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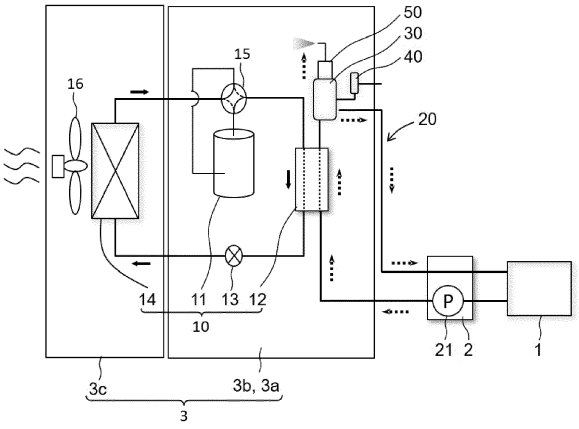
(54) HEAT MEDIUM CIRCULATION DEVICE

(57) [Object] It is an object of the present invention to provide a heat medium circulation device having excellent maintainability when a pressure relief valve having an operating section is placed in a limited space such as an outdoor machine.

[Solving Means] The heat medium circulation device includes an outdoor unit 3, the outdoor unit 3 is provided therein with a refrigerant circuit 10 through which refrigerant circulates, a heat medium circuit 20 which circulates heat medium through a use-side terminal 1, and a pressure relief valve 40 for releasing the heat medium circuit 20 to atmosphere when pressure in the heat medium circuit 20 becomes equal to or higher than predetermined pressure, the pressure relief valve 40 is placed in the heat medium circuit 20 located downstream of the use-side heat exchanger 12, the pressure relief valve 40 is located at a position higher than the use-side heat exchanger 12, the pressure relief valve 40 includes an operating section 41 which can manually be operated, a wall surface material 60 is placed in the outdoor unit 3 between a bottom surface material outer periphery 3d and a top surface material outer periphery 3e, and the wall surface material 60 is provided with an opening 80 at a position corresponding to the operating section 41 of the pressure relief valve 40.

[Fig. 1]



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Description

[TECHNICAL FIELD]

[0001] The present invention relates to a heat medium circulation device for circulating heat medium through a use-side terminal by a heat medium circuit having a gas-liquid separating section.

[BACKGROUND TECHNIQUE]

[0002] Patent document 1 discloses an air conditioner which has a separating section for separating refrigerant from heat medium flowing through a heat medium pipe, and which discharges the refrigerant separated by the separating section to outside of air-conditioning space.

[0003] According to the patent document 1, even if refrigerant flows into the heat medium circuit, since the refrigerant is discharged to outside of the air-conditioning space, it is possible to suppress the refrigerant from flowing into the heat medium pipe which is provided in a room.

[PRIOR ART DOCUMENT]

[PATENT DOCUMENT]

[0004] [Patent Document 1]
Japanese Translation of PCT international Application Publication No.2018/154628

[SUMMARY OF THE INVENTION]

[PROBLEM TO BE SOLVED BY THE INVENTION]

[0005] However, the patent document 1 does not assume that a pressure relief valve having an operating section is placed in a limited space such as an outdoor machine.

[0006] It is an object of the present invention to provide a heat medium circulation device having excellent maintainability when a pressure relief valve having an operating section is placed in a limited space such as an outdoor machine.

[MEANS FOR SOLVING THE PROBLEM]

[0007] A heat medium circulation device described in claim 1 of the present invention including an outdoor unit 3, in which the outdoor unit 3 is provided with: a refrigerant circuit 10 to which a compressor 11, a use-side heat exchanger 12, an expansion device 13 and a heat source-side heat exchanger 14 are connected, and through which refrigerant circulates; a heat medium circuit 20 which circulates heat medium cooled or heated by the refrigerant which is discharged out from the compressor 11 in the use-side heat exchanger 12 through a use-side terminal 1; and a pressure relief valve 40 for releasing the heat medium circuit 20 into atmosphere when pressure in the heat medium circuit 20 becomes equal to or higher than predetermined pressure; wherein the pressure relief valve 40 is placed in the heat medium circuit 20 located downstream of the use-side heat exchanger 12, the pressure relief valve 40 is located at a position higher than the use-side heat exchanger 12, the pressure relief valve 40 includes an operating section 41 which can manually be operated, a wall surface material 60 is placed in the outdoor unit 3 between a bottom surface material outer periphery 3d and a top surface material outer periphery 3e, and the wall surface material 60 is provided with an opening 80 at a position corresponding to the operating section 41 of the pressure relief valve 40.

[0008] According to claim 2 of the invention, in the heat medium circulation device described in claim 1, the outdoor unit 3 includes a first partition plate 71 which prevents the heat medium leaked from the pressure relief valve 40 from scattering to the compressor 11 placed in a machine chamber 3b, and the opening 80 is provided at a position corresponding to the heat medium chamber 3a which is divided from the machine chamber 3b by the first partition plate 71.

[0009] According to claim 3 of the invention, the heat medium circulation device described in claim 1 further includes a lid for closing the opening 80.

[0010] According to claim 4 of the invention, in the heat medium circulation device described in claim 1, wherein the outdoor unit 3 includes a gas-liquid separating section 30 which separates gas in the heat medium circuit 20 from the heat medium, and the pressure relief valve 40 is connected to the gas-liquid separating section 30.

[EFFECT OF THE INVENTION]

[0011] According to the invention, the operating section of the pressure relief valve can be operated from the opening, and when heat medium is charged into the heat medium circuit or when the heat medium is discharged out from the heat medium circuit, the pressure relief valve can be utilized, and maintainability is excellent.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0012]

Fig. 1 is a diagram showing a configuration of a heat medium circulation device according to an embodiment of the present invention;
Fig. 2 is a perspective view showing essential portions of an outdoor unit of the heat medium circulation device;
Figs. 3 are side views showing essential portions of the outdoor unit;
Figs. 4 are diagrams showing a configuration of a gas-liquid separating section used in the embodiment;
Fig. 5 is a side view showing the gas-liquid separating section and a pressure relief valve used in the

embodiment; and

Fig. 6 is a perspective view showing a heat medium chamber of the outdoor unit.

[MODE FOR CARRYING OUT THE INVENTION]

[0013] In a heat medium circulation device according to a first embodiment of the present invention, a pressure relief valve includes a manually operatable operating section. In an outdoor unit, a wall surface material is placed between a bottom surface material outer periphery and a top surface material outer periphery, and the wall surface material is provided with an opening at a position corresponding to the operating section of the pressure relief valve. According to this embodiment, the operating section of the pressure relief valve can be operated from the opening, and when heat medium is charged into a heat medium chamber or when heat medium is discharged out from the heat medium chamber, the pressure relief valve can be utilized, and maintainability is excellent.

[0014] According to a second embodiment of the invention, in the heat medium circulation device of the first embodiment, the outdoor unit includes a first partition plate which prevents the heat medium leaked from the pressure relief valve from scattering to the compressor placed in a machine chamber, and the opening is provided at a position corresponding to the heat medium chamber which is divided from the machine chamber by the first partition plate. According to the second embodiment, even when heat medium leaks out, the opening can be utilized only for operating the operating section of the pressure relief valve by limiting the opening to a specific size while avoiding a case where heat medium affects the compressor by the first partition plate.

[0015] According to a third embodiment of the invention, in the heat medium circulation device of the first embodiment further includes a lid for closing the opening. According to the third embodiment, the maintenance operation can be carried out in a state where the lid is detached.

[0016] According to a fourth embodiment of the invention, in the heat medium circulation device of the first embodiment, the outdoor unit includes a gas-liquid separating section which separates gas in the heat medium circuit from the heat medium, and the pressure relief valve is connected to the gas-liquid separating section. According to the fourth embodiment, even when operation of the gas-liquid separating section has a problem, it is possible to flow out the gas by the pressure relief valve, and safety can be enhanced.

[Embodiment]

[0017] An embodiment of the present invention will be described below with reference to the drawings.

[0018] Fig. 1 is a diagram showing a configuration of a heat medium circulation device according to the embodiment.

[0019] The heat medium circulation device of the embodiment includes a refrigerant circuit 10 and a heat medium circuit 20.

[0020] The refrigerant circuit 10 is formed by connecting a compressor 11, a use-side heat exchanger 12, an expansion device 13 and a heat source-side heat exchanger 14 to one another through a refrigerant pipe, and refrigerant circulates through the refrigerant circuit 10.

[0021] The heat medium circuit 20circulates heat medium heated by the refrigerant discharged out from the compressor 11 in the use-side heat exchanger 12 through a use-side terminal 1.

[0022] The heat medium circuit 20 includes a gas-liquid separating section 30 which separates gas in the heat medium circuit 20 from heat medium, and a transfer pump 21 for circulating the heat medium.

[0023] The heat medium circuit 20 further includes a pressure relief valve 40. In this embodiment, the pressure relief valve 40 is connected to the gas-liquid separating section 30. A discharge device 50 which discharges gas separated by the gas-liquid separating section 30 is connected to the gas-liquid separating section 30.

[0024] The transfer pump 21 is placed in an indoor unit 2.

[0025] It is preferable that the refrigerant circuit 10 includes a four-way valve 15 which switches flow of refrigerant.

[0026] An air blower 16 is provided at a position opposed to the heat source-side heat exchanger 14.

[0027] Propane which is combustible refrigerant is used as refrigerant. Instead of the combustible refrigerant, it is possible to use any of R1234yf, R1234ze and R32 which are slightly flammable refrigerants.

[0028] Water or antifreeze liquid is used as the heat medium.

[0029] The gas-liquid separating section 30 and the pressure relief valve 40 are placed in the heat medium circuit 20 located downstream of the use-side heat exchanger 12.

[0030] An outdoor unit 3 is divided into a heat medium chamber 3a (see Fig. 2), a machine chamber 3b and an air blowing chamber 3c.

[0031] At least a portion of the use-side heat exchanger 12, the gas-liquid separating section 30, the pressure relief valve 40 and the discharge device 50 are placed in the heat medium chamber 3a. The compressor 11, the expansion device 13 and the four-way valve 15 are placed in the machine chamber 3b. The heat source-side heat exchanger 14 and the air blower 16 are placed in the air blowing chamber 3c.

[0032] It is possible to heat or cool the heat medium by switching the four-way valve 15.

[0033] When the heat medium is heated, refrigerant compressed by the compressor 11 flows through the use-side heat exchanger 12, the expansion device 13 and the heat source-side heat exchanger 14 in this order. The

refrigerant is decompressed by the expansion device 13, heat of the refrigerant is absorbed by the heat source-side heat exchanger 14, and the refrigerant is sucked into the compressor 11. By flowing the refrigerant compressed by the compressor 11 into the use-side heat exchanger 12 in this manner, the heat medium can be heated.

[0034] When the heat medium is cooled, refrigerant compressed by the compressor 11 flows through the heat source-side heat exchanger 14, the expansion device 13 and the use-side heat exchanger 12 in this order. The refrigerant is decompressed by the expansion device 13, heat of the refrigerant is absorbed by the use-side heat exchanger 12 and the refrigerant is sucked into the compressor 11. By flowing the refrigerant compressed by the compressor 11 into the heat source-side heat exchanger 14 in this manner, the heat medium can be cooled.

[0035] The heat medium which is cooled or heated by the use-side heat exchanger 12 is transferred to the use-side terminal 1 by the transfer pump 21, and the heat medium whose heat is absorbed or radiated by the use-side terminal 1 is returned to the use-side heat exchanger 12.

[0036] Especially when a plate-type heat exchanger is used as the use-side heat exchanger 12, there is a possibility that refrigerant which flows through the refrigerant circuit 10 is mixed into the heat medium circuit 20 by damage of the use-side heat exchanger 12.

[0037] If refrigerant which leaks into the heat medium circuit 20 is separated from liquid phase heat medium by the gas-liquid separating section 30 in this manner, the refrigerant can be discharged out from the discharge device 50.

[0038] In the outdoor unit 3, the gas-liquid separating section 30 is plated in the heat medium circuit 20 which is located downstream of the use-side heat exchanger 12. Therefore, it is possible to suppress a case where refrigerant which leaks into the heat medium circuit 20 is guided into the use-side terminal 1.

[0039] When the indoor unit 2 is located downstream of the use-side heat exchanger 12 and upstream of the use-side terminal 1, the gas-liquid separating section 30 should be placed upstream of the indoor unit 2, but it is preferable that the gas-liquid separating section 30 is placed in the outdoor unit 3 as in this embodiment.

[0040] The gas-liquid separating section 30 can separate the leaked refrigerant and in addition, the gas-liquid separating section 30 can separate air existing in the heat medium circuit 20. Especially, when heat medium is charged into the heat medium circuit 20 at the time of installation of the heat medium circulation device, the gas-liquid separating section 30 is utilized for removing air from the heat medium circuit 20.

[0041] Although the transfer pump 21 is placed in the indoor unit 2 in this embodiment, the transfer pump 21 may be placed in the outdoor unit 3. When the transfer pump 21 is placed in the outdoor unit 3, it is preferable that the transfer pump 21 is placed in the heat medium chamber 3a.

[0042] Fig. 2 is a perspective view showing essential portions of the outdoor unit of the heat medium circulation device.

[0043] In the outdoor unit 3, a wall surface material 60 is placed between a bottom surface material outer periphery 3d and a top surface material outer periphery 3e. The wall surface material 60 includes a first wall surface material 61 and a second wall surface material 62 which is adjacent to the first wall surface material 61.

[0044] The heat medium chamber 3a and the machine chamber 3b are divided by a first partition plate 71. The first partition plate 71 is provided with an opening, and the heat medium chamber 3a and the machine chamber 3b keep air permeability. The machine chamber 3b and the air blowing chamber 3c are divided by a second partition plate 72, thereby dividing the outdoor unit 3 into the heat medium chamber 3a, the machine chamber 3b and the air blowing chamber 3c. The first partition plate 71 prevents heat medium which leaks out from the pressure relief valve 40 from scattering to the compressor 11 placed in the machine chamber 3b.

[0045] One side 71x (see Figs. 3) of the first partition plate 71 abuts against the first wall surface material 61, and the other side 71y of the first partition plate 71 abuts against the second wall surface material 62.

[0046] The heat medium chamber 3a is formed by a space which is surrounded by the first partition plate 71, the first wall surface material 61 and the second wall surface material 62.

[0047] By utilizing the first wall surface material 61 and the second wall surface material 62 which are adjacent to each other, the heat medium chamber 3a is formed at a corner portion of the outdoor unit 3. According to this, even when heat medium leaks out, the heat medium chamber 3a can be formed at a position where the heat medium does not exert an influence on the compressor 11, the expansion device 13 and the heat source-side heat exchanger 14.

[0048] Therefore, since the heat medium chamber 3a where the use-side heat exchanger 12, the gas-liquid separating section 30 and the pressure relief valve 40 are placed is separated from the machine chamber 3b and the air blowing chamber 3c, even if heat medium leaks out, the heat medium does not exert an influence on the compressor 11, the expansion device 13 and the heat source-side heat exchanger 14.

[0049] An opening 80 is formed in the first wall surface material 61.

[0050] Figs. 3 are side views showing essential portions of the outdoor unit.

[0051] The first wall surface material 61 is provided with the opening 80 at a position corresponding to an operating lever 41 of the pressure relief valve 40. The opening 80 is provided at a position corresponding to the heat medium chamber 3a which is divided from the machine chamber 3b by the first partition plate 71. The opening 80 formed in the first wall surface material 61 is lo-

cated in the heat medium chamber 3a, and the opening 80 does not open from the machine chamber 3b. Since the opening 80 does not open from the machine chamber 3b, even when heat medium leaks out, it is possible to prevent the heat medium from entering into the machine chamber 3b from the heat medium chamber 3a.

[0052] The pressure relief valve 40 is placed at a position opposed to the opening 80. When pressure in the heat medium circuit 20 becomes equal to or higher than predetermined pressure, the pressure relief valve 40 releases heat medium to atmosphere so that the pressure in the heat medium circuit 20 does not become abnormal pressure which is equal to or higher than the predetermined pressure.

[0053] The pressure relief valve 40 includes the operating lever 41. By manually operating the operating lever 41, heat medium can be released to atmosphere from the heat medium circuit 20.

[0054] The operating lever 41 of the pressure relief valve 40 can be operated from the opening 80, and when heat medium is charged into the heat medium circuit 20 or when heat medium is discharged out from the heat medium circuit 20, the pressure relief valve 40 can be utilized.

[0055] Although it is not illustrated in the drawings, when it is unnecessary to operate the operating lever 41, the opening 80 is closed by a lid. Upper and lower portions of the opening 80 includes fastening holes. By mounting fastening tools 81 in the fastening holes, the lid is mounted on the first wall surface material 61.

[0056] Figs. 4 are diagrams showing a configuration of the gas-liquid separating section used in the embodiment, wherein Fig. 4(a) is a perspective view of a partially cut-away gas-liquid separating section, and Fig. 4(b) is a diagram showing a configuration of a gas-liquid separation inflow port and a gas-liquid separation outflow port of the gas-liquid separating section.

[0057] The gas-liquid separating section 30 includes the gas-liquid separation inflow port 32 through which heat medium flows into a cylindrical inner space 31, the gas-liquid separation outflow port 33 through which heat medium flows out from the cylindrical inner space 31, and a pressure relief valve connection port 34 to which the pressure relief valve 40 is connected.

[0058] The gas-liquid separation inflow port 32 is provided on a bottom surface of the gas-liquid separating section 30, and the gas-liquid separation outflow port 33 and the pressure relief valve connection port 34 are provided on a side surface of the gas-liquid separating section 30.

[0059] By flowing the heat medium from the bottom surface of the gas-liquid separating section 30 and flowing out the heat medium from the side surface of the gas-liquid separating section 30 in this manner, a high gas-liquid separation ratio can be expected.

[0060] The heat medium flows in from the gas-liquid separation inflow port 32 and flows out from the gas-liquid separation outflow port 33. The gas-liquid separation inflow port 32 is eccentric from a virtual axis 31x of the cylindrical inner space 31 at a position separated from the gas-liquid separation outflow port 33. Therefore, time during which heat medium stays in the cylindrical inner space 31 can be increased, and the high gas-liquid separation ratio can be expected.

[0061] A bottle diameter 31R of the cylindrical inner space 31 is two times or more of an entrance diameter 32R of the gas-liquid separation inflow port 32. Therefore, it is possible to reduce the flow speed of heat medium which flows in from the gas-liquid separation inflow port 32, and the high gas-liquid separation ratio can be expected.

[0062] An exit diameter 33R of the gas-liquid separation outflow port 33 is equal to or greater than the entrance diameter 32R. Therefore, the flow speed of the heat medium which flows out from the gas-liquid separation outflow port 33 can be made smaller than the flow speed of the heat medium which flows in from the gas-liquid separation inflow port 32, and the high gas-liquid separation ratio can be expected.

[0063] The discharge device 50 is provided therein with a float 51, and gas separated by the gas-liquid separating section 30 moves to an upper portion of the float 51. When gas does not exist in the discharge device 50, the float 51 is located at an upper end of the discharge device 50.

[0064] Fig. 5 is a side view showing the gas-liquid separating section and the pressure relief valve used in the embodiment.

[0065] The gas-liquid separation outflow port 33 is located at a position of a height 33h which is equal to or smaller than a half of a bottle height 31h of the cylindrical inner space 31. It is further preferable that the height 33h of the gas-liquid separation outflow port 33 is equal to or smaller than 1/3 of the bottle height 31h of the cylindrical inner space 31. Therefore, since a space where gas stays can be formed at a height 34h which is higher than the height 33h of the gas-liquid separation outflow port 33 of the cylindrical inner space 31, the high gas-liquid separation ratio can be expected. Here, the height 33h of the gas-liquid separation outflow port 33 is a height from a bottom surface of the cylindrical inner space 31 to a center of the exit diameter 33R of the gas-liquid separation outflow port 33.

[0066] The pressure relief valve connection port 34 is located at the height 34h which is higher than the height 33h of the gas-liquid separation outflow port 33. Therefore, even when operation of the gas-liquid separating section 30 has a problem, it is possible to flow out the gas by the pressure relief valve 40, and safety can be enhanced.

[0067] The pressure relief valve 40 and the pressure relief valve connection port 34 are connected to each other through a pressure relief valve connection pipe 42.

[0068] The pressure relief valve connection pipe 42 includes a lateral connection pipe portion 42a connected to the pressure relief valve connection port 34, and a

vertical connection pipe portion 42b connected to the pressure relief valve 40. The pressure relief valve 40 may be connected directly to the gas-liquid separating section 30 without through the pressure relief valve connection pipe 42.

[0069] Gas introduced into the discharge device 50 is discharged out from a discharge port 52. If gas is discharged out from the discharge port 52, the float 51 (see Fig. 4(a)) is located at the upper end of the discharge device 50, thereby closing the discharge port 52.

[0070] Fig. 6 is a perspective view showing the heat medium chamber of the outdoor unit.

[0071] A height 12h of the use-side heat exchanger 12 is greater than its width 12w and depth 12b.

[0072] A lower portion of a side surface of the use-side heat exchanger 12 includes a heat medium first connection port 22x, and an upper portion of the side surface of the use-side heat exchanger 12 includes a heat medium second connection port 22y.

[0073] The lower portion of the side surface of the use-side heat exchanger 12 includes a refrigerant first connection port 17x, and the upper portion of the side surface of the use-side heat exchanger 12 includes a refrigerant second connection port 17y.

[0074] The heat medium is introduced into the use-side heat exchanger 12 from the heat medium first connection port 22x, and the heat medium introduced into the use-side heat exchanger 12 is discharged out from the heat medium second connection port 22y.

[0075] When the heat medium is heated, refrigerant compressed by the compressor 11 is introduced into the use-side heat exchanger 12 from the refrigerant second connection port 17y, and the refrigerant introduced into the use-side heat exchanger 12 is discharged out from the refrigerant first connection port 17x.

[0076] The heat medium second connection port 22y and the gas-liquid separation inflow port 32 are connected to each other through a gas-liquid separation inflow pipe 35.

[0077] The gas-liquid separation inflow pipe 35 includes a gas-liquid separation lateral inflow pipe portion 35a connected to the heat medium second connection port 22y, and a gas-liquid separation vertical inflow pipe portion 35b connected to the gas-liquid separation inflow port 32.

[0078] The gas-liquid separation inflow port 32 is located at a position higher than the heat medium second connection port 22y.

[0079] The bottom surface of the gas-liquid separating section 30 is provided with the gas-liquid separation inflow port 32, and the gas-liquid separation inflow port 32 is located at the position higher than the heat medium second connection port 22y in this manner. According to this, the gas-liquid separating section 30 which is required to be placed at a high position among the heat medium circuit 20 is easily be placed, the gas-liquid separating section 30 can be plated above the use-side heat exchanger 12, and a space of the heat medium circuit 20 can be saved.

[0080] The gas-liquid separating section 30 is placed at the position higher than the use-side heat exchanger 12 and the pressure relief valve 40 is placed on the side of the gas-liquid separating section 30. Especially according to this configuration, the gas-liquid separating section 30 and the pressure relief valve 40 are placed above the use-side heat exchanger 12, and a space of the heat medium chamber 3a can be saved. Further, since the gas-liquid separation inflow pipe 35 includes the gas-liquid separation lateral inflow pipe portion 35a and the gas-liquid separation vertical inflow pipe portion 35b, a flowing direction of heat medium discharged out from the use-side heat exchanger 12 is changed until the heat medium flows into the gas-liquid separating section 30. Therefore, the high gas-liquid separation ratio can be expected.

[0081] Further, by connecting the pressure relief valve 40 to the gas-liquid separating section 30, a space of the heat medium circuit 20 can be saved.

[0082] The pressure relief valve 40 is located at the position higher than the use-side heat exchanger 12 and the pressure relief valve 40 is placed in the upper space of the use-side heat exchanger 12. Especially according to this configuration, the upper space of the use-side heat exchanger 12 can effectively be utilized, and the space of the heat medium circuit 20 can be saved.

[0083] Further, the lateral connection pipe portion 42a connected to the pressure relief valve connection port 34 is placed above the gas-liquid separation lateral inflow pipe portion 35a. According to this configuration, the gas-liquid separating section 30 and the pressure relief valve 40 can be placed above the use-side heat exchanger 12, and the space of the heat medium circuit 20 can be saved.

[0084] The lateral connection pipe portion 42a is placed in parallel to the gas-liquid separation lateral inflow pipe portion 35a. Especially according to this configuration, the use-side heat exchanger 12, the gas-liquid separating section 30 and the pressure relief valve 40 can be placed in a limited spaced.

[0085] An exit joint 36 is connected to the gas-liquid separation flow exit 33, and a heat medium first connection pipe 23 is connected to the heat medium first connection port 22x. An entrance joint 37 is connected to the heat medium first connection pipe 23.

[0086] The exit joint 36 and the entrance joint 37 project outward from the second wall surface material 62 which is located in the heat medium chamber 3a.

[0087] The heat medium chamber 3a is formed in a corner portion of the outdoor unit 3 utilizing the first wall surface material 61 and second wall surface material 62 which are adjacent to each other. Therefore, the exit joint 36 and the entrance joint 37 easily project from the outdoor unit 3.

[Configuration supported by the above-described embodiment]

[0088] The embodiment supports the following configuration.

(Configuration 1)

[0089] A heat medium circulation device including an outdoor unit, in which the outdoor unit is provided with: a refrigerant circuit to which a compressor, a use-side heat exchanger, an expansion device and a heat source-side heat exchanger are connected, and through which refrigerant circulates; a heat medium circuit which circulates heat medium cooled or heated by the refrigerant which is discharged out from the compressor in the use-side heat exchanger through a use-side terminal; and a pressure relief valve for releasing the heat medium circuit into atmosphere when pressure in the heat medium circuit becomes equal to or higher than predetermined pressure; wherein the pressure relief valve is placed in the heat medium circuit located downstream of the use-side heat exchanger, the pressure relief valve is located at a position higher than the use-side heat exchanger, the pressure relief valve includes an operating lever which can manually be operated, a wall surface material is placed in the outdoor unit between a bottom surface material outer periphery 3d and a top surface material outer periphery, and the wall surface material is provided with an opening at a position corresponding to the operating lever of the pressure relief valve.

[0090] According to this configuration, the operating section of the pressure relief valve can be operated from the opening. When heat medium is charged into or discharged out from the heat medium circuit, the pressure relief valve can be utilized, and maintainability is excellent.

(Configuration 2)

[0091] In the heat medium circulation device according to the configuration 1, the outdoor unit includes a first partition plate which prevents the heat medium leaked from the pressure relief valve from scattering to the compressor placed in the machine chamber, and the opening is provided at a position corresponding to the heat medium chamber which is divided from the machine chamber by the first partition plate.

[0092] According to this configuration, even when heat medium leaks out, the heat medium does not exert an influence on the compressor by the first partition plate, and the opening is formed into the limited size, the opening can be utilized only for operating the operating section of the pressure relief valve.

(Configuration 3)

[0093] The heat medium circulation device according to the configuration 1 or 2 further includes a lid for closing the opening.

[0094] According to this configuration, maintenance can be performed by detaching the lid.

(Configuration 4)

[0095] In the heat medium circulation device according to any one of the configurations 1 to 3, the outdoor unit includes a gas-liquid separating section which separates gas in the heat medium circuit from the heat medium, and the pressure relief valve is connected to the gas-liquid separating section.

[0096] According to this configuration, even when operation of the gas-liquid separating section has a problem, it is possible to flow out the gas by the pressure relief valve, and safety can be enhanced.

[INDUSTRIAL APPLICABILITY]

[0097] The present invention is suitable especially for a heat medium circulation device using combustible refrigerant.

[EXPLANATION OF SYMBOLS]

[0098]

1	use-side terminal
2	indoor unit
3	outdoor unit
3a	heat medium chamber
3b	machine chamber
3c	air blowing chamber
3d	bottom surface material outer periphery
3e	top surface material outer periphery
10	refrigerant circuit
11	compressor
12	use-side heat exchanger
12b	depth
12h	height
12w	width
13	expansion device
14	heat source-side heat exchanger
15	four-way valve
16	air blower
17x	refrigerant first connection port
17y	refrigerant second connection port
20	heat medium circuit
21	transfer pump
22x	heat medium first connection port
22y	heat medium second connection port
23	heat medium first connection pipe
30	gas-liquid separating section
31	cylindrical inner space
31h	bottle height
31R	bottle diameter
31x	virtual axis

32	gas-liquid separation inflow port
32R	entrance diameter
33	gas-liquid separation outflow port
33h	height
33R	exit diameter
34	pressure relief valve connection port
34h	position
35	gas-liquid separation inflow pipe
35a	gas-liquid separation lateral inflow pipe portion
35b	gas-liquid separation vertical inflow pipe portion
36	exit joint
37	entrance joint
40	pressure relief valve
41	operating lever (operating section)
42	pressure relief valve connection pipe
42a	lateral connection pipe portion
42b	vertical connection pipe portion
50	discharge device
51	float
52	discharge port
60	wall surface material
61	first wall surface material
62	second wall surface material
71	first partition plate
71x	one side
71y	other side
72	second partition plate
80	opening
81	fastening tool

Claims

1. A heat medium circulation device comprising an outdoor unit (3), in which the outdoor unit (3) is provided with:

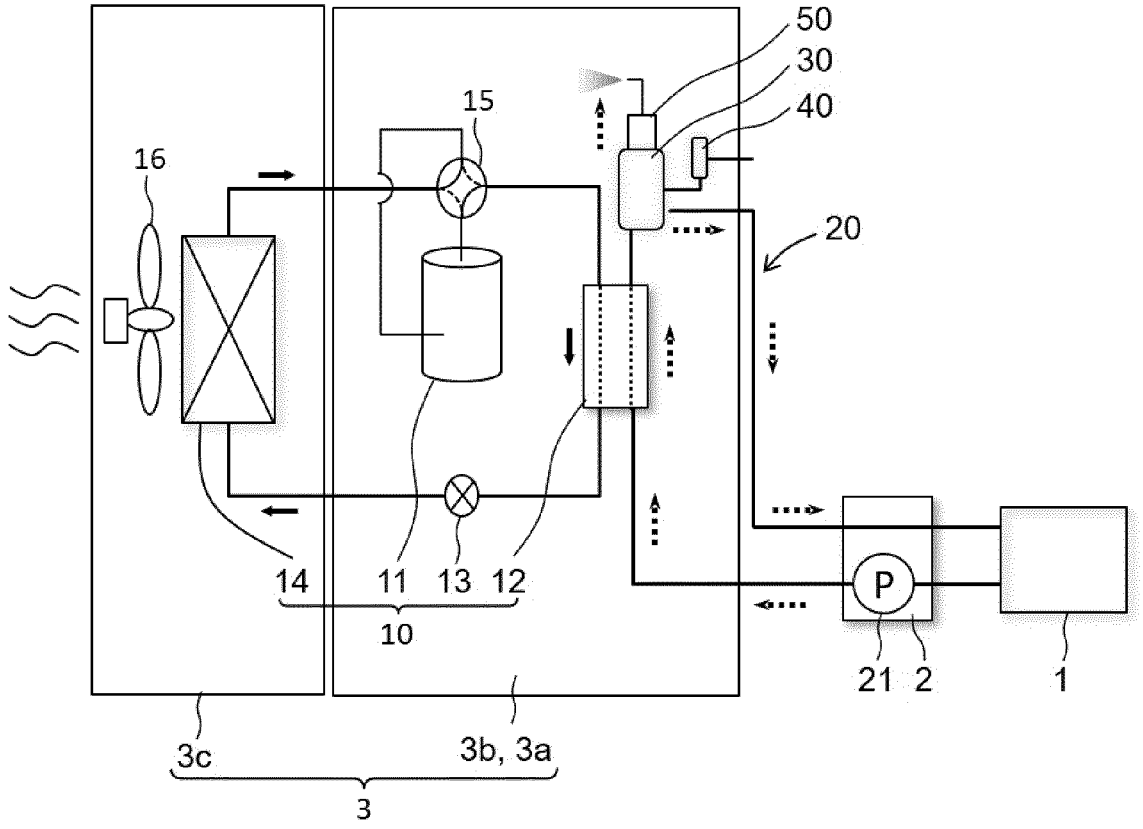
a refrigerant circuit (10) to which a compressor (11), a use-side heat exchanger (12), an expansion device (13) and a heat source-side heat exchanger (14) are connected, and through which refrigerant circulates;
a heat medium circuit (20) which circulates heat medium cooled or heated by the refrigerant discharged out from the compressor (11) in the use-side heat exchanger (12) through a use-side terminal (1); and
a pressure relief valve (40) for releasing the heat medium circuit (20) into atmosphere when pressure in the heat medium circuit (20) becomes equal to or higher than predetermined pressure; wherein
the pressure relief valve (40) is placed in the heat medium circuit (20) located downstream of the use-side heat exchanger (12), the pressure relief valve (40) is located at a position higher than the use-side heat exchanger (12),
the pressure relief valve (40) includes an operating section (41) which can manually be operated,
a wall surface material (60) is placed in the outdoor unit (3) between a bottom surface material outer periphery (3d) and a top surface material outer periphery (3e), and
the wall surface material (60) is provided with an opening (80) at a position corresponding to the operating section (41) of the pressure relief valve (40).

2. The heat medium circulation device according to claim 1, wherein the outdoor unit (3) includes a first partition plate (71) which prevents the heat medium leaked from the pressure relief valve (40) from scattering to the compressor (11) placed in a machine chamber (3b), and
the opening (80) is provided at a position corresponding to the heat medium chamber (3a) which is divided from the machine chamber (3b) by the first partition plate (71).

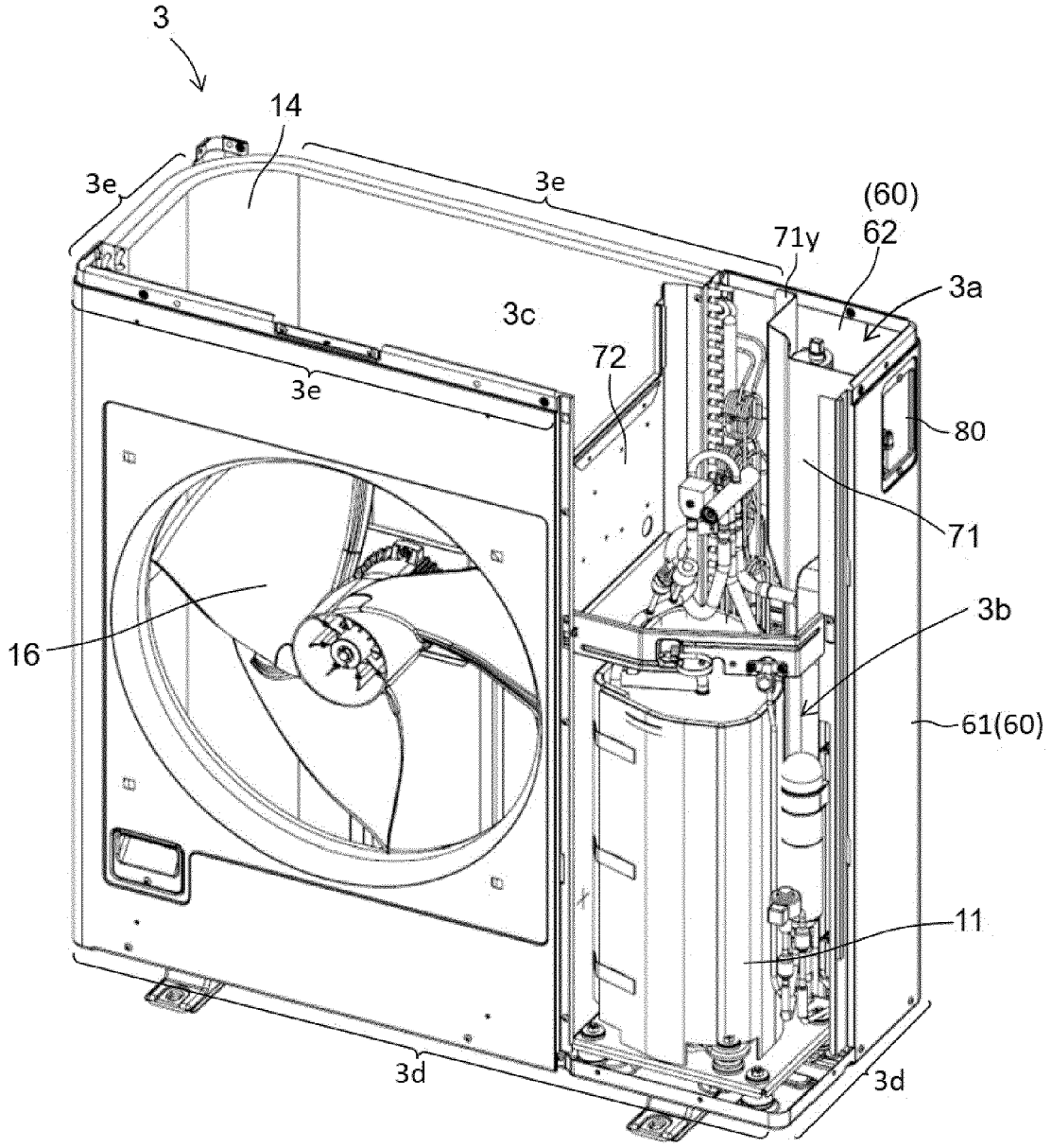
3. The heat medium circulation device according to claim 1 or 2, further comprising a lid for closing the opening (80).

4. The heat medium circulation device according to any one of claims 1 to 3, wherein the outdoor unit (3) includes a gas-liquid separating section (30) which separates gas in the heat medium circuit (20) from the heat medium, and
the pressure relief valve (40) is connected to the gas-liquid separating section (30).

[Fig. 1]

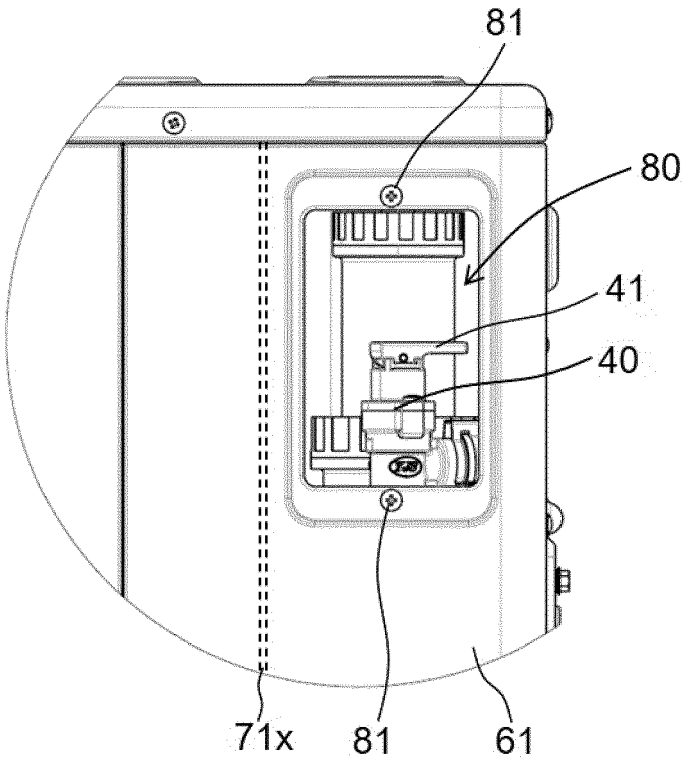


[Fig. 2]

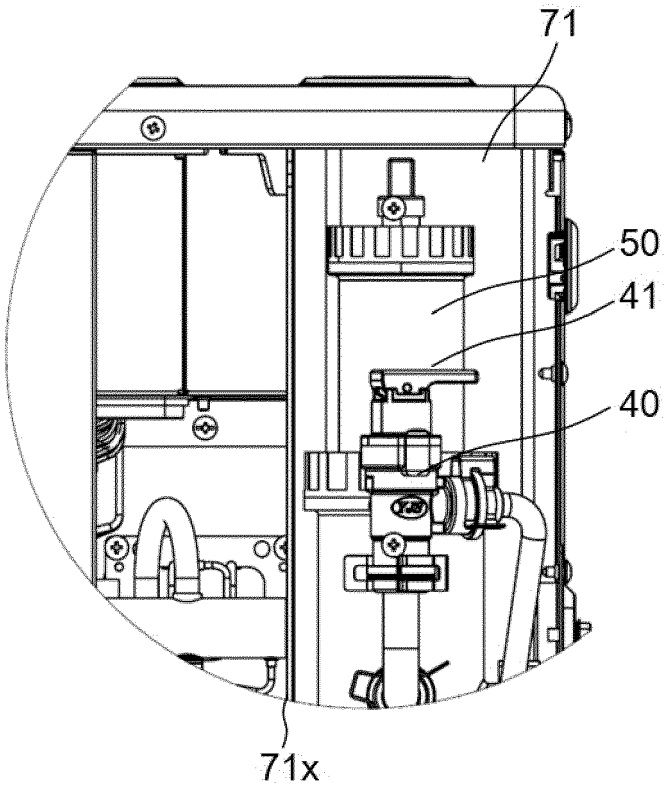


[Figs. 3]

(a)

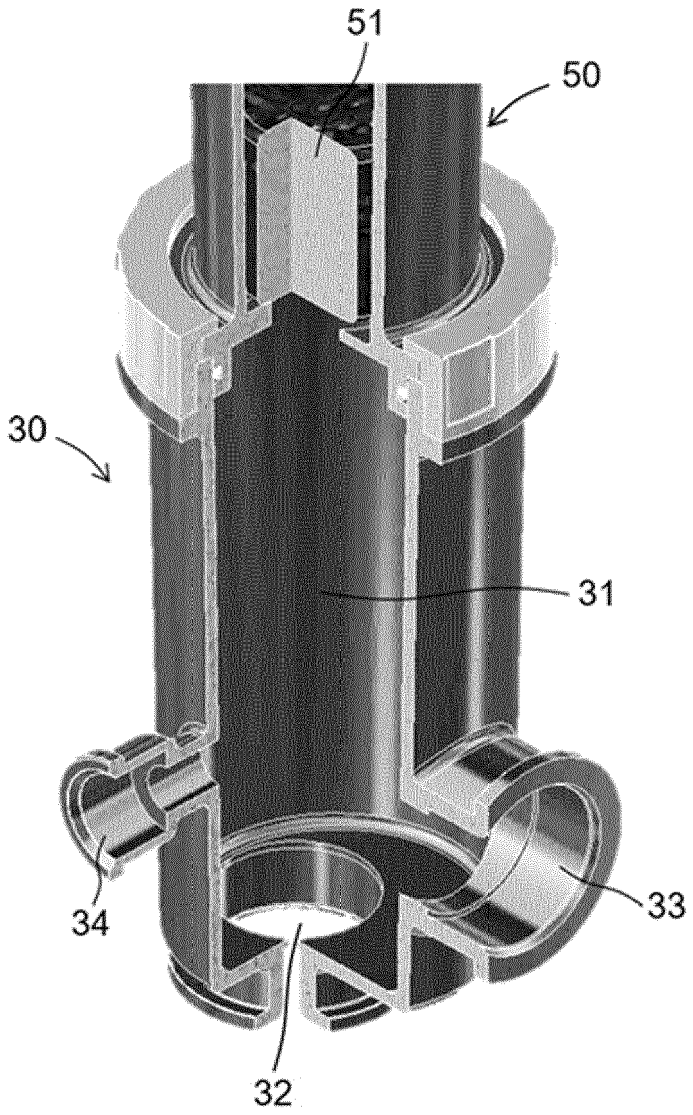


(b)

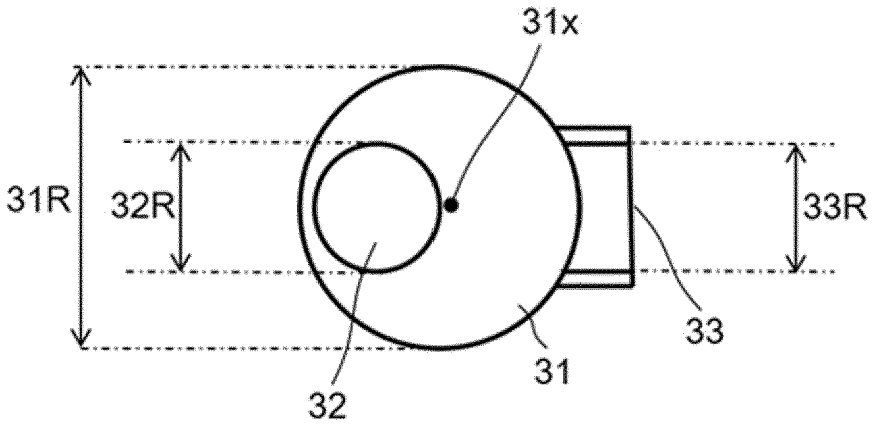


[Figs. 4]

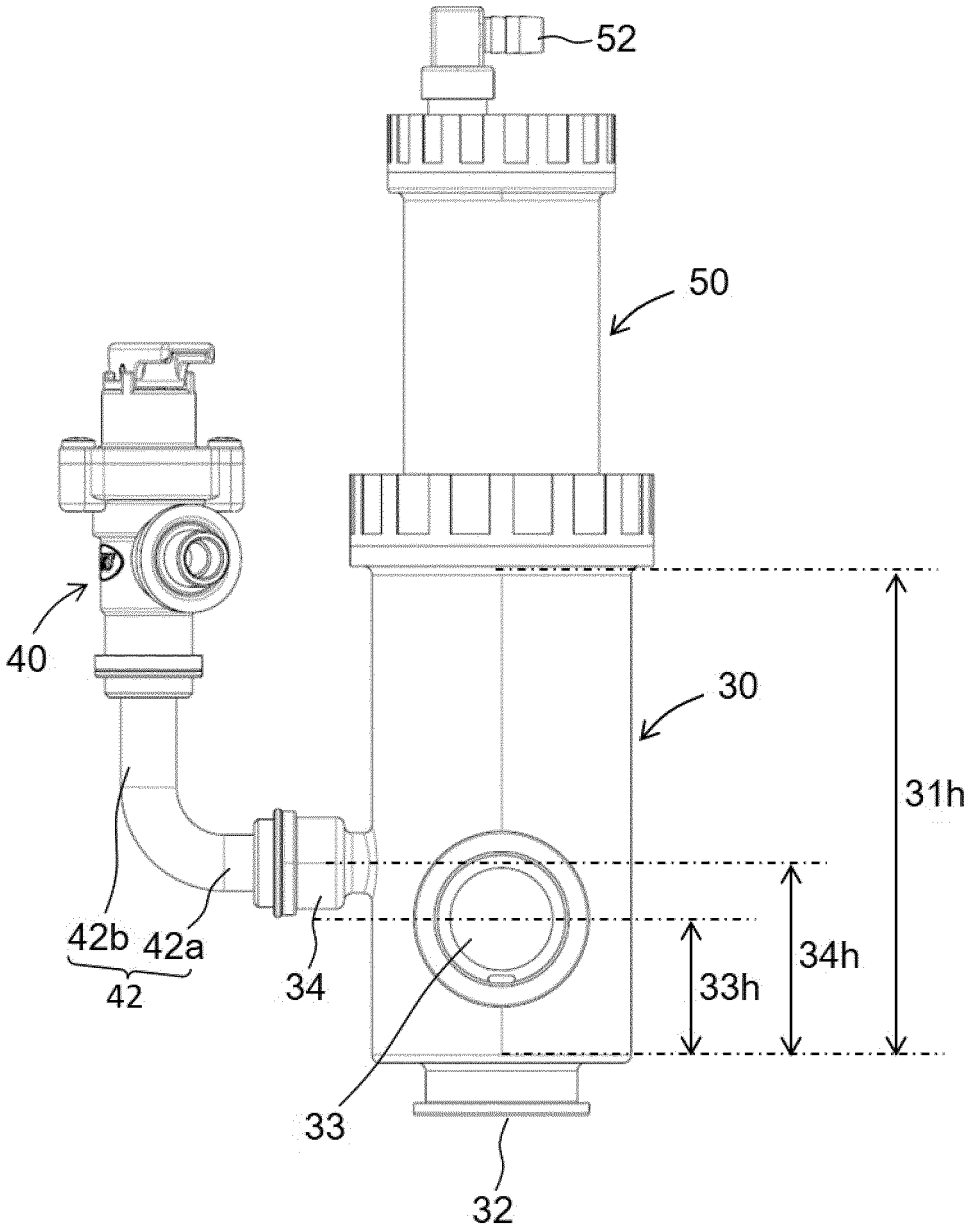
(a)



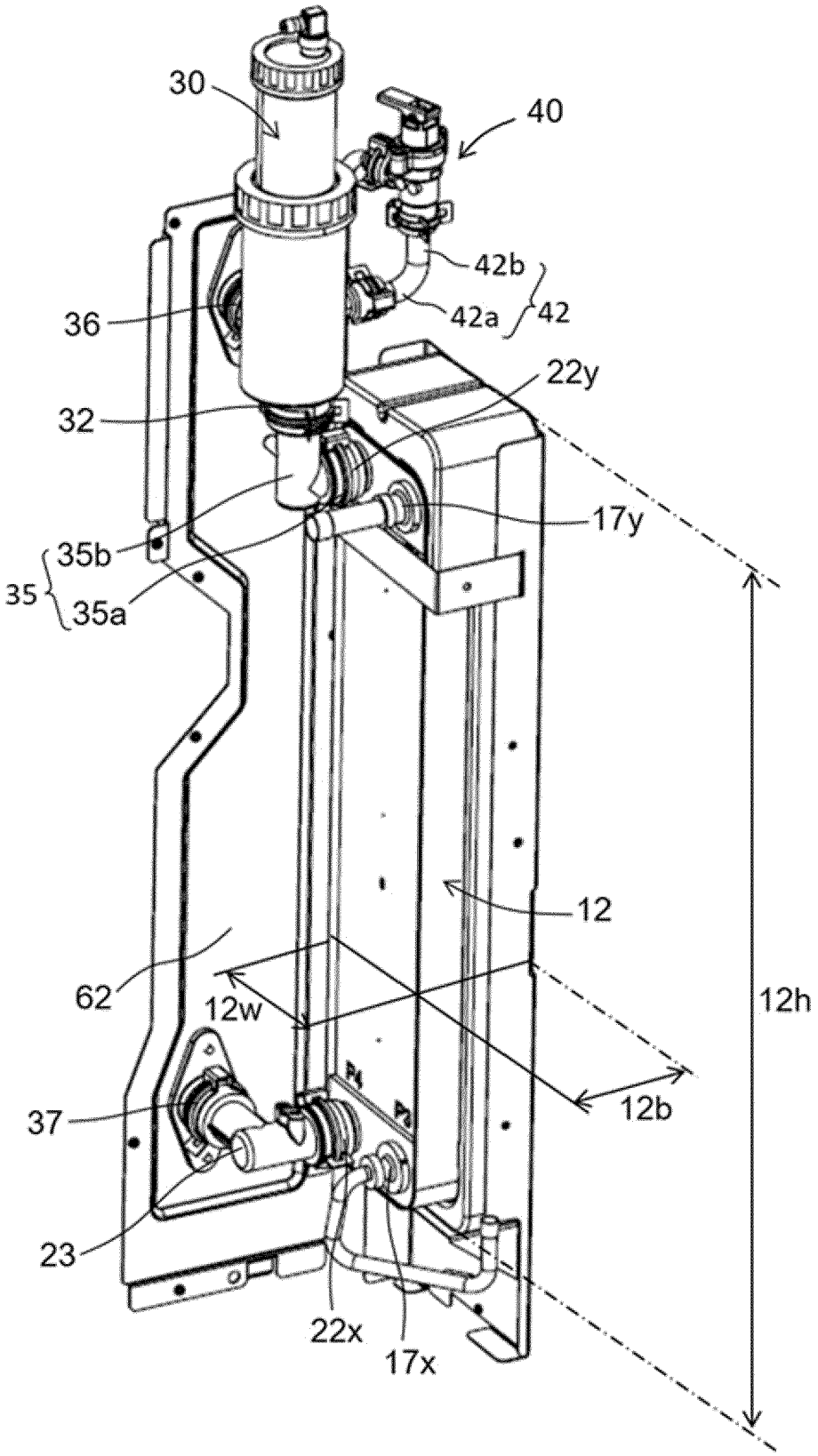
(b)



[Fig. 5]



[Fig. 6]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Application Number
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F24H
F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 December 2023	Hoffmann, Stéphanie

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