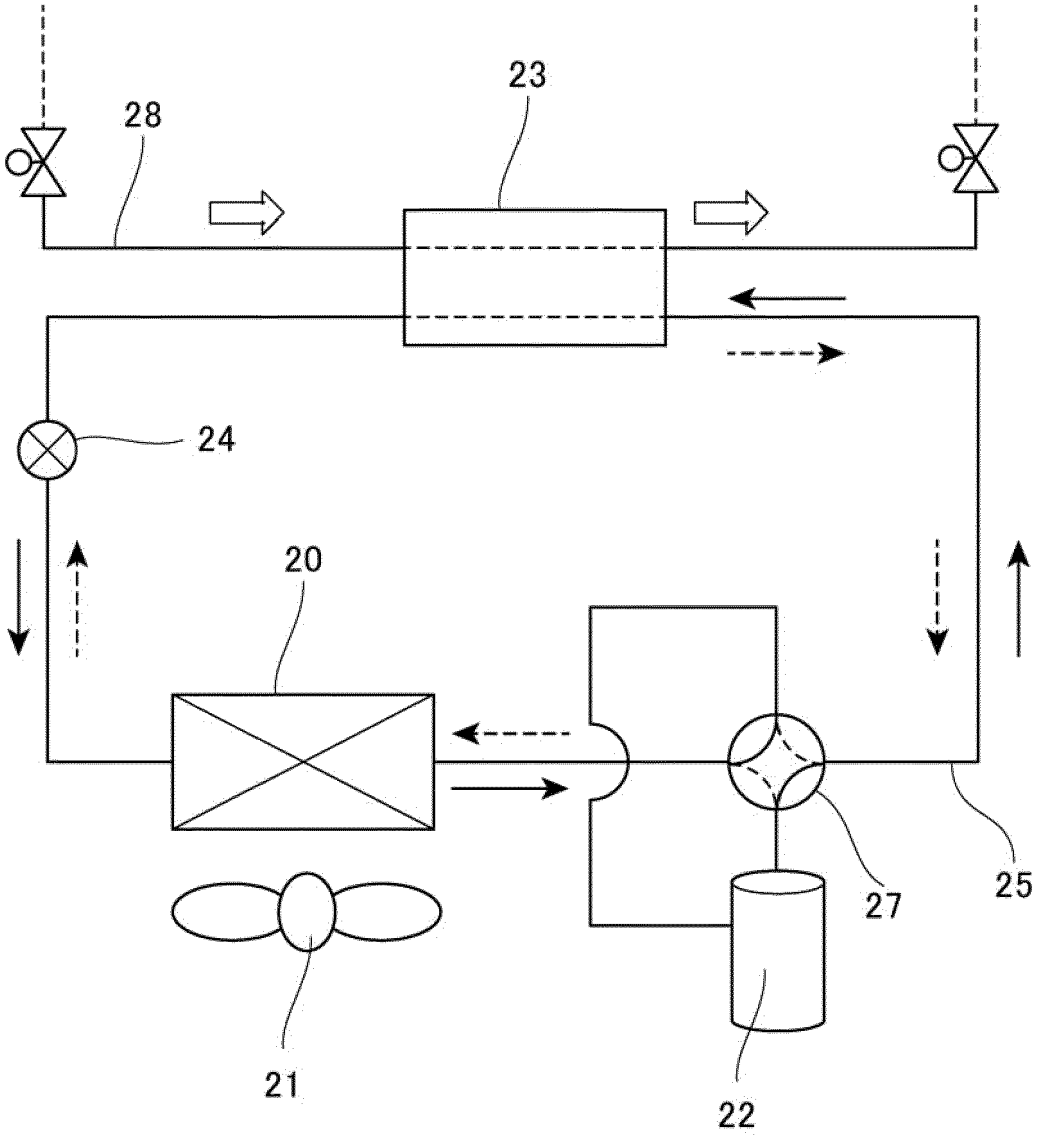
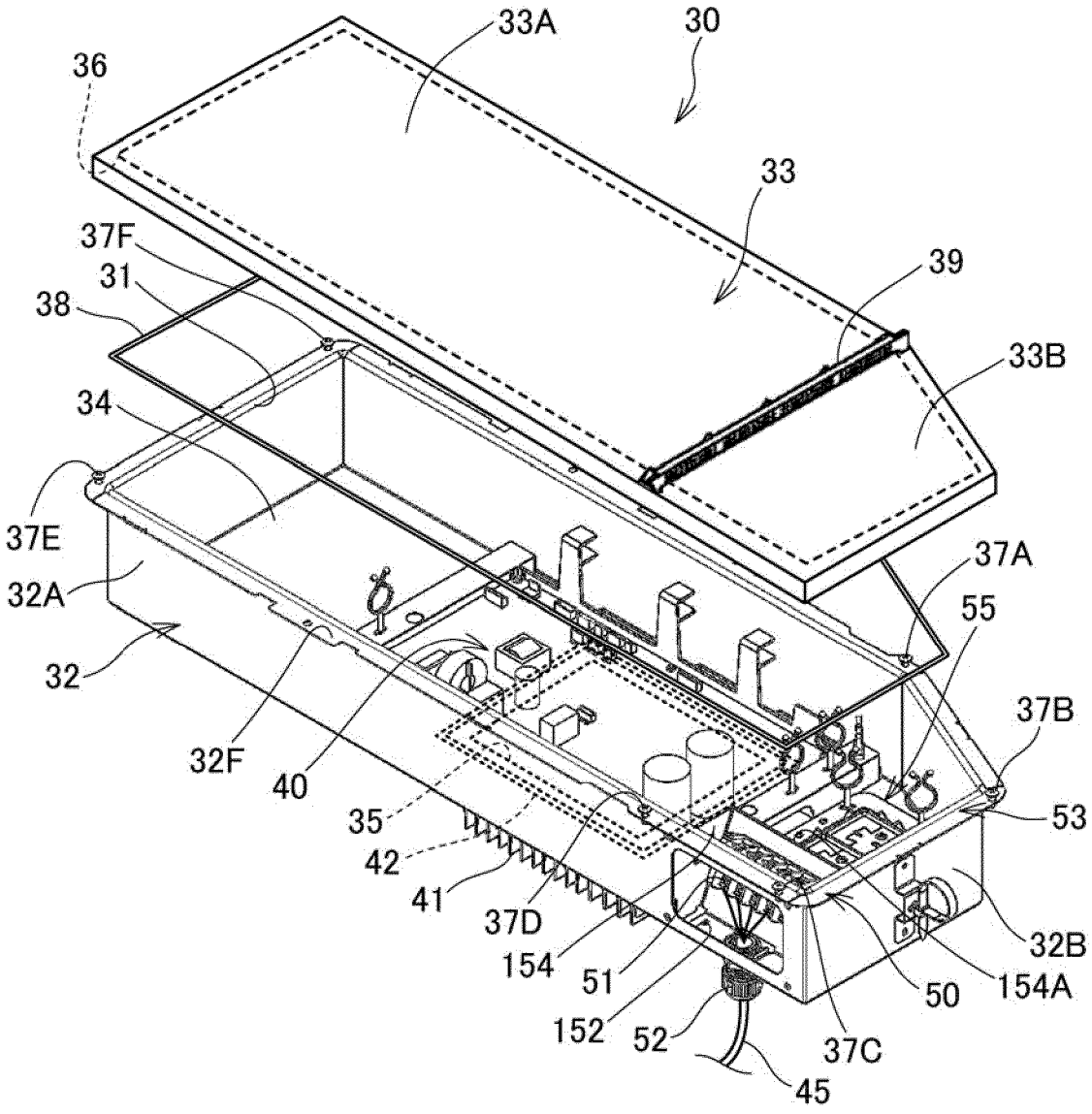


FIG.5


33A
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37F
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33B
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37D
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154
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154A
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152
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37C
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FIG.6

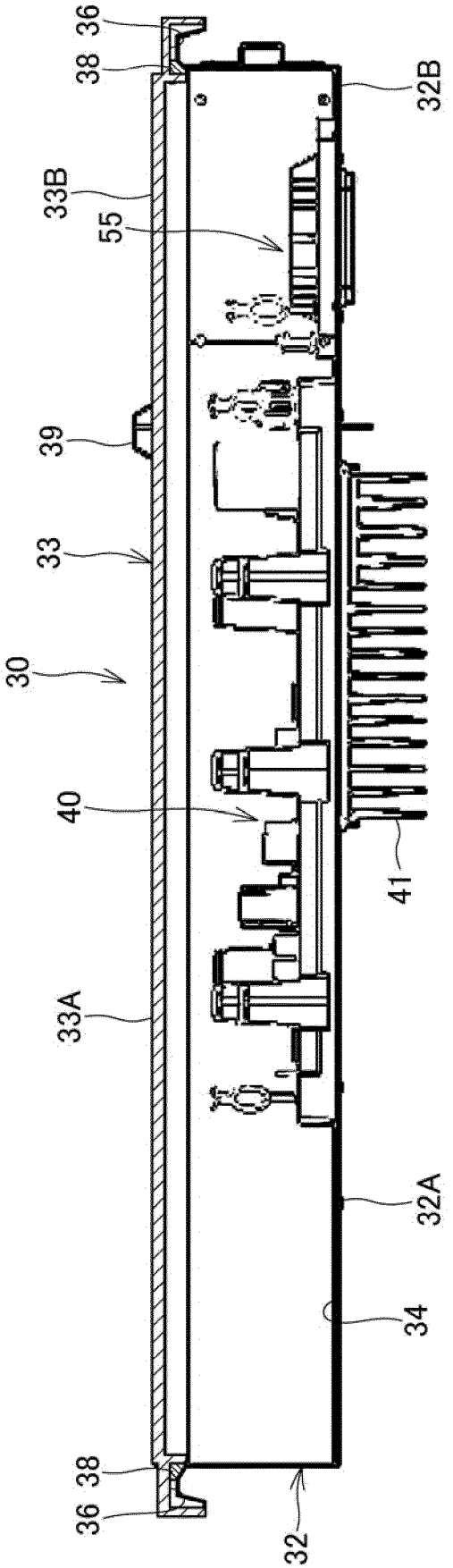


FIG.7

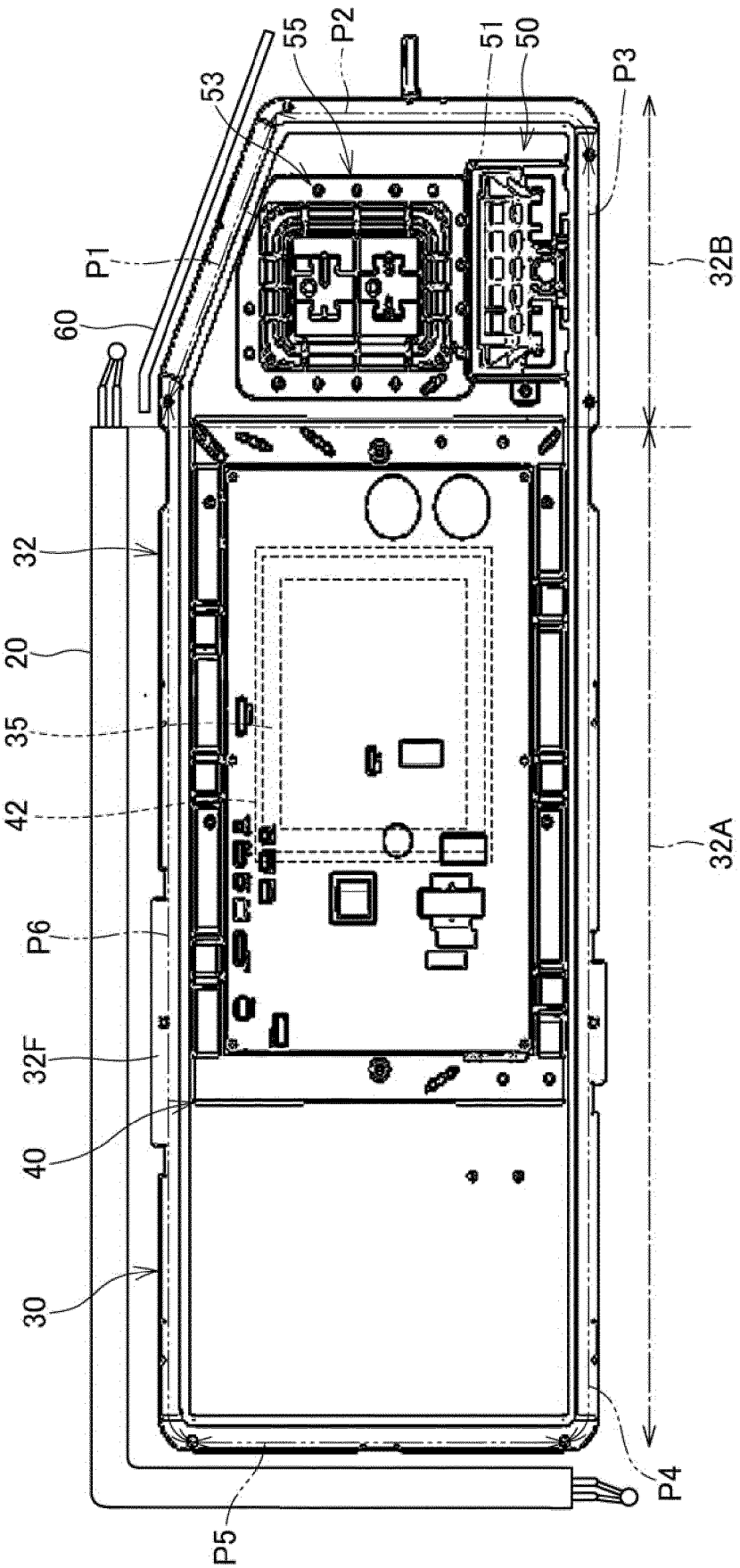
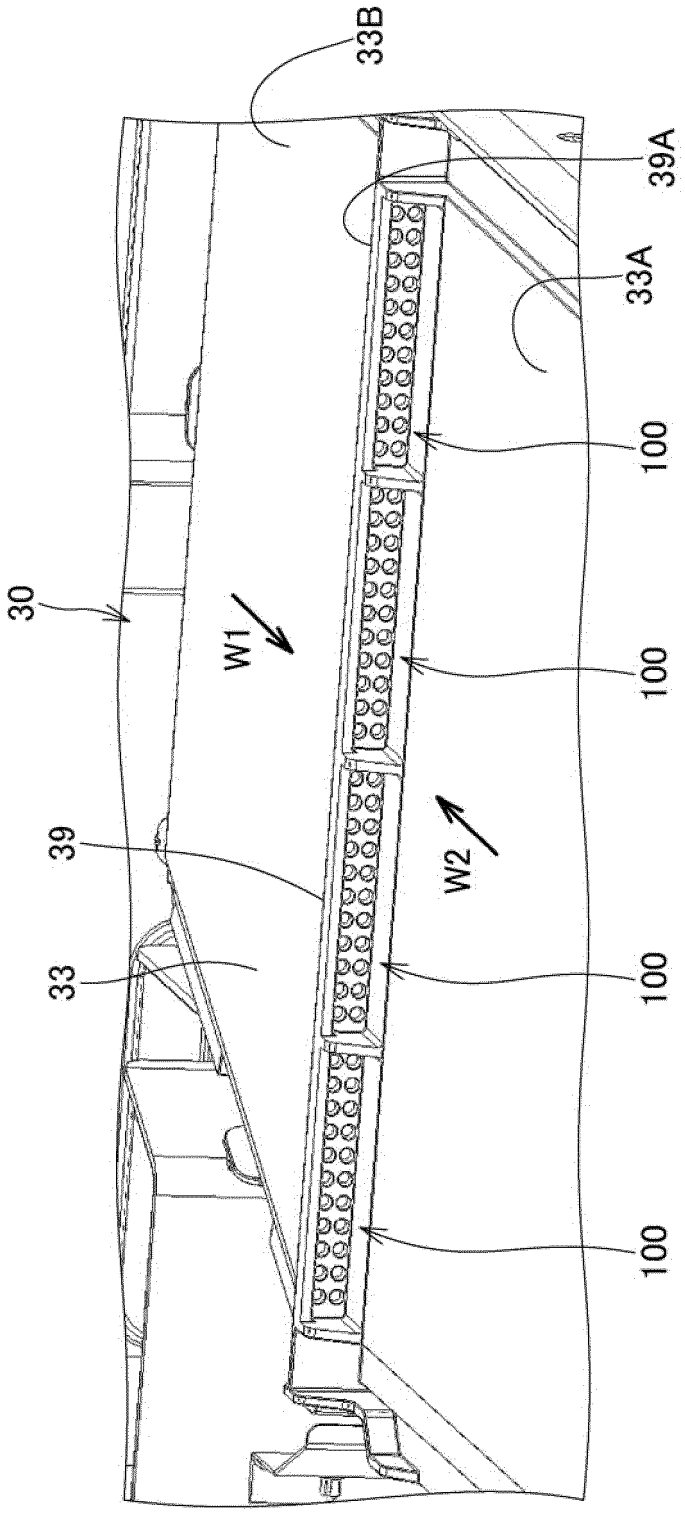


FIG.8



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Place of search	Date of completion of the search	Examiner
Munich	6 February 2024	Valenza, Davide

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