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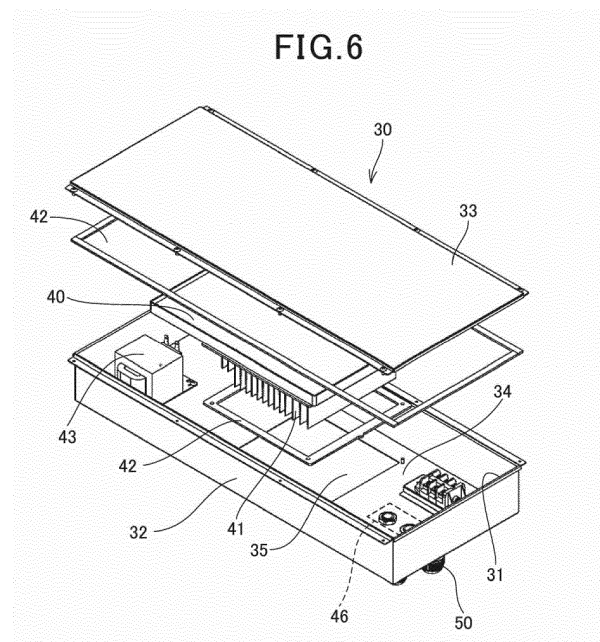
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(54) **HEAT PUMP CYCLE DEVICE**

(57) The present disclosure provides a heat pump cycle device using a flammable refrigerant, which can achieve both the airtightness of an electrical equipment box and heat radiation of electrical equipment, and improve safety and reliability. The heat pump cycle device includes: a compressor 22, a use side heat exchanger 23, expansion means 24, and a heat source side heat exchanger 20 stored inside a housing 10; a refrigerant circuit connecting these members annularly and using a flammable refrigerant; a blower device 21 for circulating air through the heat source side heat exchanger 20; and an electrical equipment box 30, wherein the electrical equipment box 30 is configured to be airtight, and a fan 44 for circulating air is installed inside the electrical equipment box 30.



Description**BACKGROUND OF THE INVENTION****Field of the Invention**

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

Description of the Related Art

[0002] Japanese Patent Laid-Open No. 2008-101862 discloses a configuration of an electrical equipment box that can mitigate an increase in temperature inside a casing (electrical equipment box), which has a sealed structure and stores electrical equipment, by thermally coupling, through a cooling jacket, the casing and refrigerant piping through which a flammable refrigerant flows.

[0003] This disclosure includes: the refrigerant piping through which the flammable refrigerant flows; the casing which has a sealed structure, is made of an electrically conductive material, and stores electrical equipment; and the cooling jacket which is made of an electrically conductive material, partly covers the refrigerant piping, and is thermally coupled to the refrigerant piping. The casing is thermally coupled to the refrigerant piping through the cooling jacket. Moreover, the cooling jacket is electrically connected to the refrigerant piping, and the casing is electrically connected through the cooling jacket to the refrigerant piping.

[0004] Further, Japanese Patent Laid-Open No. H11-094291 discloses a configuration in which an unsealed electrical equipment box is mounted in an air conditioner body.

[0005] This disclosure includes an air circulation path that, even if a leaked flammable refrigerant enters the electrical equipment box, discharges the refrigerant in the electrical equipment box to the outside of the box by circulating air in and out of the electrical equipment box.

SUMMARY OF THE INVENTION

[0006] The present disclosure provides a heat pump cycle device using a flammable refrigerant, which can achieve both the airtightness of an electrical equipment box and heat radiation of electrical equipment, and improve safety and reliability.

[0007] A heat pump cycle device according to the present disclosure includes: a compressor, a use side heat exchanger, expansion means, and a heat source side heat exchanger stored inside a housing; a refrigerant circuit connecting these members annularly and using a flammable refrigerant; a blower device for circulating air through the heat source side heat exchanger; and an electrical equipment box, wherein the electrical equipment box is configured to be airtight, and a circulation device for circulating air is installed inside the electrical equipment box.

[0008] The heat pump cycle device according to the present disclosure can mitigate an increase in temperature of electronic components disposed in the electrical equipment box, and prevent malfunctions and shortening of the service life of a product. Moreover, entry of leaked refrigerant into the electrical equipment box is prevented, and it is possible to take anti-explosion measures, and improve safety.

BRIEF DESCRIPTION OF THE DRAWINGS**[0009]**

Figure 1 is a perspective view showing a heat pump cycle device of Embodiment 1;

Figure 2 is an exploded perspective view showing the heat pump cycle device of Embodiment 1;

Figure 3 is a front view showing a state in which a front panel of the heat pump cycle device of Embodiment 1 is removed;

Figure 4 is a front view showing a schematic structure of the heat pump cycle device according to Embodiment 1;

Figure 5 is a circuit diagram showing a refrigerant circuit according to Embodiment 1;

Figure 6 is an exploded perspective view showing an electrical equipment box of Embodiment 1;

Figure 7 is a plan view showing a state of the electrical equipment box of Embodiment 1 in which a lid member is removed; and

Figure 8 is a longitudinal sectional view showing the electrical equipment box of Embodiment 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Findings that Formed the Basis of the Present Disclosure)

[0010] When the inventors came up with the present disclosure, there were technologies for a heat pump cycle device such as a water heater using a flammable refrigerant, in which, as measures to prevent ignition and explosion from electric components when the flammable refrigerant leaks, an electrical equipment box is configured to have a sealed structure to prevent a flammable gas from entering into the electrical equipment box, or the electrical equipment box is provided with air permeability to dilute the entered flammable gas to be below an ignition concentration.

[0011] However, if the electrical equipment box has a sealed structure, an increase in the temperature of the electrical equipment box becomes larger, which may lead to deterioration of the electrical components and a lowering of the reliability. Moreover, if the electrical equipment box is provided with air permeability, the dilution of the flammable refrigerant may be insufficient due to factors such as clogging with debris. In other words, in such

conventional configurations, it may be difficult to reliably separate the flammable refrigerant and an ignition source, and therefore the present inventors have configured a subject matter of the present disclosure that more sufficiently ensures safety measures against ignition due to spark, and a leakage of the refrigerant into a living space.

[0012] Hence, the present disclosure provides a heat pump cycle device using a flammable refrigerant, which can achieve both the airtightness of an electrical equipment box and heat radiation of electrical equipment, and improve safety and reliability.

[0013] Hereinafter, embodiments will be described in detail with reference to the drawings. However, unnecessarily detailed description 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 unnecessarily redundant, and to facilitate understanding of those skilled in the art.

[0014] Note that the accompanying drawings and the following description are provided to allow those skilled in the art to fully understand the present disclosure, and are not intended to limit the subject matter recited in the claims.

(Embodiment 1)

[0015] Hereinafter, Embodiment 1 will be described using the drawings.

[1-1. Configuration]

[1-1-1. Configuration of Heat Pump Cycle Device]

[0016] Figure 1 is a perspective view of a heat pump cycle device according to Embodiment 1. Figure 2 is an exploded perspective view of the heat pump cycle device according to Embodiment 1. Figure 3 is a front view showing a state in which a front panel and a right-side front panel of the heat pump cycle device according to Embodiment 1 are removed. Figure 4 is a front view showing a schematic structure of the heat pump cycle device according to Embodiment 1.

[0017] As shown in Figure 1 to Figure 4, a heat pump cycle device 1 has a box-shaped housing 10. In the present embodiment, each part of the housing 10 is made of a steel plate.

[0018] A partition plate 11 extending in the up-down direction is installed inside the housing 10. The inside space of the housing 10 is partitioned into a blower chamber 12 and a mechanical chamber 13 by the partition plate 11 (see Figure 4).

[0019] The housing 10 has a bottom plate 14 forming a bottom surface of the housing 10, a right-side front panel 15a and a right-side rear panel 15b covering the mechanical chamber 13 of the housing 10 from the front and rear thereof, a front panel 16 covering a front side of the

blower chamber 12, and a top plate 17 covering a top side of the housing 10.

[0020] The front panel 16 is provided with a ventilation part 18 formed in a mesh shape to allow passage of air.

[0021] A heat source side heat exchanger 20 and a blower device 21 are installed in the blower chamber 12.

[0022] The heat source side heat exchanger 20 of the present embodiment extends along a height direction of the housing 10, and is formed in a substantially L shape in a plan view of the housing 10 so as to face a side surface and a back surface of the housing 10.

[0023] For the heat source side heat exchanger 20, for example, a fin-tube heat exchanger is used.

[0024] For the blower device 21, for example, an axial fan with a propeller-shaped impeller is used. The blower device 21 is disposed such that an axial flow direction is directed to the ventilation part 18.

[0025] Stored in the mechanical chamber 13 are various pieces of equipment, such as a compressor 22, a use side heat exchanger 23 and expansion means 24 (see Figure 5), forming a refrigerant circuit, and refrigerant piping 25 connecting these pieces of equipment to each other.

[0026] For the use side heat exchanger 23, for example, a plate heat exchanger is used.

[0027] An upper portion of the partition plate 11 is cut out to enable installation of an electrical equipment box 30. The electrical equipment box 30 is installed in the cut-out part of the upper portion of the partition plate 11.

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

[0028] Figure 5 is a circuit diagram showing a refrigerant circuit according to Embodiment 1.

[0029] As shown in Figure 5, the compressor 22, a four-way valve 27, the use side heat exchanger 23, the expansion means 24, and the heat source side heat exchanger 20 are annularly connected through the predetermined refrigerant piping 25 so as to form the refrigerant circuit.

[0030] Predetermined water supply piping 28 is connected to the use side heat exchanger 23, and, in the use side heat exchanger 23, heat exchange is performed with a refrigerant circulating in the refrigerant circuit.

[0031] The refrigerant compressed to high temperature and high pressure by the compressor 22 flows as shown by the solid-line arrows in Figure 5, and is sent to the use side heat exchanger 23 in which the refrigerant is heat-exchanged with water flowing through the water supply piping 28, and is cooled. The water that becomes hot water by receiving the heat of the refrigerant is supplied to a predetermined location.

[0032] The refrigerant discharged from the use side heat exchanger 23 is decompressed by the expansion means 24 and heat-exchanged by the heat source side heat exchanger 20 to be a gas refrigerant, and is returned again to the compressor 22.

[0033] Further, by switching the four-way valve 27, the

refrigerant flows as shown by the broken-line arrows in Figure 5, is heat-exchanged with outside air by the heat source side heat exchanger 20, is decompressed by the expansion means 24, and then sent to the use side heat exchanger 23 so as to enable cooling of the water flowing through the water supply piping 28.

[0034] Here, in the present embodiment, a flammable refrigerant is used as the 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.

[0035] Note that an inflammable refrigerant may be used as the refrigerant, instead of the flammable refrigerant.

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

[0036] Figure 6 is an exploded perspective view showing the electrical equipment box of Embodiment 1. Figure 7 is a plan view showing the electrical equipment box of Embodiment 1 in a state in which the lid member is removed. Figure 8 is a longitudinal sectional view showing the electrical equipment box of Embodiment 1.

[0037] As shown in Figure 2, the electrical equipment box 30 is disposed in the cut-out part of the upper portion of the partition plate 11. The electrical equipment box 30 is disposed across the mechanical chamber 13 and the blower chamber 12.

[0038] As shown in Figure 6 to Figure 8, the electrical equipment box 30 includes an open-top box-shaped electrical equipment box body 32 with an opening 31, and a lid member 33 for closing the opening 31.

[0039] A substantially rectangular bottom surface opening 35 is formed on a bottom surface 34 of the electrical equipment box body 32.

[0040] The electrical equipment box body 32 is made of a material with high thermal conductivity, for example, a metal material.

[0041] Note that, in the present embodiment, although the entire electrical equipment box body 32 is made of a metal material, only a portion located in the blower chamber 12 may be made of a metal material.

[0042] The lid member 33 is formed in a substantially rectangular flat plate shape. The lid member 33 is preferably made of a metal material with high thermal conductivity like the electrical equipment box body 32.

[0043] A control board 40 made of a printed wiring board, and various electronic components are stored inside the electrical equipment box 30.

[0044] Although not shown in the drawings, on the control board 40, for example, electronic components such as a semiconductor chip like a CPU, a transistor, a capacitor, and a resistor are mounted to form an electrical circuit.

[0045] A radiator plate 41 with a plurality of fins is installed on a lower surface of the control board 40 so as to project downward from the bottom surface opening 35.

[0046] The control board 40 is installed such that the

radiator plate 41 projects downward from the bottom surface opening 35. A seal material 42 is disposed on a peripheral edge of the bottom surface opening 35, and secured to the control board 40 so as to close the bottom surface opening 35.

[0047] Other electronic components which are connected to the control board 40 are installed on both sides of the control board 40 on the bottom surface 34 of the electrical equipment box body 32.

[0048] A fan 44 in the electrical equipment box 30 is installed as a circulation device in the vicinity of a reactor 43 which generates a large amount of heat among the electronic components.

[0049] The fan 44 in the electrical equipment box 30 is installed so as to direct an air blowing direction to the reactor 43.

[0050] The lid member 33 is secured through the seal material 42 to the upper portion of the electrical box main body 32 with screws or the like. Consequently, the inside of the electrical box main body 32 is sealed.

[0051] Furthermore, a ventilable space is formed between the lower surface of the top plate 17 of the housing 10 and the upper surface of the lid member 33 of the electrical equipment box 30.

[0052] An outlet 46 for a cable connected to the control board 40 is provided on the bottom surface 34 of the electrical equipment box body 32, at a point located in the mechanical chamber 13.

[0053] In the present embodiment, a cable gland 50 is attached to the outlet 46. A cable 45 is taken out of the electrical equipment box 30 through the cable gland 50, and connected to predetermined equipment such as the compressor 22.

[1-2. Operation]

[0054] Next, an operation of the heat pump cycle device 1 configured as described above will be described.

[0055] When the heat pump cycle device 1 is driven, the compressor 22 and the blower device 21 are operated, and the fan 44 in the electrical equipment box 30 is also started to operate.

[0056] Consequently, in a case in which hot water is used, the refrigerant compressed to high temperature and high pressure by the compressor 22 flows as shown by the solid-line arrows in Figure 5, is sent to the use side heat exchanger 23, and cooled by heat exchange with the water flowing through the water supply piping 28, and the water becomes hot water by receiving the heat of the refrigerant, and is supplied to a predetermined location.

[0057] The refrigerant discharged from the use side heat exchanger 23 is decompressed by the expansion means 24 and heat-exchanged by the heat source side heat exchanger 20 to be a gas refrigerant, and is returned again to the compressor 22.

[0058] Moreover, in a case in which cold water is used, by switching the four-way valve 27, the refrigerant flows as shown by the broken-line arrows in Figure 5, is heat-

exchanged with outside air by the heat source side heat exchanger 20, is decompressed by the expansion means 24, is then sent to the use side heat exchanger 23 to cool the water flowing through the water supply piping 28, and is then returned again to the compressor 22.

[0059] During these operations, when the blower device 21 is operated, air flows to the electrical equipment box 30 located in the blower chamber 12.

[0060] With this operation of the blower device 21, the air hits the radiator plate 41. Consequently, it is possible to cool the radiator plate 41, and it is possible to cool the control board 40 through the radiator plate 41.

[0061] Further, since the ventilable space is formed between the lower surface of the top plate 17 of the housing 10 and the upper surface of the lid member 33 of the electrical equipment box 30, the air also flows on the upper surface of the lid member 33 of the electrical equipment box 30.

[0062] With these air flows, it is possible to cool the entire surface of the electrical equipment box 30 in the blower chamber 12.

[0063] Furthermore, in the present embodiment, the fan 44 is installed inside the electrical equipment box 30, and the air inside the electrical equipment box 30 can be circulated by driving the fan 44 in the electrical equipment box 30.

[0064] Consequently, it is possible to prevent heat from staying in a portion of the inside of the electrical equipment box 30, and it is possible to average the temperature distribution. Therefore, when the air is sent to the outside of the electrical equipment box 30 by the operation of the blower device 21, the heat radiation effect can be improved.

[0065] Additionally, in the present embodiment, since the fan 44 in the electrical equipment box 30 is disposed so as to be directed to the reactor 43 that generates a large amount of heat, it is possible to efficiently cool the reactor 43 that tends to get hot, and it is possible to prevent heat from staying inside the electrical equipment box 30.

[0066] Moreover, even if the airtightness of the electrical equipment box 30 is decreased due to driving the fan 44 in the electrical equipment box 30, and the flammable refrigerant enters, it is possible to prevent the flammable refrigerant from staying inside the electrical equipment box 30, and to keep the concentration at or below a non-flammable range.

[1-3. Effects]

[0067] As described above, in the present embodiment, the heat pump cycle device 1 includes: the compressor 22, the use side heat exchanger 23, the expansion means 24, and the heat source side heat exchanger 20 stored inside the housing 10; the refrigerant circuit connecting these members annularly and using the flammable refrigerant; the blower device 21 for circulating air through the heat source side heat exchanger 20; and the

electrical equipment box 30, wherein the electrical equipment box 30 is configured to be airtight, and the fan 44 (circulating device) for circulating air is installed inside the electrical equipment box 30.

[0068] By driving the fan 44 in the electrical equipment box 30, it is possible to circulate the air inside the electrical equipment box 30, and prevent heat from staying at a particular location. Consequently, in comparison with a case in which the fan 44 is not present in the electrical equipment box 30, an increase in temperature of the electronic components such as the reactor 43 disposed in the electrical equipment box 30 can be mitigated, and the temperature distribution inside the electrical equipment box 30 can be more averaged. Hence, it is possible to mitigate malfunctions and shortening of the service-life of a product. Moreover, since the electrical equipment box 30 is configured to be airtight, entry of leaked refrigerant into the electrical equipment box 30 is prevented, and it is possible to take anti-explosion measures, and improve safety.

[0069] Further, in the present embodiment, the compressor 22, the use side heat exchanger 23, and the expansion means 24 are disposed in the mechanical chamber 13 located on one side of the housing 10, the heat source side heat exchanger 20 and the blower device 21 are disposed in the blower chamber 12 located on another side of the housing 10, and the electrical equipment box 30 is disposed across the mechanical chamber 13 and the blower chamber 12.

[0070] Consequently, since at least a portion of the electrical equipment box 30 is disposed in the blower chamber 12, it is possible to facilitate heat radiation of the electrical equipment box 30 and perform cooling by sending air from the blower device 21 to the portion of the electrical equipment box 30, which is located on the blower chamber 12 side.

[0071] Furthermore, in the present embodiment, at least the portion of the electrical equipment box 30, which is located in the blower chamber 12, is made of a metal material, the control board 40 stored in the electrical equipment box 30 is provided with the radiator plate 41, and the radiator plate 41 is disposed in the blower chamber 12.

[0072] Consequently, since the electric equipment box 30 is made of the metal material, it is possible to increase the heat transmission efficiency, and improve the cooling efficiency of the electrical equipment box 30. Moreover, the control board 40 can be cooled through the radiator plate 41 by the air sent from the blower device 21.

[0073] Further, in the present embodiment, the ventilable space is formed between the top plate 17 of the housing 10 and the electrical equipment box 30.

[0074] Consequently, since the air also flows on the upper surface of the electrical equipment box 30, the entire surface of the electrical equipment box 30 can be cooled by the air, and an increase in temperature of the reactor 43 stored inside the electrical equipment box 30 can be mitigated.

[0075] Furthermore, in the present embodiment, 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.

[0076] In the present embodiment, the electrical equipment box 30 has a sealed structure, and is isolated from the flammable refrigerant. Consequently, even if the flammable refrigerant leaks, it is possible to prevent accidents such as ignition due to spark.

[Other Embodiment]

[0077] As described above, Embodiment 1 is described as an example of technology disclosed in the present application. However, the technology in the present disclosure is not limited to this, and can also be applied to embodiments in which modifications, replacements, additions, omissions, etc. are made.

[Configurations Supported by the Embodiments]

[0078] The above-described embodiments support the following configurations.

(Configuration 1)

[0079] A heat pump cycle device including: a compressor, a use side heat exchanger, expansion means, and a heat source side heat exchanger stored inside a housing; a refrigerant circuit connecting these members annularly and using a flammable refrigerant; a blower device for circulating air through the heat source side heat exchanger; and an electrical equipment box, wherein the electrical equipment box is configured to be airtight, and a circulation device for circulating air is installed inside the electrical equipment box.

[0080] According to this configuration, the temperature distribution inside the electrical equipment box can be more averaged by the circulation device in the electrical equipment box, the temperature of electronic components such as a reactor disposed in the electrical equipment box can be averaged, and malfunctions and shortening of the service life of a product can be mitigated. Moreover, since the electrical equipment box is configured to be airtight, entry of leaked refrigerant into the electrical equipment box is prevented, and it is possible to take anti-explosion measures, and improve safety.

(Configuration 2)

[0081] The heat pump cycle device according to configuration 1, wherein the compressor, the use side heat exchanger, and the expansion means are disposed in a mechanical chamber located on one side of the housing, the heat source side heat exchanger and the blower device are disposed in a blower chamber located on another side of the housing, and the electrical equipment box is disposed across the mechanical chamber and the blower

chamber.

[0082] According to this configuration, since at least a portion of the electrical equipment box is disposed in the blower chamber, it is possible to facilitate heat radiation of the electrical equipment box 30 and perform cooling by sending air from the blower device 21 to the portion of the electrical equipment box 30, which is located on the blower chamber 12 side.

10 (Configuration 3)

[0083] The heat pump cycle device according to configuration 1 or configuration 2, wherein at least the portion of the electrical equipment box, which is located in the blower chamber, is made of a metal material, a control board stored in the electrical equipment box is provided with a radiator plate, and the radiator plate is disposed in the blower chamber.

[0084] According to this configuration, since the electrical equipment box is made of the metal material, it is possible to increase the heat transmission efficiency, and improve the cooling efficiency of the electrical equipment box. Moreover, it is possible to cool the control board through the radiator plate by the air sent from the blower device.

(Configuration 4)

[0085] The heat pump cycle device according to any one of configuration 1 to configuration 3, wherein a ventilable space is formed between a top plate of the housing and the electrical equipment box.

[0086] According to this configuration, since the air also flows on the top surface of the electrical equipment box in the blower chamber, the entire surface of the electrical equipment box in the blower chamber can be cooled by the air, and an increase in temperature of the reactor stored inside the electrical equipment box can be mitigated.

(Configuration 5)

[0087] The heat pump cycle device according to any one of configuration 1 to configuration 4, wherein 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.

[0088] In the present embodiment, the electrical equipment box 30 has a sealed structure, and is isolated from the flammable refrigerant described above. Consequently, even if the flammable refrigerant leaks, it is possible to prevent accidents such as ignition due to spark.

[0089] The present disclosure can be suitably applied to a heat pump cycle device that can mitigate malfunctions and shortening of the service life of a product, prevent entry of leaked refrigerant into the electrical equipment box, take anti-explosion measures, and improve safety by averaging the temperature inside the electrical

equipment box and facilitating heat radiation.

Reference Signs List

[0090]

1	heat pump cycle device
10	housing
11	partition plate
12	blower chamber
13	mechanical chamber
14	bottom plate
15a	right-side front panel
15b	right-side rear panel
16	front panel
17	top plate
18	ventilation part
20	heat source side heat exchanger
21	blower device
22	compressor
23	use side heat exchanger
24	expansion means
25	refrigerant piping
27	four-way valve
28	water supply piping
30	electrical equipment box
31	opening
32	electrical equipment box body
33	lid member
34	electrical equipment box bottom surface
35	bottom surface opening
40	control board
41	radiator plate
42	seal material
43	reactor
44	fan
45	cable
46	outlet
50	cable gland

5 the compressor, the use side heat exchanger, and the expansion means are disposed in a mechanical chamber located on one side of the housing,
the heat source side heat exchanger and the blower device are disposed in a blower chamber (12) located on another side of the housing, and the electrical equipment box is disposed across the mechanical chamber and the blower chamber.

15 3. The heat pump cycle device according to claim 2, wherein

20 at least a portion of the electrical equipment box, which is located in the blower chamber, is made of a metal material,
a control board (40) stored in the electrical equipment box is provided with a radiator plate (41), and
25 the radiator plate is disposed in the blower chamber.

30 4. The heat pump cycle device according to claim 2, wherein a ventilable space is formed between a top plate (17) of the housing and the electrical equipment box.

35 5. The heat pump cycle device according to any one of claim 1 to claim 4, wherein the flammable refrigerant is R32 or a refrigerant containing 70 weight percent or more of R32, or propane or a mixed refrigerant containing propane.

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Claims

1. A heat pump cycle device (1) **characterized by** comprising: a compressor (22), a use side heat exchanger (23), expansion means (24), and a heat source side heat exchanger (20) stored inside a housing (10); a refrigerant circuit connecting these members annularly and using a flammable refrigerant; a blower device (21) for circulating air through the heat source side heat exchanger; and an electrical equipment box (30), wherein

45 the electrical equipment box is configured to be airtight, and
50 a circulation device for circulating air is installed inside the electrical equipment box.

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FIG. 1

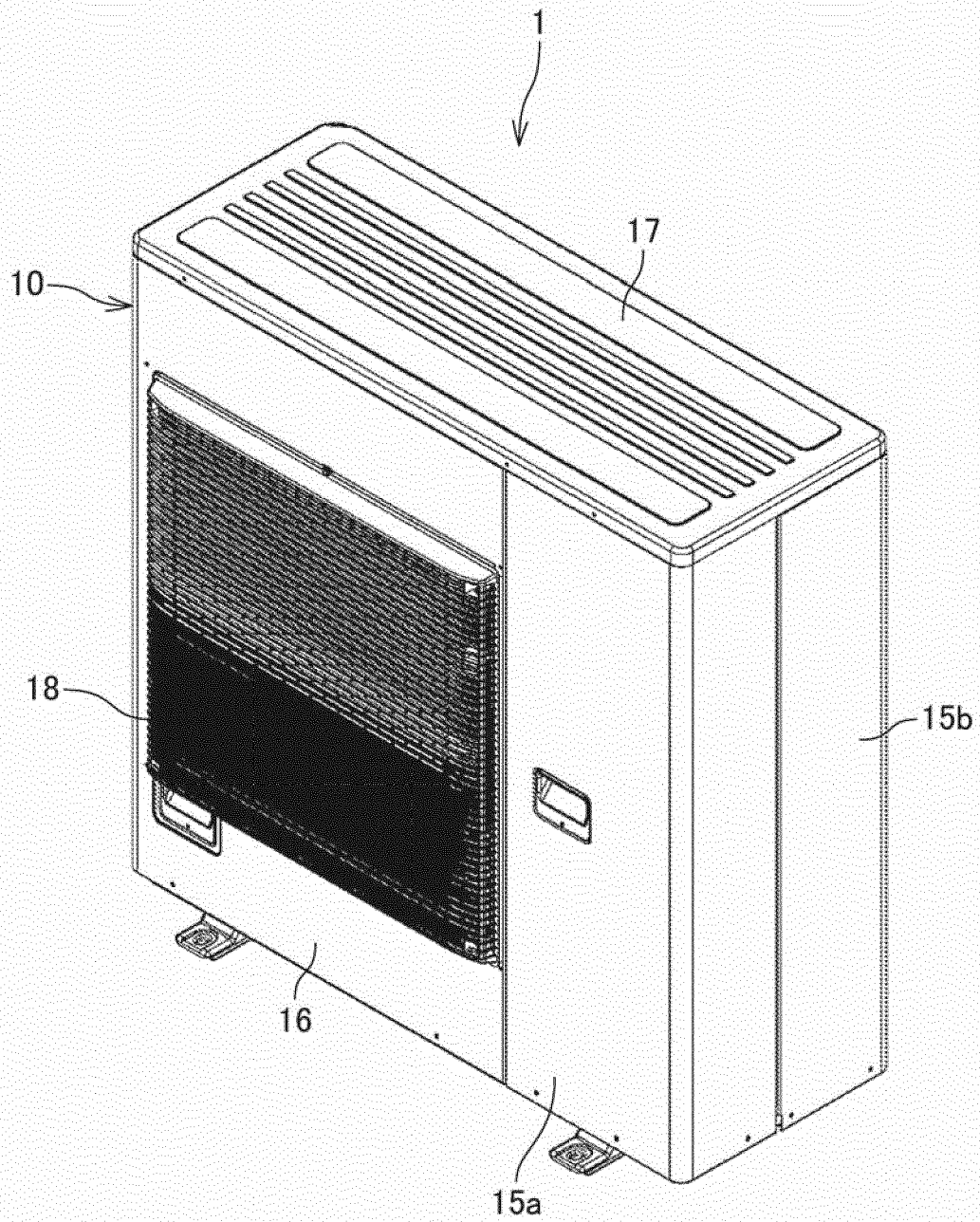


FIG.2

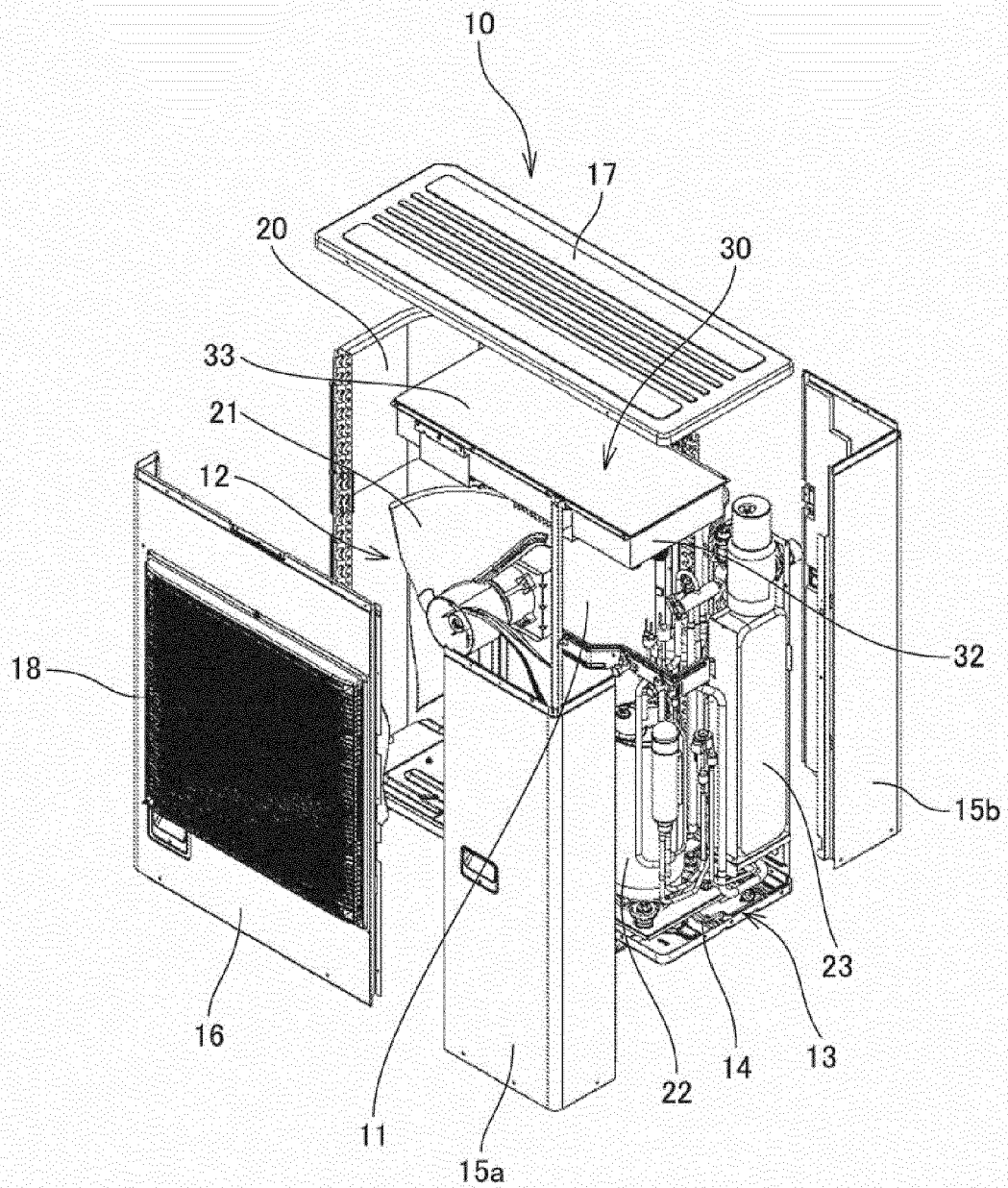


FIG.3

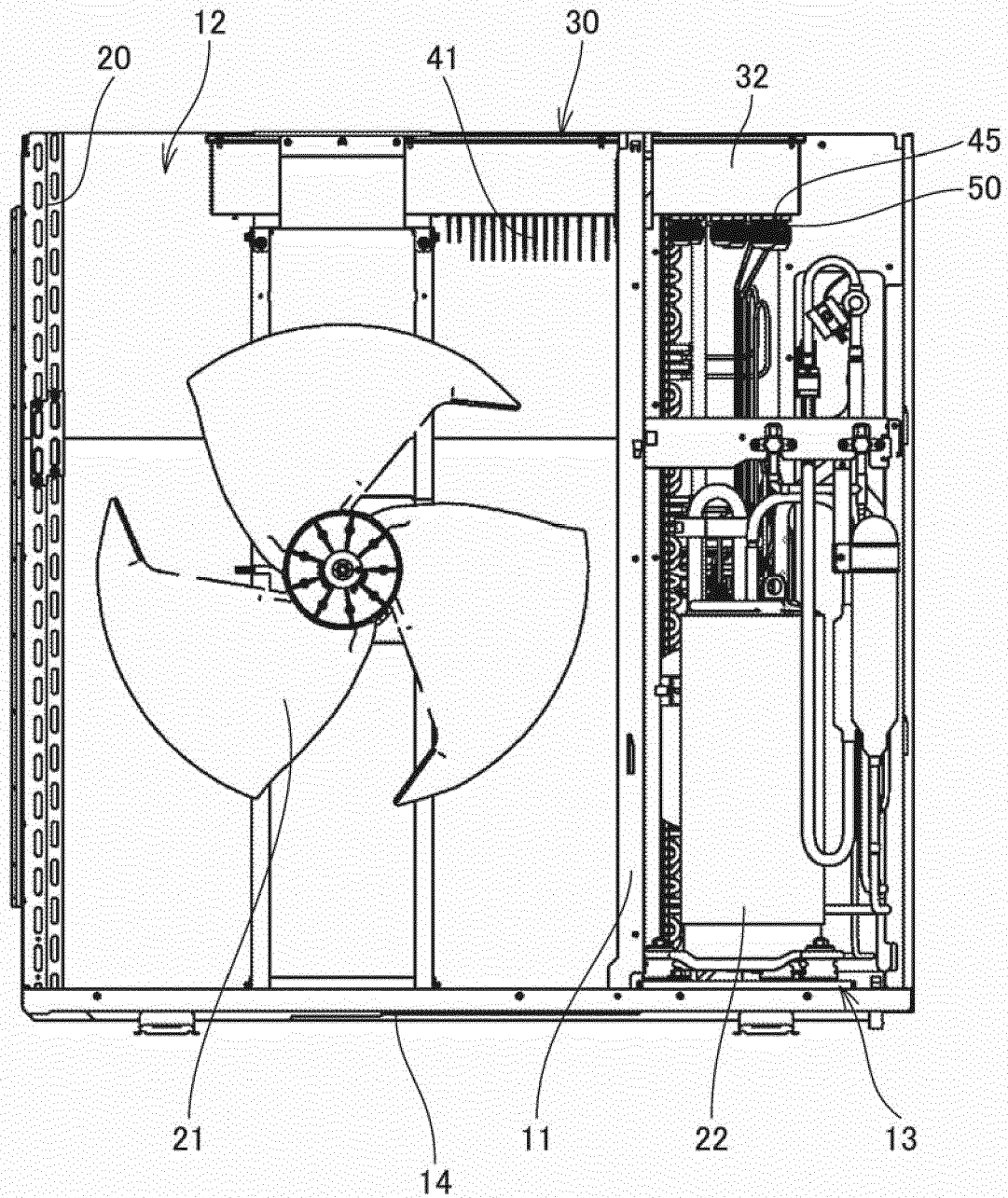


FIG. 4

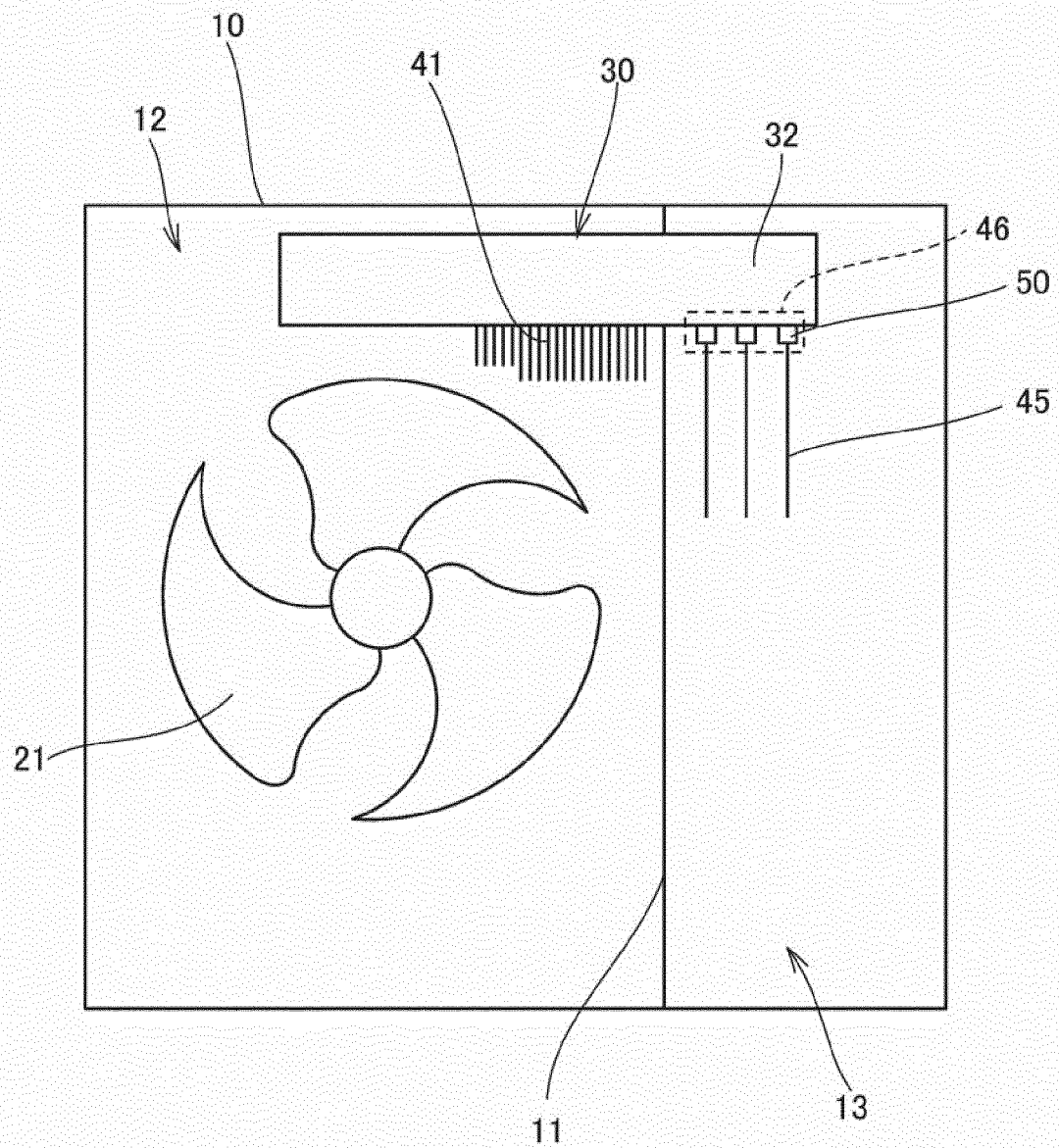


FIG.5

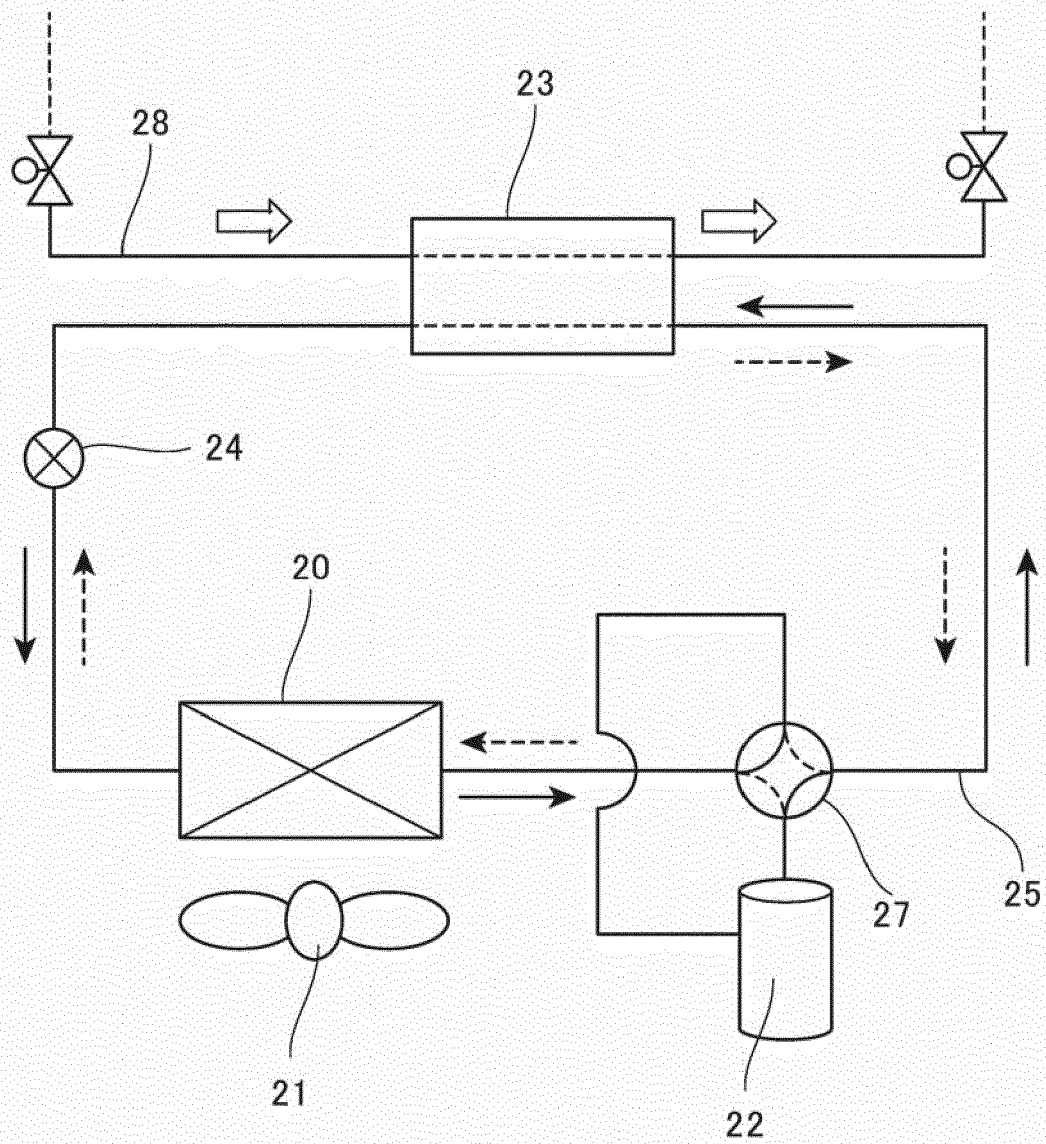


FIG.6

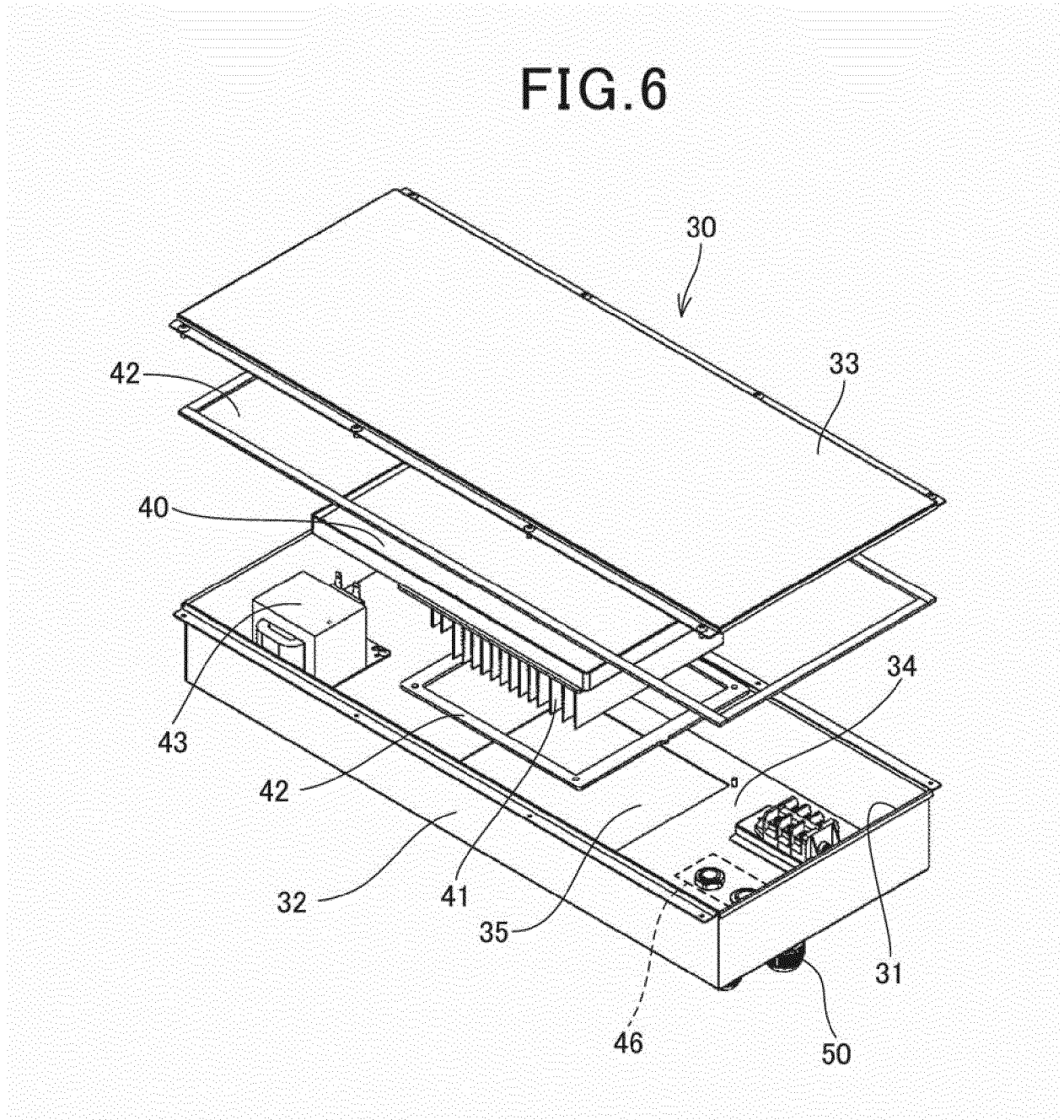


FIG. 7

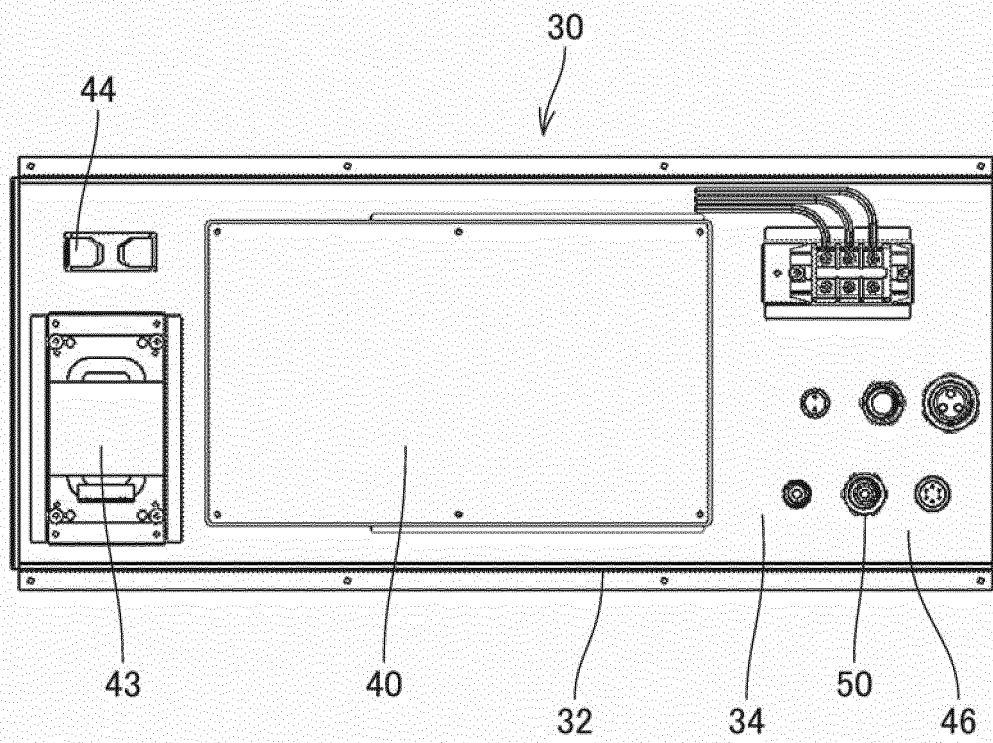
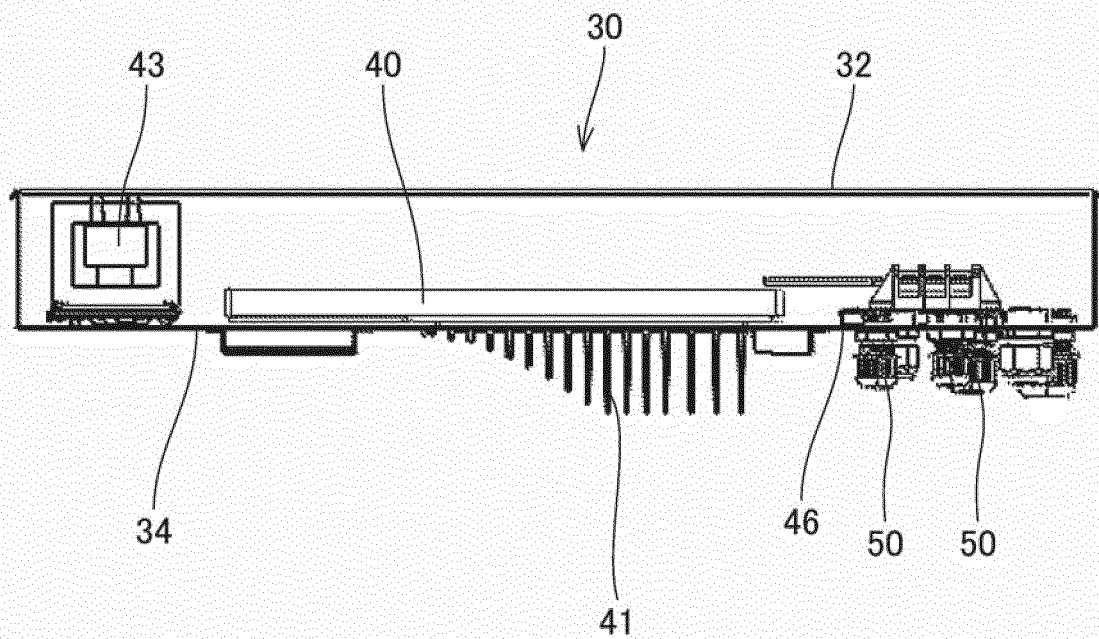


FIG.8





EUROPEAN SEARCH REPORT

Application Number

EP 23 17 5404

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 202 835 659 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO LTD) 27 March 2013 (2013-03-27) * claim 1; figures 1-4 *	1-5	INV. F24F1/22 F24F1/24
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