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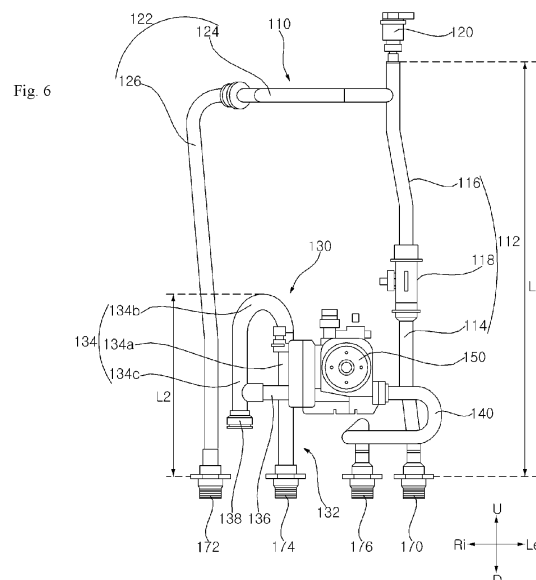
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(54) **HEAT SUPPLY APPARATUS**

(57) The present disclosure relates to a heat supply apparatus that includes an outdoor unit including a heat exchanger configured to exchange heat between refrigerant and water, a load unit using heat of heat-exchanged water as a load, and an indoor unit configured to supply water discharged from the outdoor unit to the load unit and configured to supply water discharged from the load unit to the outdoor unit, wherein the indoor unit includes

a case defining an outer shape, a first connection pipe disposed in the case and configured to transfer water introduced from the outdoor unit to the load unit, a second connection pipe disposed in the case and configured to transfer water introduced from the load unit to the outdoor unit, and a pump disposed at the second connection pipe and configured to pump water of the load unit to the outdoor unit.



Description

BACKGROUND

Technical Field

[0001] The present disclosure relates to a heat supply apparatus, and more particularly, to a heat supply apparatus configured to supply water, which is heat-exchanged with refrigerant flowing through a heat pump, to a load unit of an indoor space.

Description of the Related Art

[0002] Referring to FIG. 1, in a heating system including a gas boiler, a heat source heated by a gas boiler 1 is supplied to a load unit 2, such as floor heating and a hot water tank, through a pipe. Such a pipe connecting a gas boiler and a load unit may be installed in a buried manner in a building.

[0003] Meanwhile, in countries such as Europe, there is a growing trend of replacing gas boilers with heat supply apparatuses using water-refrigerant to reduce carbon emission and minimize the use of refrigerant.

[0004] KR 10-2012-0062153 A discloses a configuration for supplying water, which is heat-exchanged with refrigerant, to a load unit. However, since refrigerant is supplied to an indoor unit, the amount of refrigerant used is more than a certain level. This is problematic in countries, such as Europe, where a limit on the amount of refrigerant is imposed.

[0005] Referring to FIG. 2, in a heat supply apparatus using water-refrigerant (hereinafter, 'water-refrigerant heat supply apparatus'), water may be supplied to a load unit 30 via an indoor unit 10 through which water that is heat-exchanged in an outdoor unit 20 is replaced in a boiler. However, in the water-refrigerant heat supply apparatus, water discharged from the load unit 30 is directly supplied to the outdoor unit 20. In such a structure, a separate pipe connecting a load unit and an outdoor unit should be newly installed, thereby requiring much time and cost for a buried installation of the new pipe in a building.

[0006] Further, in this structure, a pump, which is disposed in an indoor unit, is disposed at a part or portion where water discharged from an outdoor unit is supplied to a load unit, so as to allow water heated by the pump to be supplied, thereby reducing the lifespan of the pump.

SUMMARY

[0007] It is an object of the present disclosure to provide a heat supply apparatus that can replace a water-refrigerant heat supply apparatus while using piping of the existing or conventional boiler system.

[0008] It is an object of the present disclosure to provide a heat supply apparatus that can secure the lifespan of a pump that causes a circulation of water in a water

pipe.

[0009] It is an object of the present disclosure to provide a heat supply apparatus that can increase the efficiency of heat transfer to a load unit.

5 [0010] The objects of the present disclosure are not limited to the problems mentioned above, and other problems not mentioned will be clearly understood by those skilled in the art from the following description.

10 [0011] The object is solved by the features of the independent claims. Preferred embodiments are given in the dependent claims.

[0012] According to an aspect of the subject matter described in this application, a heat supply apparatus includes an outdoor unit including a heat exchanger configured to exchange heat between refrigerant and water, a load unit using heat of heat-exchanged water as a load, and an indoor unit configured to supply water discharged from the outdoor unit to the load unit and configured to supply water discharged from the load unit to the outdoor unit, wherein the indoor unit includes a case defining an outer shape, a first connection pipe disposed in the case and configured to transfer water introduced from the outdoor unit to the load unit, a second connection pipe disposed in the case and configured to transfer water introduced from the load unit to the outdoor unit, and a pump disposed at the second connection pipe and configured to pump water of the load unit to the outdoor unit.

25 [0013] Accordingly, water discharged from the outdoor unit may be transferred to the load unit through the indoor unit, and water discharged from the load unit may be transferred to the outdoor unit through the indoor unit.

[0014] Further, the pump may supply water transferred from the load unit to the outdoor unit, allowing water to be circulated entirely.

35 [0015] The first connection pipe may include a 1-1 connection pipe extending from a lower plate of the case and defining a flow path through which water flows upward, and a 1-2 connection pipe connected to a circumferential surface of the 1-1 connection pipe at a position spaced downward from an upper end of the 1-1 connection pipe.

40 [0016] An air band configured to discharge vapor produced from flowing water may be disposed at the upper end of the 1-1 connection pipe, allowing vapor generated from heated water that is supplied from the outdoor unit to be discharged.

45 [0017] A length of the 1-1 connection pipe extending upward from the lower plate may be greater than a height of the second connection pipe protruding upward from the lower plate.

50 [0018] Accordingly, vapor produced from water that is supplied from the outdoor unit through the 1-1 connection pipe may be collected as much as possible to be transferred to the air band.

55 [0019] The 1-1 connection pipe may include a lower pipe connected to the first connector, an upper pipe disposed above the lower pipe and having the air band disposed at an upper end thereof, and a middle pipe connecting the lower pipe and the upper pipe.

[0020] The middle pipe may be made of a different material from the lower pipe and the upper pipe, thereby achieving a long length of the 1-1 connection pipe configured as a plurality of pipes.

[0021] The middle pipe may be made of a material having a higher melting point than the lower pipe and the upper pipe.

[0022] Accordingly, the middle pipe may be coupled to the lower pipe and the upper pipe through welding or the like.

[0023] The 1-2 connection pipe may include a horizontal pipe connected to the 1-1 connection pipe, and a vertical pipe extending from an end portion of the horizontal pipe in a downward direction in which the lower plate is disposed.

[0024] The vertical pipe may be provided with a heater configured to heat water flowing therethrough. Thus, water supplied to the load unit may be additionally heated.

[0025] The second connection pipe may include a pump inlet pipe disposed at an upstream side of the pump, and a pump outlet pipe disposed at a downstream side of the pump. The pump inlet pipe may be provided with a strainer configured to filter foreign substances contained in water introduced from the load unit to thereby filter out foreign substances from the water supplied from the load unit.

[0026] The pump inlet pipe may have a shape bending at the upstream side where the strainer is disposed.

[0027] The pump inlet pipe may include a first pump inlet pipe extending upward from a lower plate of the case and including a bending portion that changes a flow direction, and a second pump inlet pipe connecting one side of the first pump inlet pipe and the pump.

[0028] The strainer may be disposed at an end portion of the first pump inlet pipe, allowing foreign substances to be easily collected.

[0029] The second pump inlet pipe may be disposed to be connected to a circumference of the first pump inlet pipe at a position spaced upward from the end portion of the first pump inlet pipe, thereby preventing foreign substances from flowing into the pump.

[0030] The pump inlet pipe may include an upward flow forming pipe extending upward from a lower plate of the case and defining an upward flow path, a bending portion connected to the upward flow forming pipe and changing a flow direction, and a downward flow forming pipe connected to the bending portion and defining a downward flow path.

[0031] The strainer may be disposed at a lower end portion of the downward flow forming pipe, thereby preventing foreign substances from flowing into the pump.

[0032] A length of the first connection pipe may be greater than a length of the second connection pipe.

[0033] Accordingly, vapor generated from heated water that is supplied from the outdoor unit may be collected and discharged to the outside. In other words, the transfer of vapor to the load unit may be minimized.

[0034] The case may include a lower plate covering a

lower portion thereof.

[0035] The lower plate may be provided with a plurality of connectors connecting the first connection pipe or the second connection pipe and a pipe connected to the outdoor unit or the load unit.

[0036] Accordingly, pipes connected to the outdoor unit and the load unit, and connection pipes disposed in the indoor unit may be easily connected to one another.

[0037] The plurality of connectors may include a first connector to which an upstream end of the first connection pipe is connected, a second connector to which a downstream end of the first connection pipe is connected, a third connector to which an upstream end of the second connection pipe is connected, and a fourth connector to which a downstream end of the second connection pipe is connected.

[0038] A distance between the third connector and the fourth connector that are disposed at the lower plate may be less than a distance between the first connector and the second connector that are disposed at the lower plate, allowing the first connection pipe to have a longer length than the second connection pipe.

[0039] The details of other embodiments are included in the detailed description and drawings.

[0040] A heat supply apparatus according to the present disclosure has one or more of the following effects.

[0041] First, as water discharged from an outdoor unit is transferred to a load unit through an indoor unit and water discharged from the load unit is transferred to the outdoor unit through the indoor unit, a heat supply apparatus of a boiler may be easily replaced with a heat supply apparatus including an indoor unit that uses a heat pump to heat water and an outdoor unit without a separate indoor pipe installation.

[0042] Second, as water discharged from a load unit is pumped by a pump, the temperature of water supplied to the pump may be kept below a set temperature, thereby increasing the lifespan of the pump.

[0043] In addition, a structure of a second connection pipe may prevent foreign substances from entering the pump to thereby increase the service life of the pump.

[0044] Third, vapor produced from heated water that is supplied from an outdoor unit may be removed in an indoor unit to thereby minimize the flow of vapor to a load unit.

[0045] As water from which vapor has been removed is supplied to the load unit, the thermal efficiency of water transferred to the load unit may be increased.

[0046] The effects of the present disclosure are not limited to the effects described above, and other effects not stated in the above will be clearly understood by those skilled in the art from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047]

FIG. 1 is a schematic diagram of a boiler according to the related art, illustrating an apparatus that supplies heat to a load unit.

FIG. 2 is a schematic diagram of an apparatus that supplies heat to a load unit through an indoor unit and an outdoor unit.

FIG. 3 is a schematic diagram of a heat supply apparatus according to an embodiment of the present disclosure.

FIG. 4 is a system diagram illustrating a detailed configuration of an outdoor unit and an indoor unit of a heat supply apparatus according to an embodiment of the present disclosure.

FIG. 5 is a perspective diagram of an indoor unit of a heat supply apparatus according to an embodiment of the present disclosure.

FIG. 6 is a diagram illustrating a water pipe disposed in an indoor unit according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0048] The above and other aspects, features and other advantages of the present disclosure will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings. Exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings; however, they may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the exemplary embodiments to those skilled in the art. The same reference numerals are used throughout the drawings to designate the same or similar components.

[0049] The directions "U (Up)", "D (Down)", "Le (Left)", "Ri (Right)", "F (Front)", and "R (Rear)" shown in FIGS. 5 to 6 are for explaining a configuration of a heat supply apparatus. Therefore, depending on a reference or basis, corresponding directions may be described differently.

[0050] Hereinafter, the present disclosure will be described with reference to the drawings for explaining a heat supply apparatus according to embodiments of the present disclosure.

[0051] Referring to FIG. 3, a heat supply apparatus of the present disclosure includes an outdoor unit 200 including a heat exchanger (not shown) configured to exchange heat between refrigerant discharged from a compressor (not shown) and water, a load unit 300 using a heat source of water that is heat-exchanged in the outdoor unit 200, and an indoor unit 100 disposed between the outdoor unit 200 and the load unit 300, and including a pump configured to move water flowing to the indoor unit 200 and the load unit 300.

[0052] Referring to FIG. 3, the heat supply apparatus includes a first pipe 50 and a second pipe 60. The first pipe 50 connects the outdoor unit 200 and the indoor unit

100. The second pipe 60 connects the indoor unit 100 and the load unit 300. The first pipe 50 includes a first supply pipe 52 through which water is supplied to the indoor unit 100 and a first discharge pipe 54 through which water is discharged from the indoor unit 100. The second pipe 60 includes a second supply pipe 62 through which water is supplied to the indoor unit 100 and a second discharge pipe 64 through which water is discharged from the indoor unit 100.

[0053] Referring to FIG. 4, the outdoor unit 200 includes a compressor 210, a first heat exchanger 220, a second heat exchanger 230, an expansion valve 240 disposed between the first heat exchanger 220 and the second heat exchanger 230, and a switching valve 250.

[0054] The compressor 210 is configured to compress refrigerant. The first heat exchanger 220 exchanges heat between refrigerant flowing from the compressor 210 and water. The second heat exchanger 230 exchanges heat between refrigerant flowing from the compressor 210 and air. The expansion valve 240 expands flowing refrigerant. The switching valve 250 transfers refrigerant discharged from the compressor 210 to the first heat exchanger 220 or the second heat exchanger 230.

[0055] As the outdoor unit 200 of the present disclosure includes both the first heat exchanger 220 and the second heat exchanger 230 therein, the amount of refrigerant used may be minimized or reduced. In addition, as water flows into an indoor space, refrigerant leakage to the indoor space may be prevented.

[0056] The first heat exchanger 220 may exchange heat between compressed refrigerant discharged from the compressor 210 and water. That is, refrigerant may transfer heat, which is generated while being compressed by the compressor 210, to water through the first heat exchanger 220. The first heat exchanger 220 may use a plate heat exchanger that exchanges heat between water and refrigerant.

[0057] Referring to FIG. 4, the indoor unit 100 is connected to the outdoor unit 200 through the first pipe 50. The indoor unit 100 may transfer water discharged from the outdoor unit 200 to the load unit 300.

[0058] The indoor unit 100 includes a first connection pipe 110 that connects the first supply pipe 52 and the second discharge pipe 64, and a second connection pipe 130 that connects the second supply pipe 62 and the first discharge pipe 54. The second connection pipe 130 is provided with a pump 150 that causes a flow of water in the entire pipe. The first connection pipe 110 is provided with a heater 160 configured to heat water supplied to the load unit 300.

[0059] Hereinafter, a detailed configuration of the indoor unit 100 will be described with reference to FIGS. 5 to 6.

[0060] Referring to FIGS. 5 to 6, the indoor unit 100 includes a case 102 defining an outer shape. The first connection pipe 110 is disposed in the case 102 and transfers water introduced from the outdoor unit 200 to the load unit 300. The second connection pipe 130 is

disposed in the case 102 and transfers water introduced from the load unit 300 to the outdoor unit 200. The pump 150 is included in the indoor unit 100 and is disposed at the second connection pipe 130 and supplies water of the load unit 300 to the outdoor unit 200.

[0061] The pump 150 is disposed on the second connection pipe 130. The temperature of water flowing through the second connection pipe 130 is lower than the temperature of water flowing through the first connection pipe 110. As water introduced into the pump 150, which is water flowing in the second connection pipe 130 after being discharged from the load unit 300, flows at a temperature less than or equal to a set temperature, the reliability of the pump 150 may be increased.

[0062] The case 102 may have a substantially cuboid shape. The case 102 defines a space in which the first connection pipe 110 and the second connection pipe 130 are disposed.

[0063] The case 102 includes a mounting plate (not shown) mounted on a wall surface, a lower plate 104 vertically disposed at a lower end of the mounting plate, an upper plate (not shown) vertically disposed at an upper end of the mounting plate, and a peripheral plate 106 disposed to extend from a side surface of the mounting plate along edges of the lower plate 104 and the upper plate. So, when being installed the lower plate 104 face the bottom and the peripheral plate 106 forms the housing of the case 102 forming the two side walls and the front wall.

[0064] At one side of the case 102, there is a first connector 170 to which an upstream end of the first connection pipe 110 is connected, a second connector 172 to which a downstream end of the first connection pipe 110 is connected, a third connector 174 to which an upstream end of the second connection pipe 130 is connected, and a fourth connector 176 to which a downstream end of the second connection pipe 130 is connected. The first connector 170, the second connector 172, the third connector 174, and the fourth connector 176 are preferably disposed at the lower plate 104 of the case 102.

[0065] The first supply pipe 52 is connected to the first connector 170. The second discharge pipe 64 is connected to the second connector 172. The second supply pipe 62 is connected to the third connector 174. The first discharge pipe 54 is connected to the fourth connector 176.

[0066] Referring to FIG. 5, a distance D2 between the third connector 174 and the fourth connector 176 that are connected to the second connection pipe 130 is less than a distance D1 between the first connector 170 and the second connector 172 that are connected to the first connection pipe 110.

[0067] Referring to FIG. 6, the first connection pipe 110 and the second connection pipe 130 are disposed in the case 102. A length of the first connection pipe 110 is greater than a length of the second connection pipe 130.

[0068] The first connection pipe 110 is provided with an air band 120 that removes water vapor produced from

water flowing therein. The first connection pipe 110 includes a 1-1 connection pipe 112 that is connected to the first connector 170 and forms a flow path through which water flows upward, and a 1-2 connection pipe 122 that is connected to a circumferential surface of the 1-1 connection pipe 112 at a position spaced downward from an upper end of the 1-1 connection pipe 112. The air band 120 configured to discharge vapor formed from flowing water is disposed at the upper end of the 1-1 connection pipe 112. Vapor generated from water flowing in the first connection pipe 110 may be removed through the air band 120.

[0069] A length L1 of the 1-1 connection pipe 112 extending upward from the lower plate 104 is greater than a height L2 of the second connection pipe 130 protruding upward from the lower plate 104 of the case 102. Accordingly, vapor generated from water flowing along the first connection pipe 110 may be effectively collected in the air band 120.

[0070] As the 1-1 connection pipe 112 is formed long in an up-and-down direction, the 1-1 connection pipe 112 may be configured as a plurality of pipes.

[0071] The 1-1 connection pipe 112 may include a lower pipe 114 that is connected to the first connector 170, an upper pipe 116 that is disposed above the lower pipe 114 and has the air band 120 disposed at an upper end thereof, and a middle pipe 118 that connects the lower pipe 114 and the upper pipe 116.

[0072] The middle pipe 118 may be made of a different material from the lower pipe 114 and/or the upper pipe 116. The middle pipe 118 may be made of a material having a higher melting point than the lower pipe 114 and/or the upper pipe 116. The lower pipe 114 and the upper pipe 116 may be made of a copper material, and the middle pipe 118 may be made of a stainless steel material. The lower pipe 114 and the middle pipe 118 may be joined by welding, and the upper pipe 116 and the middle pipe 118 may be joined by welding.

[0073] As the middle pipe 118 is made of a material having a higher melting point than the lower pipe 114 and/or the upper pipe 116, it is possible to prevent a leak hole from forming at a joined portion or joint when joined by welding or the like.

[0074] The 1-2 connection pipe 122 is connected to the 1-1 connection pipe 112 at a position spaced downward from the upper end of the 1-1 connection pipe 112. Accordingly, a space for collecting vapor discharged to the air band 120 may be formed at the upper end of the 1-1 connection pipe 112.

[0075] The 1-2 connection pipe 122 may include a horizontal pipe 124 that is connected to the 1-1 connection pipe 112, and a vertical pipe 126 that extends downward from an end portion of the horizontal pipe 124 and is connected to the second connector 172.

[0076] The vertical pipe 126 may define a flow path through which water flows downward. Although not shown in FIG. 6, a heater (not shown), which is electrically operated, may be disposed at the vertical pipe 126. The

heater 160 (see FIG. 4) may additionally heat water supplied to the load unit 300.

[0077] The second connection pipe 130 includes a pump inlet pipe 132 disposed at an upstream side of the pump 150 and a pump outlet pipe 140 disposed at a downstream side of the pump 150.

[0078] The pump inlet pipe 132 may be provided with a strainer 138 that filters foreign substances or particles contained in water introduced from the load unit 300. The pump inlet pipe 132 may include a first pump inlet pipe 134 including a bending portion 134b that is connected to the third connector 174 and changes a flow direction, and a second pump inlet pipe 136 connected to one side of the first pump inlet pipe 134 and the pump 150.

[0079] The first pump inlet pipe 134 includes an upward flow forming pipe 134a that is connected to the third connector 174 and defines an upward (or ascending) flow path, the bending portion 134b that is connected to the upward flow forming pipe 134a and changes the flow direction, and a downward flow forming pipe 134c that is connected to the bending portion 134b and defines a downward (or descending) flow path. The strainer 138 is disposed at a lower end portion of the downward flow forming pipe 134c.

[0080] The second pump inlet pipe 136 is connected to the circumference of the first pump inlet pipe 134 at a position spaced upward from an end portion of the first pump inlet pipe 134. Accordingly, foreign substances contained in water flowing from the load unit 300 may be collected in a lower end portion of the first pump inlet pipe 134 where the strainer 138 is disposed.

[0081] The pump outlet pipe 140 has a bent shape to thereby connect the pump 150 and the fourth connector 176.

[0082] Although preferred embodiments of the present disclosure have been shown and described herein, the present disclosure is not limited to the specific embodiments described above. It will be understood that various modifications and changes can be made by those skilled in the art without departing from the idea and scope of the present disclosure as defined by the appended claims. Therefore, it shall be considered that such modifications, changes, and equivalents thereof are all included within the scope of the present disclosure.

Claims

1. A heat supply apparatus, comprising:

an outdoor unit (200) including a heat exchanger (230) configured to exchange heat between refrigerant and water;
a load unit (300) using heat of heat-exchanged water as a load; and
an indoor unit (100) configured to supply water discharged from the outdoor unit (200) to the load unit (300), and configured to supply water

discharged from the load unit (300) to the outdoor unit (300), wherein the indoor unit (100) comprises:

a case (102) defining an outer shape;
a first connection pipe (110) disposed in the case (102) and configured to transfer water introduced from the outdoor unit (200) to the load unit (300);
a second connection pipe (130) disposed in the case (102) and configured to transfer water introduced from the load unit (300) to the outdoor unit (200); and
a pump (150) disposed at the second connection pipe (130) and configured to pump water of the load unit (300) to the outdoor unit (200).

2. The heat supply apparatus of claim 1, wherein the first connection pipe (110) comprises:

a 1-1 connection pipe (112) extending from a lower plate (104) of the case (102) and defining a flow path through which water flows upward; and
a 1-2 connection pipe (122) connected to the 1-1 connection pipe (112) at a position spaced downward from an upper end of the 1-1 connection pipe (112), wherein the 1-2 connection pipe (122) protrudes upward from the lower plate (104), and/or
an air band (120) configured to discharge vapor produced from flowing water disposed at the upper end of the 1-1 connection pipe (112).

3. The heat supply apparatus of claim 2, wherein a length (L1) of the 1-1 connection pipe (112) extending upward from the lower plate (104) is greater than a height (L2) of the second connection pipe (130) protruding upward from the lower plate (104).

4. The heat supply apparatus of claim 2 or 3, wherein the lower plate (104) comprises:

a first connector (170) to which an upstream end of the first connection pipe (110) is connected;
a second connector (172) to which a downstream end of the first connection pipe (110) is connected;
a third connector (174) to which an upstream end of the second connection pipe (130) is connected; and
a fourth connector (176) to which a downstream end of the second connection pipe (130) is connected.

5. The heat supply apparatus of any one of claims 2, 3 or 4, wherein the 1-1 connection pipe (112) comprises:

es:

- a lower pipe (114) connected to a first connector (170);
 an upper pipe (116) disposed above the lower pipe (114) and having the air band (120) disposed at an upper end thereof; and
 a middle pipe (118) connecting the lower pipe (114) and the upper pipe (116).
6. The heat supply apparatus of claim 5, wherein the middle pipe (118) is made of a different material from the lower pipe (114) and the upper pipe (116) and/or the middle pipe (118) is made of a material having a higher melting point than the lower pipe (114) and the upper pipe (116).
7. The heat supply apparatus of any one of the preceding claims 2-6, wherein the 1-2 connection pipe (122) comprises:
- a horizontal pipe (124) connected to the 1-1 connection pipe (112); and
 a vertical pipe (126) extending from an end portion of the horizontal pipe (124) in a downward direction in which the lower plate (104) is disposed, and/or
 the vertical pipe (126) is provided with a heater configured to heat water flowing therethrough.
8. The heat supply apparatus of any one of the preceding claims, wherein the second connection pipe (130) comprises:
- a pump inlet pipe (134) disposed at an upstream side of the pump (150); and
 a pump outlet pipe (140) disposed at a downstream side of the pump (150), and
 wherein the pump inlet pipe (134) is provided with a strainer (138) configured to filter foreign substances contained in water introduced from the load unit (300).
9. The heat supply apparatus of claim 8, wherein the pump inlet pipe (134) has a shape bending at the upstream side where the strainer (138) is disposed.
10. The heat supply apparatus of claim 8 or 9, wherein the pump inlet pipe (134) comprises:
- a first pump inlet pipe (134) extending upward from a lower plate (104) of the case (102) and including a bending portion (134b) that changes a flow direction; and
 a second pump inlet pipe (136) connecting one side of the first pump inlet pipe (134) and the pump (150), and
 wherein the strainer (138) is disposed at an end

portion of the first pump inlet pipe (134).

11. The heat supply apparatus of claim 10, wherein the second pump inlet pipe (136) is disposed to be connected to a circumference of the first pump inlet pipe (134) at a position spaced upward from the end portion of the first pump inlet pipe (134).
12. The heat supply apparatus of claim 8, wherein the pump inlet pipe (134) comprises:
- an upward flow forming pipe (134a) extending upward from a lower plate (104) of the case (102) and defining an upward flow path;
 a bending portion (134b) connected to the upward flow forming pipe and changing a flow direction; and
 a downward flow forming pipe (134c) connected to the bending portion (134b) and defining a downward flow path, and/or
 wherein the strainer (138) is disposed at a lower end portion of the downward flow forming pipe (134c).
13. The heat supply apparatus of any one of the preceding claims, wherein a length of the first connection pipe (110) is greater than a length of the second connection pipe (130).
14. The heat supply apparatus of any one of the preceding claims, wherein the case (102) comprises a lower plate (104) covering a lower portion thereof, and wherein the lower plate (104) is provided with a plurality of connectors (172, 174, 176, 178) connecting the first connection pipe (110) or the second connection pipe (130) and a pipe connected to the outdoor unit (200) or the load unit (300).
15. The heat supply apparatus of claim 13, wherein a distance (D2) between the third connector (174) and the fourth connector (176) that are disposed at the lower plate (104) is less than a distance (D1) between the first connector (170) and the second connector (172) that are disposed at the lower plate (104).

Fig. 1

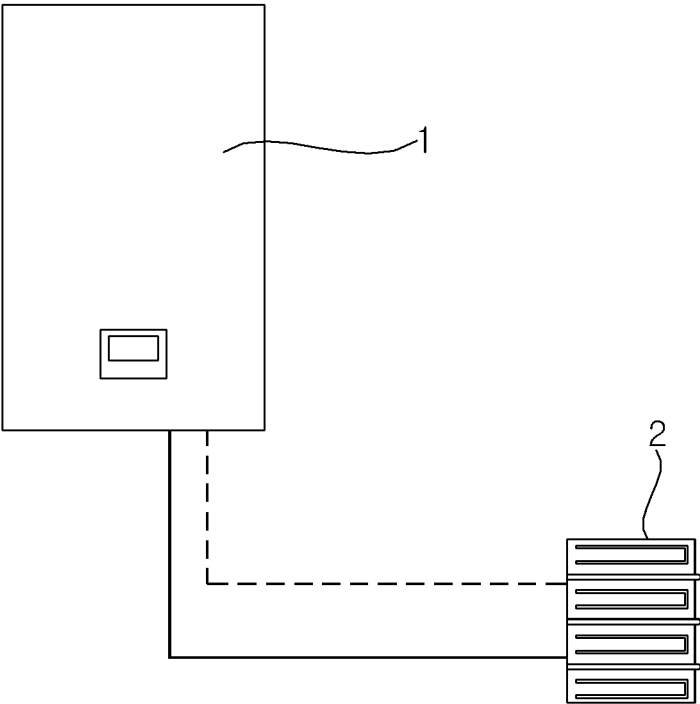


Fig. 2

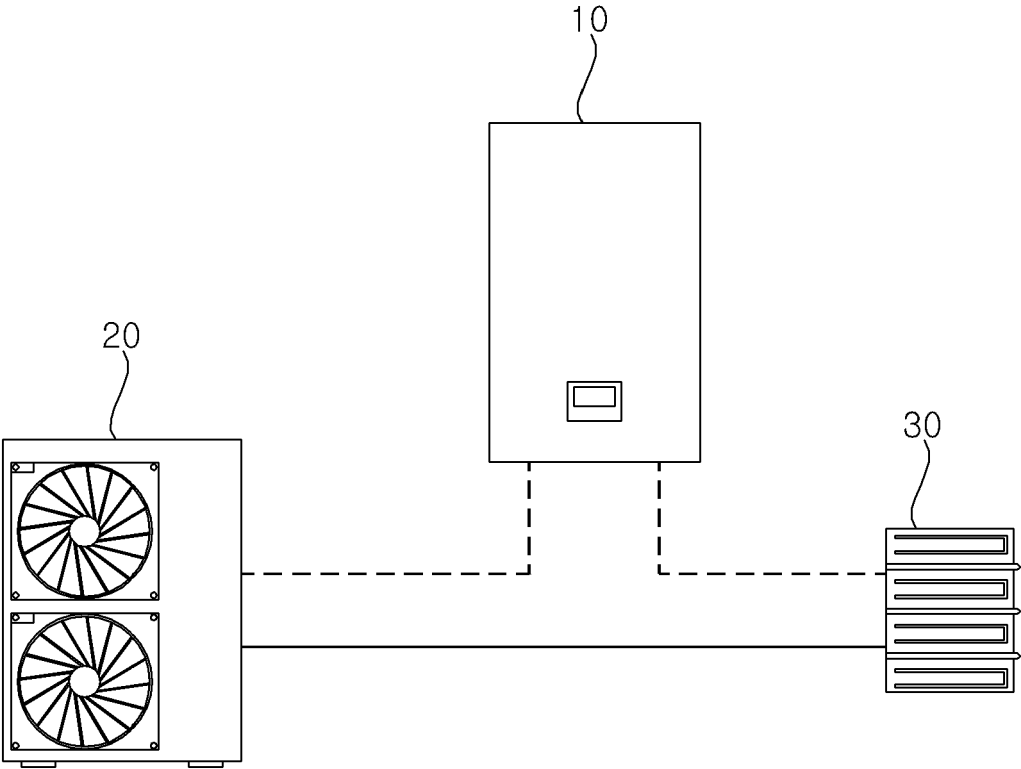


Fig. 3

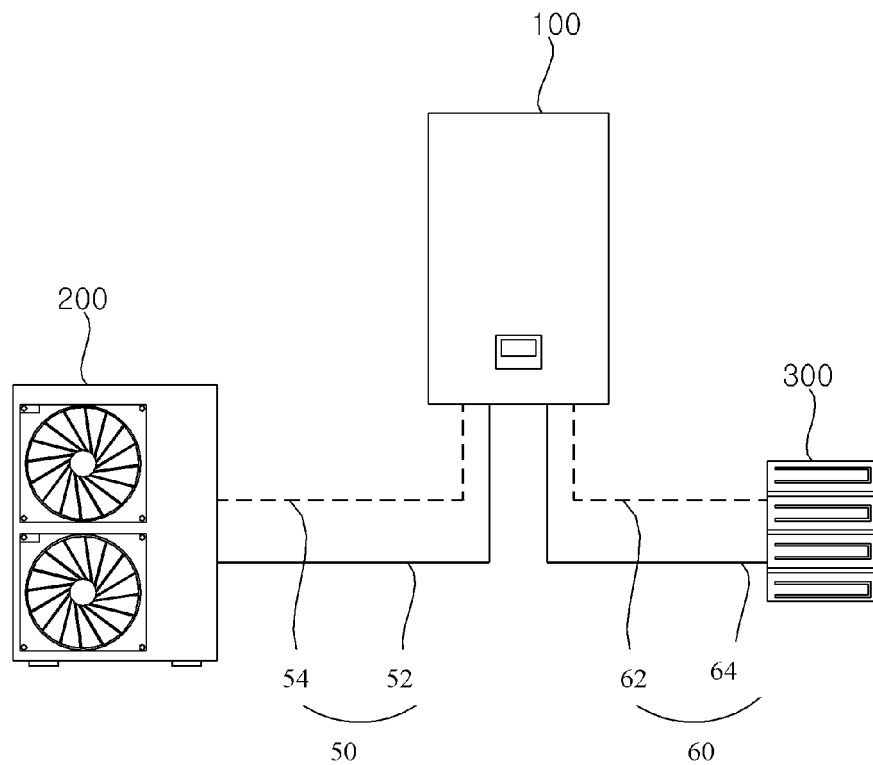


Fig. 4

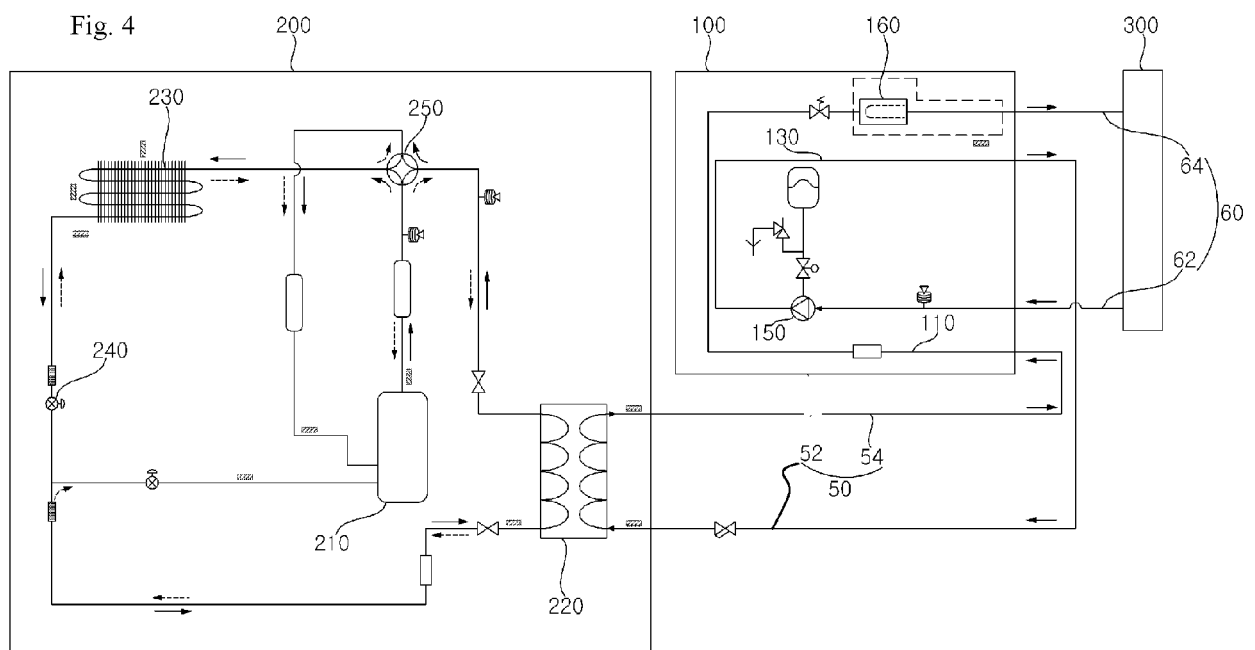


Fig. 5

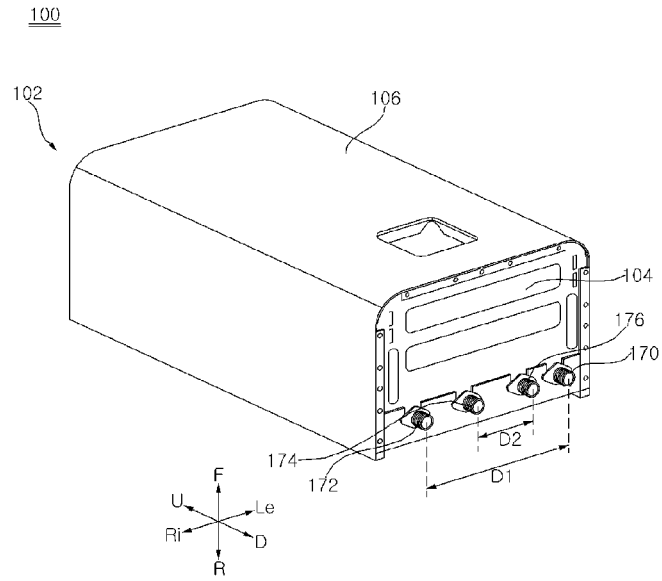
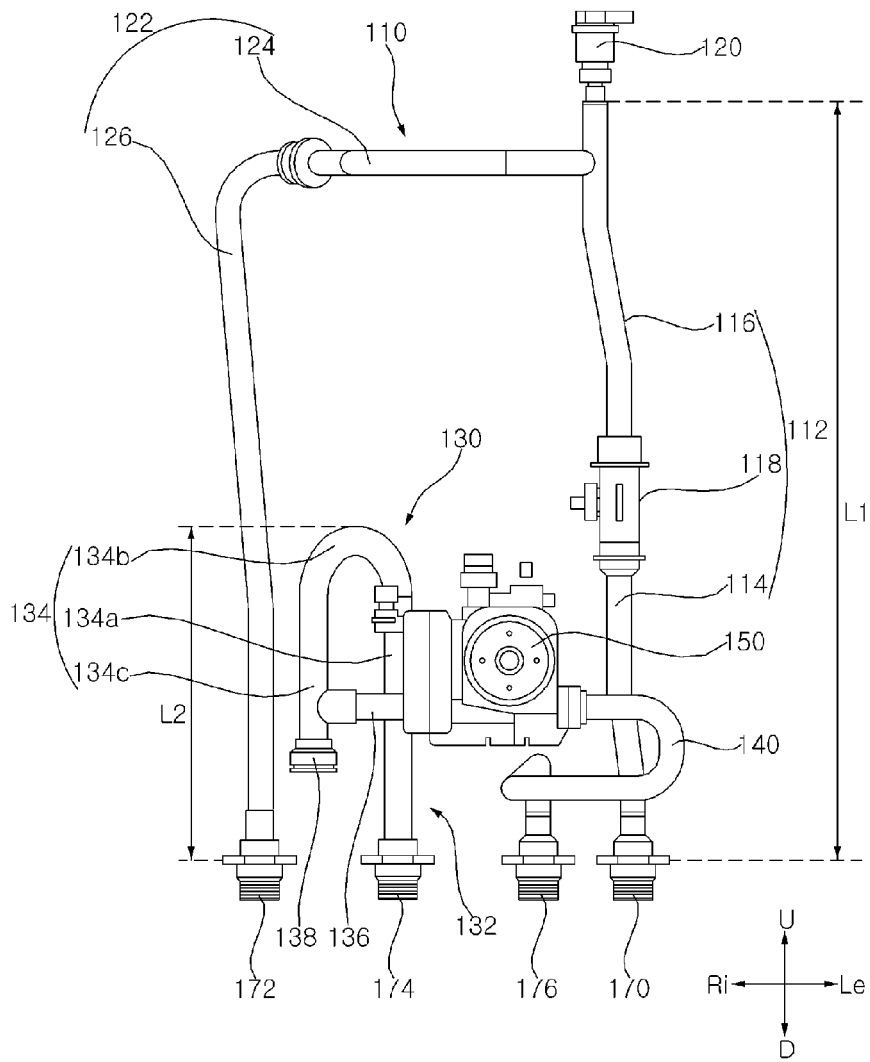


Fig. 6





EUROPEAN SEARCH REPORT

Application Number

EP 22 18 6746

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 336 453 A1 (MITSUBISHI ELECTRIC CORP [JP]) 20 June 2018 (2018-06-20)	1, 8, 9, 12, 13	INV. F24D3/18
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