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(54) **AIR CONDITIONER**

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Description

[0001] The present invention relates to an air conditioner and, more particularly, to an air conditioner for running a compressor by an engine.

[0002] An air conditioner is a device that cools or heats a room by using a heat pump cycle including a compressor, an outdoor heat exchanger, an expansion device, and an indoor heat exchanger.

[0003] The compressor needs to be run in order to circulate refrigerant in the heat pump cycle, and the air conditioner can be classified into EHP (electric heat pump) type and GHP (gas engine-driven heat pump) type depending on the method of running the compressor.

[0004] In the GHP type, the compressor is run by using an engine fueled by gas. The GHP type is suitable for industrial use or large buildings because of its low fuel costs and potentially large heating and cooling capacity.

[0005] Korean Unexamined Patent Publication KR 10-2019-0051347 discloses a GHP-type air conditioner. Notably, the air conditioner of this document discloses a structure in which the engine and the compressor are configured in a single unit, along with a plurality of components such as the outdoor heat exchanger and a heat radiator. The engine, which produces power using the explosive force of combustion of fuel gas, causes relatively high levels of vibration and noise and generates heat itself, which may affect the performance or durability of other components including the outdoor heat exchanger. Especially in the case of heat exchangers, in which a plurality of refrigerant tubes are interconnected, when the vibration coming from the engine is transmitted directly to them, the connecting portions of the refrigerant tubes may be damaged or gaps may be formed between them.

[0006] Moreover, a configuration that supplies fuel from engine to engine or emits burned gas takes up a large volume, and therefore may narrow the space occupied by compressor-related components or components through which water flows.

[0007] Another issue is that the outdoor unit of the GHP is usually installed on a rooftop of a building. The outdoor unit, with the engine placed inside, is quite hard to lift and transport because of its heavy weight. Also, the outdoor unit may have some limitations on installation because it puts an excessive load in a confined area.

[0008] Moreover, the outdoor unit of the GHP has a controller placed inside to control the engine and engine-related components. The other components, aside from the engine and its related components, may be run by a separate controller. The controller for controlling the engine and its related components is problematic in that the more the number of controllers, the higher the cost.

[0009] Another problem with the outdoor unit of the GHP is that the outdoor heat exchanger makes the components placed inside it less accessible, which may lead to low serviceability.

[0010] JP 2003 074912 A discloses an engine-driven type heat pump apparatus. JP S62 158964 A discloses a

heat pump device in which a refrigerant compressor is driven by an engine.

[0011] The present disclosure provides an air conditioner that minimizes vibration from an engine from being transmitted to heat pump components other than a compressor.

[0012] The present disclosure also provides an air conditioner that enhances the efficiency of a heat radiator and a plate-type heat exchanger where heat transfer using water occurs.

[0013] The present disclosure also provides an air conditioner that provides an efficient configuration of components included in an outdoor unit of the air conditioner. Particularly, the present disclosure provides an air conditioner in which components in a heat exchanger are configured to enhance access for serviceability.

[0014] The present disclosure also provides an air conditioner that can reduce costs by minimizing the number of controllers placed in the outdoor unit to control the components being run.

[0015] The present disclosure also provides an air conditioner that allows for easy inspection and repair by a mechanic by placing a control box and a connector near a panel, since the control box is a component of the outdoor unit that needs to be serviced the most and the connector connects a control box, refrigerant tubes, and water tubes. Furthermore, the present disclosure provides an air conditioner that can quickly cool down heat generated from the control box.

[0016] The aspects of the present disclosure are not limited to the aforementioned ones, and other aspects, which are not mentioned above, will be apparent to a person having ordinary skill in the art from the following description.

[0017] The invention is defined in the claims.

[0018] The second outdoor unit comprises: a plate-type heat exchanger that transfers heat between water and refrigerant; a first valve that sends the water discharged from the engine to the plate-type heat exchanger or the heat radiator; and a second valve that sends the water discharged from the engine to the first valve or the water pump, wherein the water pump can be placed between the plate-type heat exchanger and the heat radiator. The water pump may be placed between and/or adjacent to the heat radiator and the plate-type heat exchanger.

[0019] The second outdoor unit may comprise a second casing that forms the exterior that has an intake opening on the periphery and a discharge opening on the top, the second casing comprising: a front panel placed at the front of the second casing; a rear panel placed behind the front panel; and a pair of side panels connecting both edges of the front panel and rear panel. The second outdoor unit may further comprise a second control box containing a second controller for controlling at least one component of the air conditioner. The front panel may comprise: a first half panel disposed adjacent to the second control box; and a second half panel placed

on one side of the first half panel, and disposed adjacent to the outdoor heat exchanger.

[0020] The outdoor heat exchanger may comprise: a front heat exchanger placed inside the front panel; a first side heat exchanger that is bent at the front heat exchanger and extends rearward; a rear heat exchanger that is placed inside the rear panel and extends from the first side heat exchanger; and a second side heat exchanger that is bent at the rear heat exchanger and extends forward. The front heat exchanger may be placed behind the second half panel. Thus, the first half panel provides serviceability to the internal components inside the outdoor heat exchanger.

[0021] The water pump may be placed behind the second half panel and located closer to a reference line than the first side heat exchanger, thereby allowing the water pump to be placed in an easily serviceable position.

[0022] The water pump may be placed ahead of a virtual horizontal line that passes through centers of left and right sides of the second outdoor unit and thus divides the second outdoor unit in front and rear directions, thereby allowing the water pump to be placed in an easily serviceable position.

[0023] The first outdoor unit may further comprise a first control box containing a first controller for regulating the operation of the engine. The second outdoor unit may further comprise: a blower fan that forms a flow of air to the outdoor heat exchanger; and a second control box containing a second controller for regulating the operation of the blower fan or water pump. The first controller may control the engine-related components, and the second controller may control the other components.

[0024] The second outdoor unit may further comprise a switching valve that sends the refrigerant discharged from the compressor to the outdoor heat exchanger or an indoor heat exchanger which transfers heat between the refrigerant and the air in a room. The second controller may control the switching valve.

[0025] The second outdoor unit may comprise: a second casing that forms the exterior that has an intake opening on a side thereof and a discharge opening on a top thereof; and an orifice that is placed on an upper end of the second casing and forms a discharge path of air caused to flow by means of the blower fan. The blower fan may be placed inside the orifice and causes the air present inside the second casing to move from the intake opening to the discharge opening. The second control box may be placed below the orifice, thereby forming a flow of air by the second control box.

[0026] The second casing may comprise a second service panel in an area where the outdoor heat exchanger is not placed. This area may comprise a second connector. A plurality of refrigerant tubes and a plurality of water tubes are connected to the second connector to connect the first outdoor unit and the second outdoor unit. The second control box may be placed inside the second service panel, thereby providing easy access to the second control box.

[0027] The second service panel may have an opening portion communicating with the first control box, and a first cover covering the opening portion, thereby providing easy access to the inside of the second control box.

[0028] The first casing may comprise: a first base covering the bottom; a first peripheral panel placed above the first base and covering the periphery; and a first upper panel placed over the first peripheral panel and forming an exhaust opening. The engine may be fixed to the first base, and the first control box may be located closer to the first upper panel than the engine, thereby allowing the first control box to be placed at a far distance from the engine.

[0029] The first peripheral panel may comprise a first service panel where a first connector is placed. A plurality of refrigerant tubes and a plurality of refrigerant tubes are connected to the first connector to connect the first outdoor unit and the second outdoor unit. A first cover may be placed on the first service panel to cover an opening portion communicating with the inside of the first control box placed within, thereby providing easy serviceability to the inside of the first control box.

[0030] Details of other exemplary embodiments are included in the detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

FIG. 1 is a system diagram of an air conditioner according to an exemplary embodiment of the present disclosure.

FIG. 2 is a perspective view of a first outdoor unit and a second outdoor unit of the air conditioner according to an exemplary embodiment of the present disclosure.

FIG. 3 is a front view of a first outdoor unit and a second outdoor unit of an air conditioner according to an exemplary embodiment of the present disclosure. FIG. 4 is a rear perspective view of a first outdoor unit according to an exemplary embodiment of the present disclosure.

FIG. 5 is a front view of a first outdoor unit according to an exemplary embodiment of the present disclosure.

FIG. 6 is a rear perspective view of a first outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel is removed.

FIG. 7 is a front perspective view of a first outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel is removed.

FIG. 8 is a side view of a first outdoor unit according to an exemplary embodiment of the present disclosure from which a top cover and a frame are removed.

FIG. 9 is a plan view of a first outdoor unit according

to an exemplary embodiment of the present disclosure from which a peripheral panel, a top cover, and a frame are removed.

FIG. 10 is a rear perspective view of a second outdoor unit according to an exemplary embodiment of the present disclosure.

FIG. 11 is a front view of a second outdoor unit according to an exemplary embodiment of the present disclosure.

FIG. 12 is a front perspective view of a second outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel is removed.

FIG. 13 is a front perspective view of a second outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel, an upper panel, and a blower fan are removed.

FIG. 14 is a plan view of a second outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel, an upper panel, and a blower fan.

FIG. 15 is a rear view of a second outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel, an upper panel, a blower fan, an outdoor heat exchanger, and a heat radiator are removed.

FIG. 16 is a front perspective view of a second outdoor unit according to an exemplary embodiment of the present disclosure from which a peripheral panel, an upper panel, a blower fan, an outdoor heat exchanger, and a heat radiator are removed.

FIG. 17 is a view illustrating the relationship between a first outer refrigerant tube and an outer water tube according to an exemplary embodiment of the present disclosure.

FIG. 18 is a system diagram of an air conditioner according to another exemplary embodiment of the present disclosure.

[0032] Advantages and features of the disclosure and methods of accomplishing the same may be understood more readily by reference to the following detailed descriptions of the embodiments and the accompanying drawings. In this regard, the disclosure may, however, be embodied in many different forms and should not be construed as being 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 concept of the embodiments to one of ordinary skill in the art. Like reference numerals indicate like elements throughout the specification.

[0033] Terms indicating directions such as front (F), rear (R), left (Le), right (Ri), up (U), and down (D) shown in FIGS. 2 to 17 are for the convenience of explaining the air conditioner according to exemplary embodiments of the present disclosure. Thus, these directions shall be interpreted based on the orientation of the object.

[0034] Hereinafter, the present disclosure will be de-

scribed with reference to the drawings which are provided to describe an air conditioner according to exemplary embodiments of the present disclosure.

5 <Overall Configuration>

[0035] Referring to FIG. 1, an air conditioner according to the present disclosure includes a first outdoor unit 100 for running an engine 140 and a compressor 150 on a gas fuel, a second outdoor unit 200 for transferring heat between outside air and refrigerant discharged from the compressor 150 or transferring heat between outside air or refrigerant and water for cooling the engine 140, water tubes 400 connecting the first outdoor unit 100 and the second outdoor unit 200, through which water flows, and a first outer refrigerant tube (or first refrigerant tube) 310 connecting the first outdoor unit 100 and the second outdoor unit 200, through which refrigerant flows.

[0036] The air conditioner according to the present disclosure includes at least one indoor unit (not shown) connected to the second outdoor unit 200 and a second outer refrigerant tube (or second refrigerant tube) 320 connecting the second outdoor unit 200 and the indoor unit, through which refrigerant flows.

[0037] The first outdoor unit 100 and the second outdoor unit 200 are placed apart from each other. The first outdoor unit 100 and the second outdoor unit 200 are connected by the first outer refrigerant tube 310 and the water tubes 400. Thus, it is possible to minimize the vibration caused by the running of the engine 140 and compressor 150 included in the first outdoor unit 100 from being transmitted to the second outdoor unit 200.

35 <First Outdoor Unit>

[0038] The first outdoor unit 100 includes an engine 140 (see FIGS. 6 and 7) which runs by the combustion of a gas fuel, a compressor 150 (see FIG. 6) connected to the engine 150 by a belt 152, for compressing refrigerant, and a first casing 110 (see FIGS. 4 and 5) forming an internal space where the engine 140 and the compressor 150 are placed.

[0039] The first casing 110 may include a first base 112 (see FIG. 4) covering the bottom, first frames 114 (see FIG. 6) placed vertically upward from the first base 112 and forming a framework, a first peripheral panel 122 (see FIG. 4) placed above the first base 112 and connected to the first frames 114 to cover the periphery, and a first upper panel 126 (see FIG. 6) 126 placed over the first peripheral panel 122 and forming an exhaust opening 128.

[0040] Referring to FIG. 6, the first base 112 may be fixed to the ground and secure the components placed inside the first casing 110. The first base 112 may include a first base panel 116, a first base support 118 placed below the first base panel 116, for placing the first base panel 116 some distance above the ground, and a first base frame 120 placed on top of the first base panel 116,

where some of the components are secured.

[0041] Referring to FIG. 8, the first base 112 may include two first base frames 120 on top of the first base panel 116 that are placed apart from each other. The first base frames 120 have a roughly Π -shaped cross section, with two opposite edges being secured to the first base panel 116. With the first base frames 120 whose two opposite edges are bent and secured to the first base panel 116, it is possible to alleviate vibration generated from a damper 146 and transmitted to the first base panels 116, which will be described later.

[0042] Referring to FIG. 7, the first frames 114 may be placed on the corners of the first base panel 116. The first peripheral panel 122 is connected to the first frames 114 spaced apart from one another and covers the periphery of the first outdoor unit 100.

[0043] Referring to FIG. 7, the first frames 114 may include a plurality of first corner frames 114a placed on the corners of the first base 112 and a first middle frame 114b placed between the first corner frames 114a.

[0044] The first peripheral panel 122 includes a first front panel 122a placed on one side, a first rear panel 122b spaced apart from the first front panel 122a and placed parallel to the first front panel 122a, and two first side panels 122c and 122d placed between the first front panel 122a and the first rear panel 122b. Referring to FIGS. 4 and 5, the first front panel 122a and the first rear panel 122b may be the same size, and the two first side panels 122c and 122d also may be the same size.

[0045] Referring to FIG. 5, the first front panel 122a may be divided into a (1-1)th half panel 122a1 and a (1-2)th half panel 122a2 that are placed to the left and right of the first middle frame 114b.

[0046] The first peripheral panel 122 may include a first service panel 123 where a first connector 124 is placed, with a first outer refrigerant tube 310 and an outer water tube (or water tube) 410 being connected to the first connector 124. Referring to FIG. 5, the (1-2)th half panel 122a2 may be used as the first service panel 123. The first service panel 123 is placed between the first middle frame 114b and the first corner frames 114a. A first control box 180 to be described later may be placed inside the first service panel 123.

[0047] That is, the first service panel 123 may be removably placed, and this may increase accessibility to the first control box 180. Also, the refrigerant tubes 300 and water tubes 400 connected to the first connector 124 placed on the first service panel 123 are made easily serviceable.

[0048] The first connector 124 where the first outer refrigerant tube 310 and the outer water tube 410 are connected is placed on the first service panel 123. The first connector 124 is placed on a lower end of the first service panel 123.

[0049] The first service panel 123 has an opening portion communicating with the inside of the first control box 180 placed within, and a first cover 125 covering the opening portion is placed on the first service panel 123.

The first cover 125 may be placed on an upper end of the first service panel 123 to open and close the opening portion communicating with the first control box 180.

[0050] The first control box 180 is placed on an upper end of the first service panel 123. That is, the first control box 180 is placed on an upper end of the first service panel 123 so as to be spaced apart from the engine 140, thereby minimizing the heat generated from the engine 140 from being transmitted to the first control box 180.

[0051] Referring to FIG. 5, the (1-1)th half panel 122a1 may have an opening portion communicating with the inside of a circuit box 182 placed within, and a third cover 125 covering the opening portion may be placed on the (1-1)th half panel 122a1. The third cover 125b may be placed on a lower end of the (1-1)th half panel 122a1 to open and close the opening portion communicating with the circuit box 182.

[0052] Referring to FIG. 6, the first upper panel 126 has an exhaust opening 128 with no fan, through which air heated by the engine 140 is exhausted. Also, a top cover 130 for keeping water from coming from the outside through the exhaust opening 128 may be placed on the first upper panel 126. Moreover, the gas exhaust opening 128 for emitting exhaust gas exiting the engine 140 may be placed on the first upper panel 126.

[0053] A first top grille 132 covering the top of the first upper panel 126 may be placed on top of the first upper panel 126. The first top grille 132 has a lattice pattern or stripe pattern so as to prevent an external object from falling to the first upper panel 126, without disturbing air flow.

[0054] The engine 140 is an internal combustion engine which works through the process of burning compressed gas. The engine 140 may rotate an engine side pulley 142 (see FIG. 1) placed on one side of the engine 140 on a four-stroke cycle of intake, compression, ignition, and exhaust.

[0055] Referring to FIG. 7, the first outdoor unit 100 includes an engine frame 144 located above the first base 112 where the engine 140 is fixed in place, and a damper 146 that connects the engine frame 144 and the first base 121 and alleviates vibration caused by the running of the engine 140. The first outdoor unit 100 includes a plurality of dampers 146. Referring to FIGS. 6 and 7, four dampers 146 may be placed apart from one another.

[0056] Each of the dampers 146 may connect the engine frame 144 and the first base 112. Lower ends of the dampers 146 may be attached to the first base frames 120, and an upper end thereof may be attached to the engine frame 144.

[0057] One side of the engine frame 144 may be attached to the engine 140, and the other side may be connected to the damper 146. Thus, it is possible to minimize the vibration caused by the running of the engine 140 from being transmitted throughout the first casing 110.

[0058] The engine frame 144 may fix the compressor 150 in place which is connected to the engine 140 by the

belt 152. That is, the engine frame 144 may allow the engine 140 and the compressor 150 to be placed apart from the first base 112 by some distance.

[0059] By being connected to the engine 140, the compressor 150 may compress refrigerant when the engine 140 operates. Two compressors 150 connected to the engine 140 may be placed on the first outdoor unit 100. The compressors 150 may have a compressor side pulley 154 connected to the engine side pulley 142 by the belt 152, and may compress refrigerant as the compressor side pulley 154 (see FIG. 1) rotates by the running of the engine 140.

[0060] Referring to FIGS. 6 and 7, the first outdoor unit 100 may include an air cleaner 160 that provides clean air by filtering the air supplied to the engine 140, a zero governor 162 that allows for the supply of gas to the engine 140 at a given pressure, a mixer 164 that mixes the gas and air supplied through the air cleaner 160 and zero governor 162, an exhaust gas heat exchanger 166 that transfers heat between water and gas exiting the engine 140, a muffler 168 that reduces the noise of the exhaust gas exiting the engine, and a drain filter 170 that purifies and releases condensate generated from the exhaust gas that has passed through the muffler 168.

[0061] The zero governor 162 allows for the supply of fuel at a given pressure regardless of changes in the pressure or flow rate of fuel entering the zero governor 162. The zero governor 162 may maintain a stable exit pressure across a wide range and adjust the pressure of gas fuel supplied to the engine so that it remains almost steady at atmospheric pressure.

[0062] The air cleaner 160 may block dust, misty moisture, and oil getting mixed into the air by filtering outside air supplied to the engine using a filter.

[0063] The mixer 164 lets out the supplied fuel and air at a given mixture ratio and supplies them to the engine.

[0064] The zero governor 162 may be fixed in place to one side of the first frames 114. The air cleaner 160 is located adjacent to the zero governor 162. The air cleaner 160 may be secured to the first upper panel 126 through a separate securing member 184.

[0065] The muffler 168 may be fixed in place to one side of the first frames 114. The muffler 168 may be placed above the drain filter 170 so that the condensate generated from the muffler 168 may enter the drain filter 170. The drain filter 170 may be fixed in place to the first base 112. Referring to FIG. 7, the drain filter 170 may be fixed in place on top of the first base frames 120. A gas exhaust opening 134 may be placed above the muffler 168. Thus, the exhaust gas passed through the muffler 168 may escape through the gas exhaust opening 134.

[0066] The first outdoor unit 100 includes an oil tank 172 storing oil and an oil pump 174 for supplying the oil stored in the oil tank 172 to the engine. The oil pump 174 may supply the oil stored in the oil tank 172 to the engine and preheat or cool the engine 140.

[0067] The oil tank 172 may be fixed in place above the first base panel 116. The oil tank 172 may be placed

between the two first base frames 120 placed apart from each other.

[0068] The first outdoor unit 100 may include a first control box 180 incorporating a first controller (not shown) for regulating the operation of the engine 140 or compressor 150, and a circuit box 182 with a transformer (not shown) placed in it to convert current signal and voltage signal.

[0069] The first control box 180 is placed apart from the engine 140. Referring to FIG. 7, the engine 140 is fixed in place to the first base 112, and the first control box 180 is located adjacent to the first upper panel 126. In an inner space formed by the first peripheral panel 122, the first base 112, and the first upper panel 126, the first control box 180 is placed as far as possible from the engine 140. This minimizes the heat generated from the engine 140 from being transmitted to the first control box 180.

[0070] The first control box 180 is placed behind the first service panel 123. The first control box 180 may be placed between the first middle frame 114b and the first corner frames 114a, and may be fixed in place to the first middle frame 114b and the first corner frames 114a.

<Second Outdoor Unit>

[0071] The second outdoor unit 200 includes a second casing 210 (see FIG. 10) forming the exterior that has a second intake opening 221a on the periphery and a discharge opening 226a on the top, a blower fan 230 (see FIG. 10) that sends the air inside the second casing 210 to the discharge opening 226a, a fan motor M (see FIG. 1) that rotates the blower fan 230, an outdoor heat exchanger 240 (see FIG. 10) placed inside the second casing 210 where the second intake opening 221a is formed, a water pump 238 (see FIG. 12) that supplies water to the engine 140 or the exhaust gas heat exchanger 166, and a switching valve 242 (see FIG. 13) placed inside the second casing 210 that sends the refrigerant discharged from the compressor 150 to the outdoor heat exchanger 240 or the indoor unit.

[0072] The second casing 210 may include a second base 212 (see FIG. 12) covering the bottom, second frames 218 (see FIG. 12) placed vertically upward from the second base 212 and forming a framework, a second peripheral panel 222 (see FIG. 10) placed above the second base 212 and connected to the second frames 218 to cover the periphery, and a second upper panel 226 (see FIG. 12) placed over the second peripheral panel 220 and forming an discharge opening 226a.

[0073] The second base 212 includes a second base panel 214 and a second base support 216 placed below the second base panel 214, for placing the second base panel 214 some distance above the ground.

[0074] The second frames 218 may be placed on the corners of the second base panel 214. The second peripheral panel 220 may be placed such that it is connected to the second frames 218 spaced apart from one another, so as to cover the periphery of the second out-

door unit 200.

[0075] The second frames 218 may include a plurality of second corner frames 218a (see FIG. 12) placed on the corners of the second base 212 and a second middle frame (not shown) placed between the second corner frames 218a.

[0076] Referring to FIGS. 10 and 11, the second peripheral panel 220 includes a second front panel 220a placed on one side, a second rear panel 220b spaced apart from the second front panel 220a and placed parallel to the second front panel 220a, and two second side panels 220c and 220d placed between the second front panel 220a and the second rear panel 220b. The second front panel 220a and the second rear panel 220b may be the same size, and the two second side panels 220c and 220d also may be the same size.

[0077] Referring to FIG. 11, the second front panel 220a may be divided into a (2-1)th half panel 220a1 and a (2-2)th half panel 220a2 that are placed to the left and right when viewed from the front.

[0078] The second peripheral panel 220 may include a second service panel 223 where a second connector 222a is placed, with a second outer refrigerant tube 310 and an outer water tube (or water tube) 410 being connected to the second connector 222a. Referring to FIG. 11, the (2-2)th half panel 220a2 may be used as the second service panel 223. The second service panel 223 is placed between the second middle frame 218b and the second corner frames 218a. A second control box 256 to be described later may be placed inside the second service panel 223.

[0079] Referring to FIG. 11, the second connector 222a where the first outer refrigerant tube 310 and the outer water tube 410 are connected is placed on the second service panel 223. The second connector 222a is placed on a lower end of the second service panel 223.

[0080] Referring to FIG. 11, a third connector 222b where a second outer refrigerant tube 320 is connected may be placed on the second service panel 223. The third connector 222b may be placed apart from the second connector 222a in one direction, and may be placed at the same height as the second connector 222a.

[0081] The second service panel 223 has an opening portion communicating with the inside of the second control box 256 placed within, and a second cover 225 covering the opening portion is placed on the second service panel 223. The second cover 225 may be placed on an upper end of the second service panel 223 to open and close the opening portion communicating with the second control box 256.

[0082] The second control box 256 is placed on an upper end of the second service panel 223. That is, the second control box 256 is located adjacent to the blower fan 230 placed in an upper part of the second peripheral panel 223, which allows for quick formation of a convection of air around the second control box 256 and therefore cools the second control box 256.

[0083] At least one discharge opening 226a is formed

on the second upper panel 226. Referring to FIG. 12, two discharge openings 226a are formed on the second upper panel 226. A blower fan 230 is placed under each of the discharge openings 226a. An orifice 228 where the blower fan 230 resides is placed under the second upper panel 226.

[0084] A second top grille 232 covering the blower fan 230 and the second upper panel 226 may be placed on top of the second upper panel 226.

[0085] Referring to FIGS. 10 to 11, the second peripheral panel 220 may have a second intake opening 221a in a lower part by which the inside and outside of the second casing 210 communicate, and a cover portion 221a placed above the second intake opening that covers the outer sides of the blower fan 230 and orifice 228. The second service panel 223 may be formed in its entirety as the cover portion 221 without having an intake opening.

[0086] Referring to FIGS. 2 and 3, the second casing 210 may be made the same size as the first casing 110. That is, the second base 212 included in the second casing 210 may be the same size as the first base 112 included in the first casing 110. Also, the second peripheral panel 220 included in the second casing 210 may be the same size as the first peripheral panel 122 included in the first casing 110. Hence, the first base 112 and the second base 212 may be produced in the same manufacturing process since they are the same size, and the first peripheral panel 122 and the second peripheral panel 220 also may be produced in the same manufacturing process since they are the same size. This will simplify the production process of the first casing 110 and second casing 210 and reduce the manufacturing costs.

[0087] The outdoor heat exchanger 240 is placed inside the second intake opening 221a formed on the second peripheral panel 220. The outdoor heat exchanger 240 may be placed on at least two sides of the second peripheral panel 220 of the second casing 210. The outdoor heat exchanger 240 may be placed side by side on all four sides of the second peripheral panel 220.

[0088] Referring to FIG. 14, the outdoor heat exchanger 240 includes a front heat exchanger 240a placed inside the second front panel 220a, a first side heat exchanger 240b extending from the front heat exchanger 240a and placed inside the second side panel 220c, a rear heat exchanger 240a extending from the first side heat exchanger 240b and placed inside the second rear panel 220b, and a second side heat exchanger 240d extending from the second rear heat exchanger 240c and placed inside the second side panel 220d.

[0089] The front heat exchanger 240a may be made half or less than the size of the rear heat exchanger 240c. The second side heat exchanger 240d may be made half or less than the size of the first side heat exchanger 240b.

[0090] The outdoor heat exchanger 240 is not placed inside the second service panel 223. Thus, the outdoor heat exchanger 240 is not placed inside the (2-1)th half panel 220a1 of the second front panel 220a. That is, the

front heat exchanger 240a is placed inside the (2-2)th half panel 220a2.

[0091] The internal components placed inside the second outdoor unit 200 are placed mainly behind the (2-1)th half panel 220a1. Here, the internal components placed inside the second outdoor unit 200 refer to the components placed inside the second peripheral panel 220, apart from the outdoor heat exchanger 240 and the heat radiator 250. That is, the internal components may include an accumulator 246, a plate-type heat exchanger 248, a water tank 254, and a water pump 238. Further, the internal components may include a switching valve 242 and water valves 252a and 252b.

[0092] Referring to FIG. 14, the accumulator 246, the plate-type heat exchanger 248, and the water tank 254 are placed in an area where the second service panel 223 resides, with respect to a virtual vertical line VC extending forward and backward from the second middle frame 218b. The virtual vertical line VC corresponds to a line passing through centers of front and rear sides of the second outdoor unit 200 and thus dividing the second outdoor unit 200 in left and right directions.

[0093] Moreover, an oil separator 244 and the water pump 238 are placed opposite the second service panel 223 with respect to the virtual vertical line VC or located closer to the virtual vertical line VC than the first side heat exchanger 240b.

[0094] The outdoor heat exchanger 240 may be placed inside the second peripheral panel 220, except the second service panel 223. The outdoor heat exchanger 240 may have one edge on the inside of the (2-2)th half panel 220a2 of the second front panel 220a and the other edge on the inside of the second side panels 220c and 220d located adjacent to the (2-1)th half panel 220a1.

[0095] A blower fan 230 is placed above the outdoor heat exchanger 240 to move air to the discharge opening 226a formed on the second upper panel 226. An orifice 228 is placed above the outdoor heat exchanger 240 to form a flow of air moving to the discharge opening 226a and create a space where the blower fan 230 resides.

[0096] The water pump 238 may send water to the engine 140 and the exhaust gas heat exchanger 166 to cool the engine 140 and the exhaust gas heat exchanger 166. The water pump 238 may be fixed in place to the second base 212.

[0097] Referring to FIG. 18, the water pump 238 may be placed in the first outdoor unit 100. Even if the water pump 238 is placed in the first outdoor unit 100, there are no additional water tubes or refrigerant tubes that are exposed on the outside of the first outdoor unit 100 and second outdoor unit 200. Thus, the water pump 238 may be placed in the first outdoor unit 100. However, in order to regulate the operations of the blower fan 230 and water pump 238 by a second controller, it is desirable that the water pump 238 is placed inside the second outdoor unit 200, as shown in FIG. 1.

[0098] The switching valve 242 is placed inside the second casing 210 and sends the refrigerant discharged

from the compressor 150 to the outdoor heat exchanger 240 or the indoor unit. The switching valve 242 may send the refrigerant supplied from the indoor unit or the plate-type heat exchanger 248 to be described later to the compressor 150. The switching valve 242 is connected to the oil separator 244 and the accumulator 246. Therefore, the refrigerant discharged from the compressor 150 and passed through the oil separator 244 may enter the switching valve 242. Also, the refrigerant may flow from the switching valve 242 to the compressor 150 via the accumulator 246. The switching valve 242 may be a four-way valve that selectively connects refrigerant tubes that are connected in four directions.

[0099] Referring to FIG. 1 and FIG. 14, the second outdoor unit 200 includes an oil separator 244 that separates oil from the refrigerant discharged from the compressor 150, an accumulator 246 that separates refrigerant supplied to the compressor 150 and supplies vapor refrigerant to the compressor 150, a plate-type heat exchanger 248 that transfers heat between water and refrigerant, a heat radiator 250 that transfers heat between water and outside air, water valves 252a and 252b that adjust the direction of flow of water, and a water tank 254 storing water. The second outdoor unit 200 may further include an overcooling heat exchanger 260 that cools moving liquid refrigerant by expanding some of the moving liquid refrigerant and transferring heat, and an expansion valve 262 that expands the refrigerant released from the outdoor heat exchanger 240.

[0100] The oil separator 244 is placed between the switching valve 242 and the compressor 150. The oil separator 244 separates oil from the refrigerant discharged from the compressor 150. The oil separator 244 may be fixed in place to the second base panel 214.

[0101] The accumulator 246 is placed between the switching valve 242 and the compressor 150. The second base panel 214 separates the refrigerant entering the compressor 150 into vapor refrigerant and liquid refrigerant and sends the vapor refrigerant to the compressor 150. The accumulator 246 may be fixed in place to the second base panel 214. The accumulator 246 may have a cylindrical shape.

[0102] Referring to FIG. 1, refrigerant flowing through the four-way valve 242 from the indoor heat exchanger (not shown) or refrigerant flowing through the plate-type heat exchanger 248 may be supplied to the accumulator 246. Also, the accumulator 246 may be connected to the overcooling heat exchanger 260 so that refrigerant generated by the overcooling heat exchanger 260 is supplied to it.

[0103] The plate-type heat exchanger 248 transfers heat between water caused to flow by means of the water pump 238 and refrigerant caused to flow by means of the compressor 150. In heating mode in which the indoor heat exchanger (not shown) placed in the indoor unit is used as a condenser, the refrigerant passed through the indoor heat exchanger (not shown) may flow to the plate-type heat exchanger 248. Also, in heating mode, the

water caused to flow by means of the cooling pump 238 may flow to and then be cooled in the plate-type heat exchanger 248.

[0104] The plate-type heat exchanger 248 transfers heat between refrigerant coming from the indoor heat exchanger (not shown) and water released from the engine 140. The plate-type heat exchanger 248 may be connected to the first valve 252a and the water pump 238 and send the water coming via the first valve 252a to the water pump 238 through heat transfer. The plate-type heat exchanger 248 may supply the refrigerant coming from the indoor heat exchanger to the accumulator 246 through heat transfer.

[0105] The plate-type heat exchanger 248 may be fixed in place to the second base panel 214. Referring to FIG. 17, the plate-type heat exchanger 248 may be placed between the accumulator 246 and the oil separator 244 when viewed from the top.

[0106] The heat radiator 250 may lower the temperature of water by transferring heat between the water and the air flowing to the second intake opening 221a. The heat radiator 250 is placed inside the outdoor heat exchanger 240. The area the heat radiator 250 occupies in the direction of the second intake opening 221a may be smaller than the area the outdoor heat exchanger 240 occupies in the direction of the second intake opening 221a. Referring to FIG. 13, the vertical length 250L of the heat radiator 250 may be shorter than the vertical length 240L of the outdoor heat exchanger 240.

[0107] The heat radiator 250 includes a front heat radiator 250a placed inside the front heat exchanger 240a, a first side heat radiator 250b placed inside the first side heat exchanger 240b, a rear heat radiator 250c placed inside the rear heat exchanger 240c, and a second side heat radiator 250d placed inside the second side heat exchanger 240d.

[0108] Referring to FIG. 13, the water valves 252a and 252b include a first valve 252a that sends the water released from the engine 140 to the plate-type heat exchanger 248 or the heat radiator 250, and a second valve 252b that sends the water released from the engine 140 to the first valve 252a or the water pump 238. The first valve 252a and the second valve 252b may be three-way valves.

[0109] Referring to FIG. 12, the second outdoor unit 200 includes a second control box 256 incorporating a second controller (not shown) for regulating the operations of the blower fan 230 and water pump 238.

[0110] The second control box 256 is placed inside the second service panel 223. The second controller for regulating the operations of the blower fan 230 and water pump 238 is placed inside the second control box 256. That is, the operations of the blower fan 230 and water pump 238 may be regulated by a single electronic part. In a case where the water pump 238 is placed inside the first outdoor unit 100, a separate electronic part for regulating the operation of the water pump 238 may be required. In the present disclosure, the operations of both of the

blower fan 230 and water pump 238 may be regulated by the second controller placed inside the second control box 256, thereby preventing an increase in the cost of additional parts. Also, the second controller may adjust the opening and closing of the switching valve 242 or water valves 252a and 252b.

[0111] That is, when the air conditioner is in cooling mode, the second controller may adjust the switching valve 242 to send the refrigerant released from the compressor 150 to the outdoor heat exchanger 240, and, when the air conditioner is in heating mode, the second controller may adjust the switching valve 242 to send the refrigerant released from the compressor 150 to the indoor heat exchanger.

[0112] Moreover, when the air conditioner is in cooling mode, the second controller may adjust the water valves 252a and 252b to send the water released from the engine 140 to the heat radiator 250, and, when the air conditioner is in heating mode, the second controller may adjust the water valves 252a and 252b to send the water released from the engine 140 to the plate-type heat exchanger 248.

[0113] The components placed inside the second outdoor unit 200 are located adjacent to an area not concealed by the outdoor heat exchanger 240.

[0114] Referring to FIG. 14, the front heat exchanger 240a is positioned to face the rear heat exchanger 240c. The lateral length 240aL of the front heat exchanger 240a may be equal to or shorter than half the lateral length 240cL of the rear heat exchanger 240c.

[0115] The first side heat exchanger 240b is positioned to face the second side heat exchanger 240d. The longitudinal length 240dL of the second side heat exchanger 240d may be equal to or shorter than half the longitudinal length 240bL of the first side heat exchanger 240b.

[0116] The lateral length 240cL of the rear heat exchanger 240c may range from 1.5 to 2 times the longitudinal length 240bL of the first side heat exchanger 240b.

[0117] The area not concealed by the outdoor heat exchanger 240 is formed on the front and right sides of the second outdoor unit 200.

[0118] Referring to FIG. 14, the second outdoor unit 200 may be divided into four sections by a virtual vertical line VC that extends to the front and rear (F-R) from the center of the lateral axis (Ri-Le) and divides the second outdoor unit 200 in left and right directions, and a virtual horizontal line HC that extends to the left and right (Ri-Le) from the center of the longitudinal axis (F-R) and divides the second outdoor unit 200 in front and rear directions. In other words, the virtual horizontal line HC corresponds to a line passing through centers of left and right sides of the second outdoor unit 200 and thus dividing the second outdoor unit 200 in front and rear directions.

[0119] Referring to FIG. 14, the second outdoor unit 200 may be divided into a first section I placed in the front right side, a second section II placed in the rear right side, a third section III placed in the front left side, and a fourth

section IV placed in the rear left side, with respect to the vertical line VC and the horizontal line HC.

[0120] Referring to FIG. 14, the outdoor heat exchanger 240 is not placed in the first section I. The second service panel 223 is placed at the front of the first section I. Thus, the components placed inside the second casing 210 may be repaired or inspected once the second service panel 223 is removed.

[0121] Therefore, the components placed inside the second outdoor unit 200 may be placed in the first section I or the second section II. Referring to FIG. 14, the accumulator 246 and the plate-type heat exchanger 248 are placed in the second section II. Referring to FIG. 14, the water tank 254 is placed in the first section I.

[0122] They may be placed in the third section III or the fourth section IV to make effective use of the interior of the second casing 210. The components placed in the third section III or the fourth section IV are located closer to the vertical line VC than the first side heat exchanger 240b, thereby enabling the user to have the relevant component easily repaired or inspected.

[0123] That is, referring to FIG. 14, the distance D1 from the vertical line VC to the water pump 238 placed in the third section III is shorter than the distance D2 from the vertical line VC to the first side heat exchanger 240b. Also, the distance D3 from a virtual reference line V1, which extends to the front and rear from the end of the front heat exchanger 240a placed at the front, to the water pump 238 is shorter than the distance D2 from the virtual reference line V1 to the first side heat exchanger 240b.

[0124] Referring to FIG. 14, the water pump 238 is placed between the heat radiator 250 and the plate-type heat exchanger 248. Here, the expression "between the heat radiator 250 and the plate-type heat exchanger 248" may refer to between inlet and outlet ends of the heat radiator 250 and the plate-type heat exchanger 248. Referring to FIG. 14, the inlet and outlet ends of the heat radiator 250 may be formed at the ends of the front heat radiator 250a.

[0125] Since the water pump 250 is located adjacent to the heat radiator 250 and the plate-type heat exchanger 248, it is easier to ensure a flow of water moving to the heat radiator 250 and the plate-type heat exchanger 248 and therefore to provide faster heat transfer.

[0126] The switching valve 242 and oil separator 244 placed in the fourth section IV are located closer to the vertical line VC than the first side heat exchanger 240b.

<Refrigerant Tubes and Water Tubes>

[0127] Referring to FIG. 1, the refrigerant tubes 300 may send the refrigerant discharged from the compressor 150 to the outdoor heat exchanger 240 or the indoor heat exchanger (not shown) and circulate the refrigerant back to the compressor 150 after heat transfer. The refrigerant tubes 300 may include a first inner refrigerant tube 330 placed inside the first outdoor unit 100, a second

inner refrigerant tube 340 placed inside the second outdoor unit 200, and a third inner refrigerant tube (not shown) placed inside the indoor unit (not shown). Also, the refrigerant tubes 300 may include a first outer refrigerant tube 310 that is exposed on the outside of the first outdoor unit 100 and second outdoor unit 200 and connects the first outdoor unit 100 and the second outdoor unit 200, and a second outer refrigerant tube 320 that is placed outside the second outdoor unit 200 and the indoor unit and connects the second outdoor unit 200 and the indoor unit.

[0128] The water tubes 400 may allow the water discharged from the water pump 238 to pass through the exhaust gas heat exchanger 166, the engine 140, and the heat radiator 250 or to pass through the plate-type heat exchanger 248 and circulate back to the water pump 238.

[0129] Referring to FIG. 1, the water tubes 400 include a first inner water tube 420 placed inside the first outdoor unit 100, a second inner water tube 430 placed inside the second outdoor unit 200, and an outer water tube 410 placed outside the first outdoor unit 100 and the second outdoor unit 200 and connecting the first outdoor unit 100 and the second outdoor unit 200.

[0130] Referring to FIGS. 2 and 3, the first outer refrigerant tube 310 and the second outer refrigerant tube 410 connect the first outdoor unit 100 and the second outdoor unit 200. Referring to FIG. 17, the first outer refrigerant tube 310 and the outer water tube 410 include at least one bending portion 312 and 412 so as to keep the vibration generated from the first outdoor unit 100 from being transmitted to the second outdoor unit 200. Referring to FIG. 17, the first outer refrigerant tube 310 and the outer water tube 410 each include four bending portions 312 and 412.

[0131] The length of the water tubes 400 may be set in consideration of the performance of the water pump 238. The performance of the water pump 238 needs to be enough to form a flow of water throughout the water tubes 400 including the heat radiator 250. Thus, the length of the water tubes 400 may be limited by the performance range of the water pump 238, and therefore it is desirable that the outer water tube 410 is made as short as possible. On the contrary, the length of the refrigerant tubes 300 may be less limited in length compared to water tubes 400, in that the compressor 150 is run by the engine 140 and connected to a plurality of indoor units.

[0132] Accordingly, referring to FIG. 17, the length $L1+2*H1+2*W1$ of the first outer refrigerant tube 310 exposed to the outside (i.e., the length of the first outer refrigerant) is greater than the length $L2+2*H2+2*W2$ of the outer water tube 410 exposed to the outside (i.e., the length of the outer water tube).

[0133] The first outer refrigerant tube 310 interconnects the first outdoor unit 100 and the second outdoor unit 200 which are located adjacent to each other, and the second outer refrigerant tube 320 interconnects the second outdoor unit 200 and the indoor unit (not shown) which are placed in difference spaces. Thus, the length

L1+2*H1+2*W1 of the first outer refrigerant tube 310 may be less than the length (not shown) of the second outer refrigerant tube 320 exposed to the outside (i.e., the length of the second outer refrigerant tube).

[0134] In the above, exemplary embodiments of the present disclosure have been illustrated and described, but the present disclosure is not limited to the specific embodiments described above, and those skilled in the art will appreciate that various modifications are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

[0135] An air conditioner according to the present disclosure has one or more of the following advantages: Firstly, the air conditioner according to the present disclosure can achieve the reliability of the outdoor heat exchanger since a first outdoor unit where a compressor runs by an engine is placed and a second outdoor unit where a plurality of heat exchangers reside are placed apart from each other, so as to minimize the vibration caused by the running of the engine from being transmitted to the second outdoor unit.

[0136] Secondly, the air conditioner according to the present disclosure allows for quick heat transfer in a heat radiator or plate-type heat exchanger by ensuring a flow of water by locating the heat radiator, the plate-type heat exchanger, and a water pump adjacent to one another inside the second outdoor unit.

[0137] Thirdly, the air conditioner according to the present disclosure provides easy serviceability to the internal components of the outdoor heat exchanger by adjusting the configuration of the internal components inside the outdoor heat exchanger.

[0138] Fourthly, the air conditioner according to the present disclosure has a first controller placed in the first outdoor unit to control the engine and engine-related components and a second controller placed in the second outdoor unit to control the operations of the blower fan and cooling pump. Although a controller for operation control may be needed, apart from the engine, when adding components like the water pump to the first outdoor unit, the above-described configuration may minimize the number of controllers, which may result in cost reduction.

[0139] Fifthly, the air conditioner according to the present disclosure offers easy serviceability to the control box by including a service panel where the control box is placed, without removing the service panel through a separate opening portion. Moreover, the control box may be kept at low temperature by being placed at a far distance from a heat source in the outdoor unit or being placed in an area where active air flow occurs.

[0140] The advantages of the present invention are not limited to the aforementioned advantages, and other advantages, which are not mentioned above, will be apparent to a person having ordinary skill in the art from the following description.

Claims

1. An air conditioner comprising:

a first outdoor unit (100) including an engine (140) operated by combustion of a gas fuel and a compressor (150) connected to the engine (140) by a belt (152) for compressing refrigerant; a second outdoor unit (200) including an outdoor heat exchanger (240) that is placed apart from the first outdoor unit (100) and configured to transfer heat between outside air and refrigerant discharged from the compressor (150), a water pump (238) configured to supply water to the engine (140), and a heat radiator (250) configured to transfer heat between the water and outside air, wherein the second outdoor unit (200) is placed apart from the first outdoor unit (100);

a first refrigerant tube (310) that is exposed on the outside of the first outdoor unit (100) and the second outdoor unit (200), and connected to the compressor (150); and

a water tube (400) that is exposed on the outside of the first outdoor unit (100) and second outdoor unit (200), and connects the engine (140) and the water pump (238),

wherein the second outdoor unit (200) further comprises:

a plate-type heat exchanger (248) configured to transfer heat between the water and the refrigerant;

a first valve (252a) configured to send the water discharged from the engine (140) selectively to the plate-type heat exchanger (248) or the heat radiator (250); and

a second valve (252b) configured to send the water discharged from the engine (140) selectively to the first valve (252a) or the water pump (238).

2. The air conditioner of claim 1,

wherein the water pump (238) is placed between the plate-type heat exchanger (248) and the heat radiator (250).

3. The air conditioner of claim 1 or 2, wherein the second outdoor unit (200) comprises a second casing (210) exposed the outside thereof and having an intake opening (221a) on a side thereof and a discharge opening (226a) on a top thereof, the second casing (210) comprising:

a front panel (220a) placed at a front of the second casing (210);

a rear panel (220b) placed behind the front panel (220a); and

a pair of side panels (220c, 220d) connecting both edges of the front panel (220a) and rear panel (220b).

4. The air conditioner of claim 3, wherein the second outdoor unit (200) further comprises a second control box (256) containing a second controller for controlling at least one component of the air conditioner, and
the front panel (220a) comprises:

a first half panel (220a1) disposed adjacent to the second control box (256); and
a second half panel (220a2) placed on one side of the first half panel (220a1), and disposed adjacent to the outdoor heat exchanger (240).

5. The air conditioner of claim 4, wherein the outdoor heat exchanger (240) comprises:

a front heat exchanger (240a) placed inside the front panel (220a);
a first side heat exchanger (240b) that is bent at the front heat exchanger (240a) and extends rearward;
a rear heat exchanger (240c) that is placed inside the rear panel (220b) and extends from the first side heat exchanger (240b); and
a second side heat exchanger (240d) that is bent at the rear heat exchanger (240c) and extends forward,
wherein the front heat exchanger (240a) is placed behind the second half panel (220a2).

6. The air conditioner of claim 5, wherein the water pump (238) is placed behind the second half panel (220a2) and located closer to a virtual vertical line (VC) than the first side heat exchanger (240b), wherein the virtual vertical line (VC) is a line passing through centers of front and rear sides of the second outdoor unit (200) and thus dividing the second outdoor unit (200) in left and right directions.

7. The air conditioner of any one of claims 4 to 6, wherein the water pump (238) is placed ahead of a virtual horizontal line (HC) that passes through centers of left and right sides of the second outdoor unit (200) and thus divides the second outdoor unit (200) in front and rear directions.

8. The air conditioner of claim 1, wherein the first outdoor unit (100) comprises a first control box (180) containing a first controller for regulating at least the operation of the engine (140), and
the second outdoor unit (200) comprises:

a blower fan (230) that forms a flow of air to the outdoor heat exchanger (240); and

a second control box (256) containing a second controller for regulating at least the operation of the blower fan (230) or water pump (238).

9. The air conditioner of claim 8, wherein the second outdoor unit (200) comprises a switching valve (242) configured to send the refrigerant discharged from the compressor (150) to the outdoor heat exchanger (240) or an indoor heat exchanger for heat transfer between the refrigerant and the air in a room.

10. The air conditioner of claim 8 or 9, wherein the second outdoor unit (200) comprises:

a second casing (210) exposed the outside thereof and having an intake opening (221a) on a side thereof and a discharge opening (226a) on a top thereof; and
an orifice (228) that is placed on an upper end of the second casing (210) and forms a discharge path of air blown by the blower fan (230), wherein the blower fan (230) is placed inside the orifice (228) and causes the air present inside the second casing (210) to move from the intake opening (221a) to the discharge opening (226a), and
the second control box (256) is placed below the orifice (228).

11. The air conditioner of claim 10, wherein the second casing (210) comprises a second service panel (223) in an area where the outdoor heat exchanger (240) is not placed, where a second connector (222a) is placed, with a plurality of refrigerant tubes and a plurality of water tubes being connected to the second connector (222a), wherein the second control box (256) is placed inside the second service panel (223).

12. The air conditioner of claim 11, wherein the second service panel (223) has an opening portion communicating with the second control box (256), and a second cover (225) covering the opening portion is placed on the second service panel (223).

13. The air conditioner of any one of claims 8 to 12, wherein the first outdoor unit (100) comprises a first casing (110) forming an internal space in which the engine (140) and the compressor (150) are placed.

14. The air conditioner of claim 13, wherein the first casing (110) comprises:

a first base (112) covering a bottom of the first casing (110);
a first peripheral panel (122) placed above the first base (112) and covering sides of the first casing (110); and

a first upper panel (126) placed over the first peripheral panel (122) and forming an exhaust opening (128), and
 wherein the engine (140) is fixed to the first base (112), and the first control box (180) is located closer to the first upper panel (126) than the engine (140).

15. The air conditioner of claim 14, wherein the first peripheral panel (122) comprises a first service panel (123) where a first connector (124) is placed, with a plurality of refrigerant tubes and a plurality of water tubes being connected to the first connector (124), and
 wherein a first cover (125) is placed on the first service panel (123) to cover an opening portion communicating with the inside of the first control box (180).

Patentansprüche

1. Klimaanlage, die aufweist:

eine erste Außeneinheit (100) mit einem Motor (140), der durch Verbrennung eines brennbaren Gases betrieben wird, und einem Verdichter (150), der mit dem Motor (140) über einen Riemen (152) verbunden ist, um ein Kältemittel zu verdichten,
 eine zweite Außeneinheit (200), die einen Außenwärmetauscher (240), der von der ersten Außeneinheit (100) entfernt angeordnet und so konfiguriert ist, dass er Wärme zwischen der Außenluft und dem vom Verdichter (150) abgegebenen Kältemittel überträgt, eine Wasserpumpe (238), die so konfiguriert ist, dass sie dem Motor (140) Wasser zuführt, und einen Wärmestrahler (250) aufweist, der so konfiguriert ist, dass Wärme zwischen Wasser und Außenluft übertragen wird, wobei die zweite Außeneinheit (200) von der ersten Außeneinheit (100) entfernt angeordnet ist;
 ein erstes Kältemittelrohr (310), das auf der Außenseite der ersten Außeneinheit (100) und der zweiten Außeneinheit (200) freiliegt und mit dem Verdichter (150) verbunden ist, und
 ein Wasserrohr (400), das an der Außenseite der ersten Außenseite (100) und der zweiten Außeneinheit (200) freiliegt und den Motor (140) mit der Wasserpumpe (238) verbindet,
 wobei die zweite Außeneinheit (200) ferner aufweist:

einen Plattenwärmetauscher (248), der so konfiguriert ist, dass er Wärme zwischen dem Wasser und dem Kältemittel überträgt, ein erstes Ventil (252a), das so konfiguriert

ist, dass es das vom Motor (140) abgegebene Wasser entweder zum Plattenwärmetauscher (248) oder zum Wärmestrahler (250) leitet, und
 ein zweites Ventil (252b), das so konfiguriert ist, dass es das vom Motor (140) abgegebene Wasser entweder zum ersten Ventil (252a) oder zur Wasserpumpe (238) leitet.

2. Klimaanlage nach Anspruch 1, wobei die Wasserpumpe (238) zwischen dem Plattenwärmetauscher (248) und dem Wärmestrahler (250) angeordnet ist.
3. Klimaanlage nach Anspruch 1 oder 2, wobei die zweite Außeneinheit (200) ein an seiner Außenseite freiliegendes zweites Gehäuse (210) aufweist, das an einer Seite eine Einlassöffnung (221a) und an einer Oberseite eine Auslassöffnung (226a) aufweist, wobei das zweite Gehäuse (210) aufweist:

eine an einer Vorderseite des zweiten Gehäuses (210) angebrachte Frontplatte (220a),
 eine hinter der Frontplatte (220a) angebrachte Rückwand (220b), und
 ein Paar Seitenplatten (220c, 220d), die beide Kanten der Frontplatte (220a) und der Rückplatte (220b) verbindet.

4. Klimaanlage nach Anspruch 3, wobei die zweite Außeneinheit (200) ferner einen zweiten Steuerungskasten (256) aufweist, der eine zweite Steuerung zur Steuerung mindestens eines Bauteils der Klimaanlage aufweist, und die Frontplatte (220a) aufweist:

eine erste Halbplatte (220a1), die neben dem zweiten Steuerungskasten (256) angeordnet ist, und
 eine zweite Halbplatte (220a2), die auf einer Seite der ersten Halbplatte (220a1) und neben dem Außenwärmetauscher (240) angeordnet ist.

5. Klimaanlage nach Anspruch 4, wobei der Außenwärmetauscher (240) aufweist:

einen vorderen Wärmetauscher (240a), der innen an der Frontplatte (220a) angeordnet ist,
 einen ersten seitlichen Wärmetauscher (240b), der am vorderen Wärmetauscher (240a) gekrümmt ist und sich nach hinten erstreckt,
 einen hinteren Wärmetauscher (240c), der innen an der Rückplatte (220b) angeordnet ist und sich vom ersten seitlichen Wärmetauscher (240b) aus erstreckt, und
 einen zweiten seitlichen Wärmetauscher (240d), der am hinteren Wärmetauscher

- (240c) gekrümmt ist und sich nach vorne erstreckt,
wobei der vordere Wärmetauscher (240a) hinter der zweiten Halbplatte (220a2) angeordnet ist.
6. Klimaanlage nach Anspruch 5, wobei die Wasserpumpe (238) hinter der zweiten Halbplatte (220a2) angeordnet ist und sich näher an einer virtuellen vertikalen Linie (VC) befindet als der erste seitliche Wärmetauscher (240b), wobei die virtuelle vertikale Linie (VC) eine Linie ist, die durch die Mittelpunkte der Vorder- und Rückseiten der zweiten Außeneinheit (200) verläuft und dadurch die zweite Außeneinheit (200) nach links und rechts unterteilt.
7. Klimaanlage nach einem der Ansprüche 4 bis 6, wobei die Wasserpumpe (238) vor einer virtuellen horizontalen Linie (HC) angeordnet ist, die durch die Mittelpunkte der linken und der rechten Seite der zweiten Außeneinheit (200) verläuft und dadurch die zweite Außeneinheit (200) nach vorne und hinten unterteilt.
8. Klimaanlage nach Anspruch 1, wobei die erste Außeneinheit (100) einen ersten Steuerungskasten (180) mit einem ersten Regler zur Regelung mindestens des Betriebs des Motors (140) aufweist und die zweite Außeneinheit (200) aufweist:
- ein Gebläse (230), das einen Luftstrom zum Außenwärmetauscher (240) bildet, und einen zweiten Steuerungskasten (256), die einen zweiten Regler zur Regelung mindestens des Betriebs des Gebläses (230) oder der Wasserpumpe (238) aufweist.
9. Klimaanlage nach Anspruch 8, wobei die zweite Außeneinheit (200) ein Schaltventil (242) aufweist, das so konfiguriert ist, dass es das vom Verdichter (150) abgegebene Kältemittel zum Wärmeaustausch zwischen dem Kältemittel und der Luft in einem Raum zum Außenwärmetauscher (240) oder zu einem Innenwärmetauscher sendet.
10. Klimaanlage nach Anspruch 8 oder 9, wobei die zweite Außeneinheit (200) aufweist:
- ein zweites Gehäuse (210), das an seiner Außenseite freiliegt und an einer Seite eine Einlassöffnung (221a) und an einer Oberseite eine Auslassöffnung (226a) aufweist, und eine Öffnung (228), die an einem oberen Ende des zweiten Gehäuses (210) angeordnet ist und einen Auslassweg für die vom Gebläse (230) geblasene Luft bildet, wobei das Gebläse (230) im Inneren der Öffnung (228) angeordnet ist und die Luft, die sich im Inneren des zweiten Gehäuses (210) befindet, veranlasst, sich von der Einlassöffnung (221a) zur Auslassöffnung (226a) zu bewegen, und der zweite Steuerungskasten (256) unterhalb der Öffnung (228) angeordnet ist.
11. Klimaanlage nach Anspruch 10, wobei das zweite Gehäuse (210) eine zweite Bedienplatte (223) in einem Bereich aufweist, in dem der Außenwärmetauscher (240) nicht angeordnet und in dem ein zweiter Anschluss (222a) angeordnet ist, wobei mehrere Kältemittelrohre und mehrere Wasserrohre mit dem zweiten Anschluss (222a) verbunden sind, wobei der zweite Steuerungskasten (256) im Inneren der zweiten Bedienplatte (223) angeordnet ist.
12. Klimaanlage nach Anspruch 11, wobei die zweite Bedienplatte (223) einen Öffnungsabschnitt aufweist, der mit dem zweiten Steuerungskasten (256) in Verbindung steht, und eine zweite Abdeckung (225), die den Öffnungsabschnitt abdeckt, auf der zweiten Bedienplatte (223) angeordnet ist.
13. Klimaanlage nach einem der Ansprüche 8 bis 12, wobei die erste Außeneinheit (100) ein erstes Gehäuse (110) aufweist, das einen Innenraum bildet, in dem der Motor (140) und der Verdichter (150) angeordnet sind.
14. Klimaanlage nach Anspruch 13, wobei das erste Gehäuse (110) aufweist:
- eine erste Grundplatte (112), die eine Unterseite des ersten Gehäuses (110) abdeckt, eine erste Umfangsplatte (122), die auf der ersten Grundplatte (112) angeordnet ist und die Seiten des ersten Gehäuses (110) abdeckt, und eine erste obere Platte (126), die auf der ersten Umfangsplatte (122) angeordnet ist und eine Auslassöffnung (128) bildet, und wobei der Motor (140) auf der ersten Grundplatte (112) befestigt ist und sich der erste Steuerungskasten (180) näher an der ersten oberen Platte (126) befindet als der Motor (140).
15. Klimaanlage nach Anspruch 14, wobei die erste Umfangsplatte (122) eine erste Bedienplatte (123) aufweist, auf der ein erster Anschluss (124) angeordnet ist, wobei mehrere Kältemittelrohre und mehrere Wasserrohre mit dem ersten Anschluss (124) verbunden sind, und wobei eine erste Abdeckung (125) auf der ersten Bedienplatte (123) angeordnet ist, um einen Öffnungsabschnitt, der mit dem Inneren des ersten Steuerungskastens (180) in Verbindung ist, abzudecken.

Revendications

1. Climatiseur comprenant :

une première unité extérieure (100) comportant
un moteur (140) actionné par la combustion d'un
carburant gazeux et un compresseur (150) rac-
cordé au moteur (140) par une courroie (152)
pour comprimer le réfrigérant ;
une deuxième unité extérieure (200) compor-
tant un échangeur de chaleur extérieur (240) qui
est placé à distance de la première unité exté-
rieure (100) et est configuré pour transférer de la
chaleur entre l'air extérieur et le réfrigérant éva-
cué du compresseur (150), une pompe à eau
(238) configurée pour fournir de l'eau au moteur
(140), et un radiateur de chaleur (250) configuré
pour transférer de la chaleur entre l'eau et l'air
extérieur, dans lequel la deuxième unité exté-
rieure (200) est placée à distance de la première
unité extérieure (100) ;
un premier tube réfrigérant (310) qui est exposé
sur l'extérieur de la première unité extérieure
(100) et de la deuxième unité extérieure (200), et
est raccordé au compresseur (150) ; et
un tube d'eau (400) qui est exposé sur l'extérieur
de la première unité extérieure (100) et de la
deuxième unité extérieure (200), et raccorde le
moteur (140) et la pompe à eau (238),
dans lequel la deuxième unité extérieure (200)
comprend en outre :

un échangeur de chaleur à plaques (248)
configuré pour transférer de la chaleur entre
l'eau et le réfrigérant ;
une première soupape (252a) configurée
pour envoyer l'eau évacuée du moteur
(140) au choix vers l'échangeur de chaleur
à plaques (248) ou le radiateur thermique
(250) ; et
une deuxième soupape (252b) configurée
pour envoyer l'eau évacuée du moteur
(140) au choix vers la première soupape
(252a) ou la pompe à eau (238).

2. Climatiseur selon la revendication 1,
dans lequel la pompe à eau (238) est placée entre
l'échangeur de chaleur à plaques (248) et le radia-
teur thermique (250).

3. Climatiseur selon la revendication 1 ou 2, dans le-
quel la deuxième unité extérieure (200) comprend un
deuxième boîtier (210) exposé à l'extérieur de celle-
ci et présentant une ouverture d'admission (221a)
sur un côté de celui-ci et une ouverture d'évacuation
(226a) sur un dessus de celui-ci,
le deuxième boîtier (210) comprenant :

un panneau avant (220a) placé à l'avant du
deuxième boîtier (210) ;
un panneau arrière (220b) placé derrière le
panneau avant (220a) ; et
une paire de panneaux latéraux (220c, 220d)
raccordant les deux bords du panneau avant
(220a) et du panneau arrière (220b).

4. Climatiseur selon la revendication 3, dans lequel la
deuxième unité extérieure (200) comprend en outre
une deuxième boîte de commande (256) contenant
un deuxième dispositif de commande pour comman-
der au moins un composant du climatiseur, et
le panneau avant (220a) comprend :

un premier demi-panneau (220a1) disposé de
manière adjacente à la deuxième boîte de
commande (256) ; et
un deuxième demi-panneau (220a2) placé sur
un côté du premier demi-panneau (220a1), et
disposé de manière adjacente à l'échangeur de
chaleur extérieur (240).

5. Climatiseur selon la revendication 4, dans lequel
l'échangeur de chaleur extérieur (240) comprend :

un échangeur de chaleur avant (240a) placé à
l'intérieur du panneau avant (220a) ;
un premier échangeur de chaleur latéral (240b)
qui est plié au niveau de l'échangeur de chaleur
avant (240a) et s'étend vers l'arrière ;
un échangeur de chaleur arrière (240c) placé à
l'intérieur du panneau arrière (220b) et s'éten-
dant depuis le premier échangeur de chaleur
latéral (240b) ; et
un deuxième échangeur de chaleur latéral
(240d) qui est plié au niveau de l'échangeur
de chaleur arrière (240c) et s'étend vers l'avant,
dans lequel l'échangeur de chaleur avant (240a)
est placé derrière le deuxième demi-panneau
(220a2).

6. Climatiseur selon la revendication 5, dans lequel la
pompe à eau (238) est placée derrière le deuxième
demi-panneau (220a2) et est située davantage à
proximité d'une ligne verticale virtuelle (VC) que le
premier échangeur de chaleur latéral (240b), dans
lequel la ligne verticale virtuelle (VC) est une ligne
passant par des centres de côtés avant et arrière de
la deuxième unité extérieure (200) et divisant ainsi la
deuxième unité extérieure (200) dans des directions
gauche et droite.

7. Climatiseur selon l'une quelconque des revendica-
tions 4 à 6, dans lequel la pompe à eau (238) est
placée devant une ligne horizontale virtuelle (HC) qui
passe par des centres des côtés gauche et droit de la
deuxième unité extérieure (200) et divise ainsi la

- deuxième unité extérieure (200) dans les directions avant et arrière.
8. Climatiseur selon la revendication 1, dans lequel la première unité extérieure (100) comprend une première boîte de commande (180) contenant un premier dispositif de commande pour réguler au moins le fonctionnement du moteur (140), et la deuxième unité extérieure (200) comprend :
- un ventilateur soufflant (230) qui forme un écoulement d'air vers l'échangeur de chaleur extérieur (240) ; et
 - une deuxième boîte de commande (256) contenant un deuxième dispositif de commande pour réguler au moins le fonctionnement du ventilateur soufflant (230) ou de la pompe à eau (238).
9. Climatiseur selon la revendication 8, dans lequel la deuxième unité extérieure (200) comprend une soupape de commutation (242) configurée pour envoyer le réfrigérant évacué du compresseur (150) à l'échangeur de chaleur extérieur (240) ou à un échangeur de chaleur intérieur pour un transfert de chaleur entre le réfrigérant et l'air dans une pièce.
10. Climatiseur selon la revendication 8 ou 9, dans lequel la deuxième unité extérieure (200) comprend :
- un deuxième boîtier (210) exposé à l'extérieur de celui-ci et présentant une ouverture d'admission (221a) sur un côté de celui-ci et une ouverture d'évacuation (226a) sur un dessus de celui-ci ; et
 - un orifice (228) qui est placé sur une extrémité supérieure du deuxième boîtier (210) et forme un chemin d'évacuation de l'air soufflé par le ventilateur soufflant (230), dans lequel le ventilateur soufflant (230) est placé à l'intérieur de l'orifice (228) et provoque le déplacement de l'air présent à l'intérieur du deuxième boîtier (210) depuis l'ouverture d'admission (221a) jusqu'à l'ouverture d'évacuation (226a), et
 - la deuxième boîte de commande (256) est placée sous l'orifice (228).
11. Climatiseur selon la revendication 10, dans lequel le deuxième boîtier (210) comprend un deuxième panneau de service (223) dans une zone où l'échangeur de chaleur extérieur (240) n'est pas placé, dans lequel un deuxième raccord (222a) est placé, avec une pluralité de tubes de réfrigérant et une pluralité de tubes d'eau qui sont raccordés au deuxième raccord (222a), dans lequel la deuxième boîte de commande (256) est placée à l'intérieur du deuxième panneau de service (223).
12. Climatiseur selon la revendication 11, dans lequel le deuxième panneau de service (223) présente une partie d'ouverture communiquant avec la deuxième boîte de commande (256), un deuxième couvercle (225) recouvrant la partie d'ouverture est placé sur le deuxième panneau de service (223).
13. Climatiseur selon l'une quelconque des revendications 8 à 12, dans lequel la première unité extérieure (100) comprend un premier boîtier (110) formant un espace intérieur dans lequel le moteur (140) et le compresseur (150) sont placés.
14. Climatiseur selon la revendication 13, dans lequel le premier boîtier (110) comprend :
- une première base (112) recouvrant un fond du premier boîtier (110) ;
 - un premier panneau périphérique (122) placé au-dessus de la première base (112) et recouvrant des côtés du premier boîtier (110) ; et
 - un premier panneau supérieur (126) disposé au-dessus du premier panneau périphérique (122) et formant une ouverture d'échappement (128), et
 - dans lequel le moteur (140) est fixé à la première base (112), et la première boîte de commande (180) est située davantage à proximité du premier panneau supérieur (126) que le moteur (140).
15. Climatiseur selon la revendication 14, dans lequel le premier panneau périphérique (122) comprend un premier panneau de service (123) où un premier raccord (124) est placé, avec une pluralité de tubes de réfrigérant et une pluralité de tubes d'eau qui sont raccordés au premier raccord (124), et dans lequel un premier couvercle (125) est placé sur le premier panneau de service (123) pour couvrir une partie d'ouverture communiquant avec l'intérieur de la première boîte de commande (180).

Fig. 1

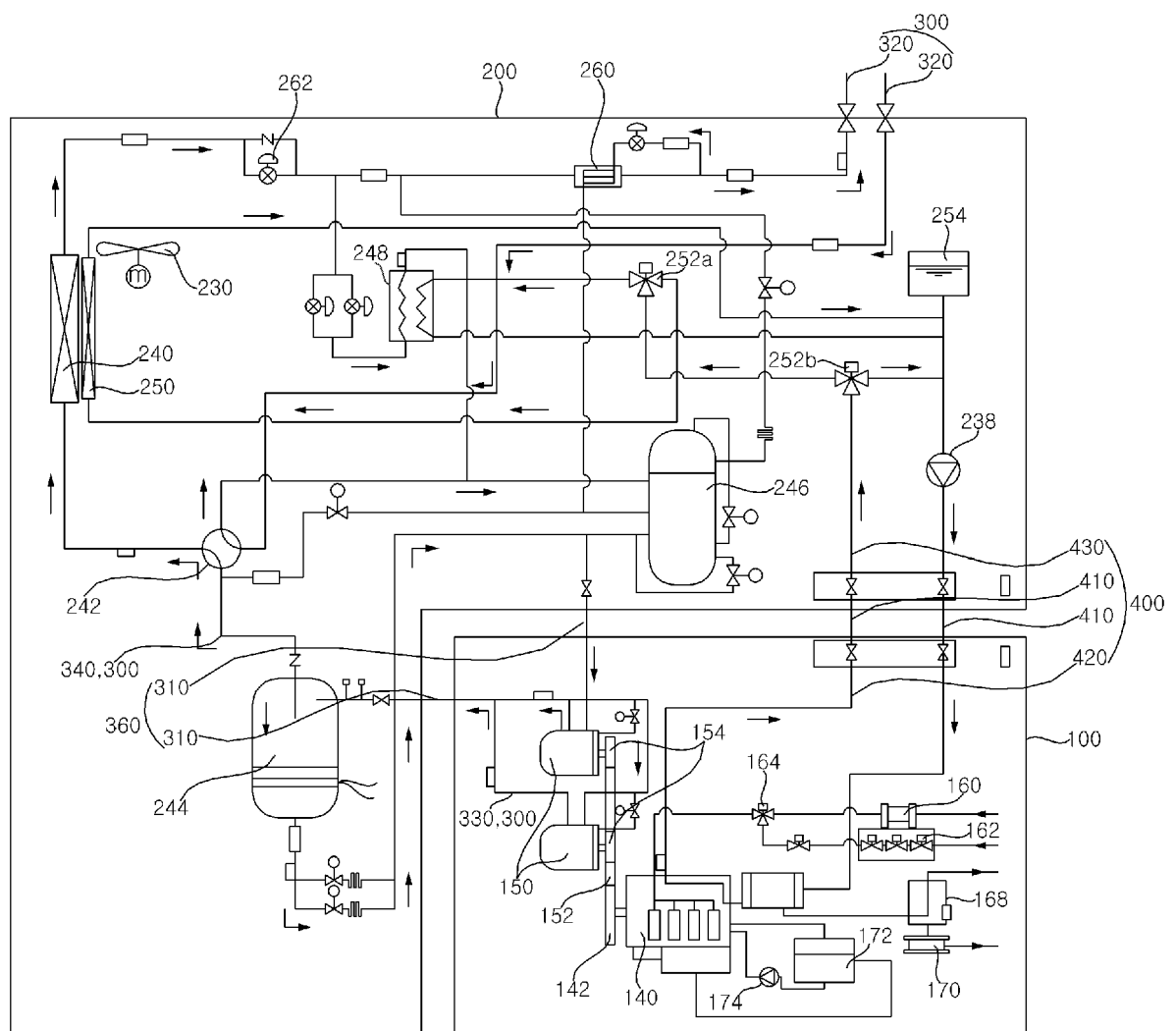


Fig. 2

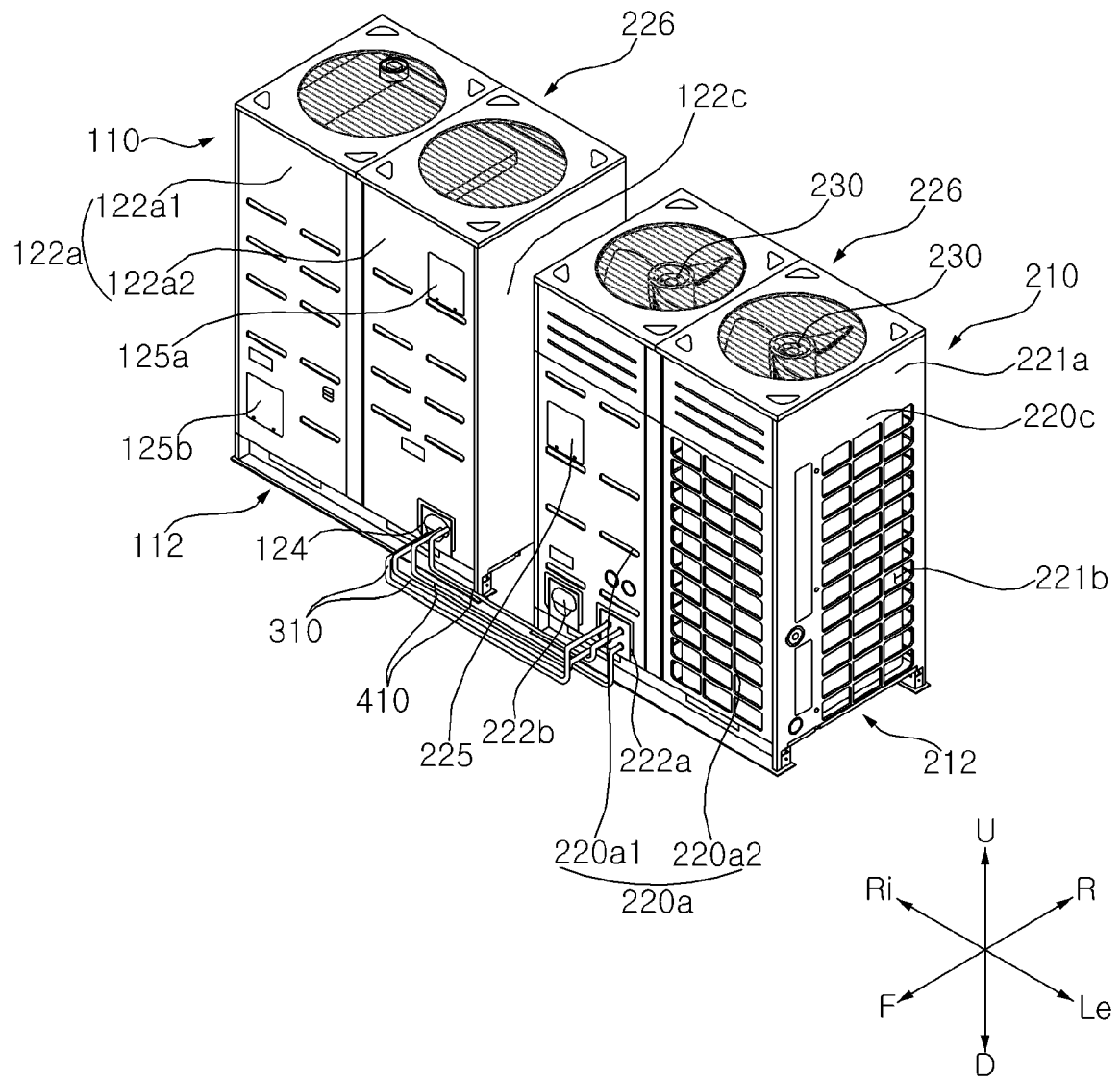


Fig. 3

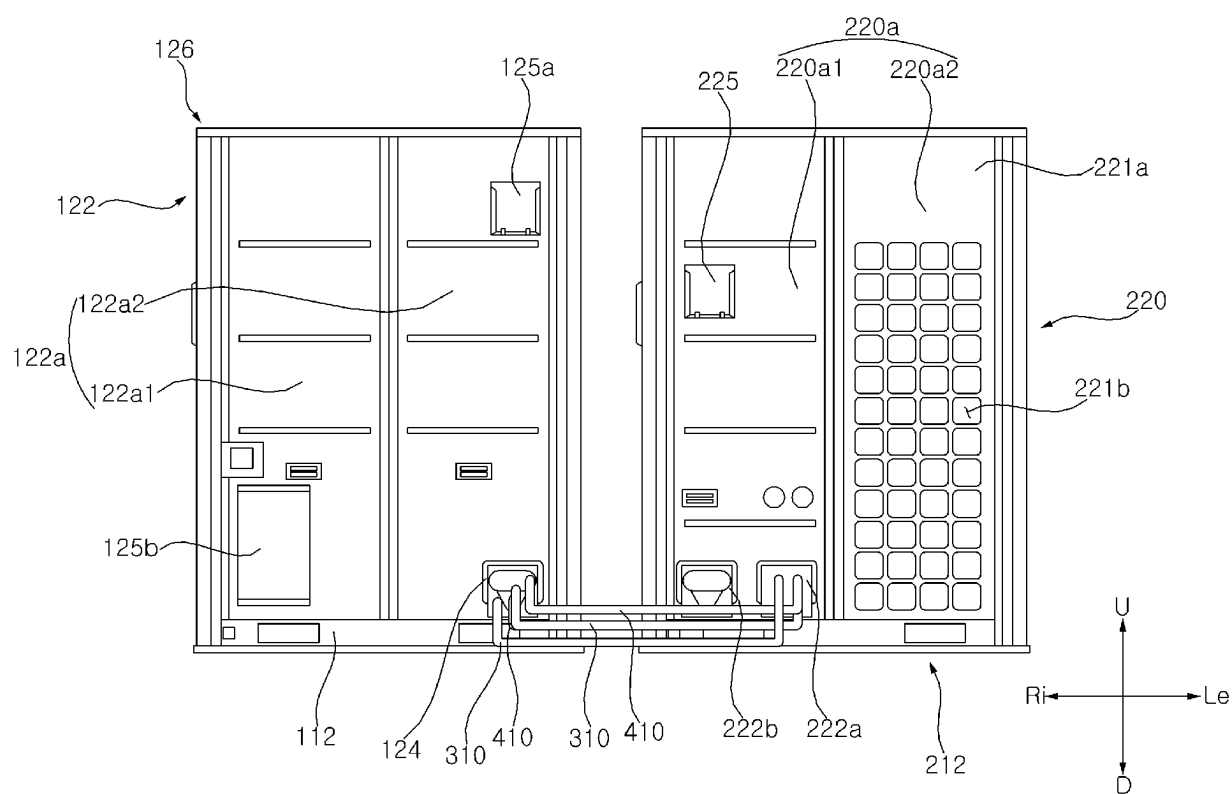


Fig. 4

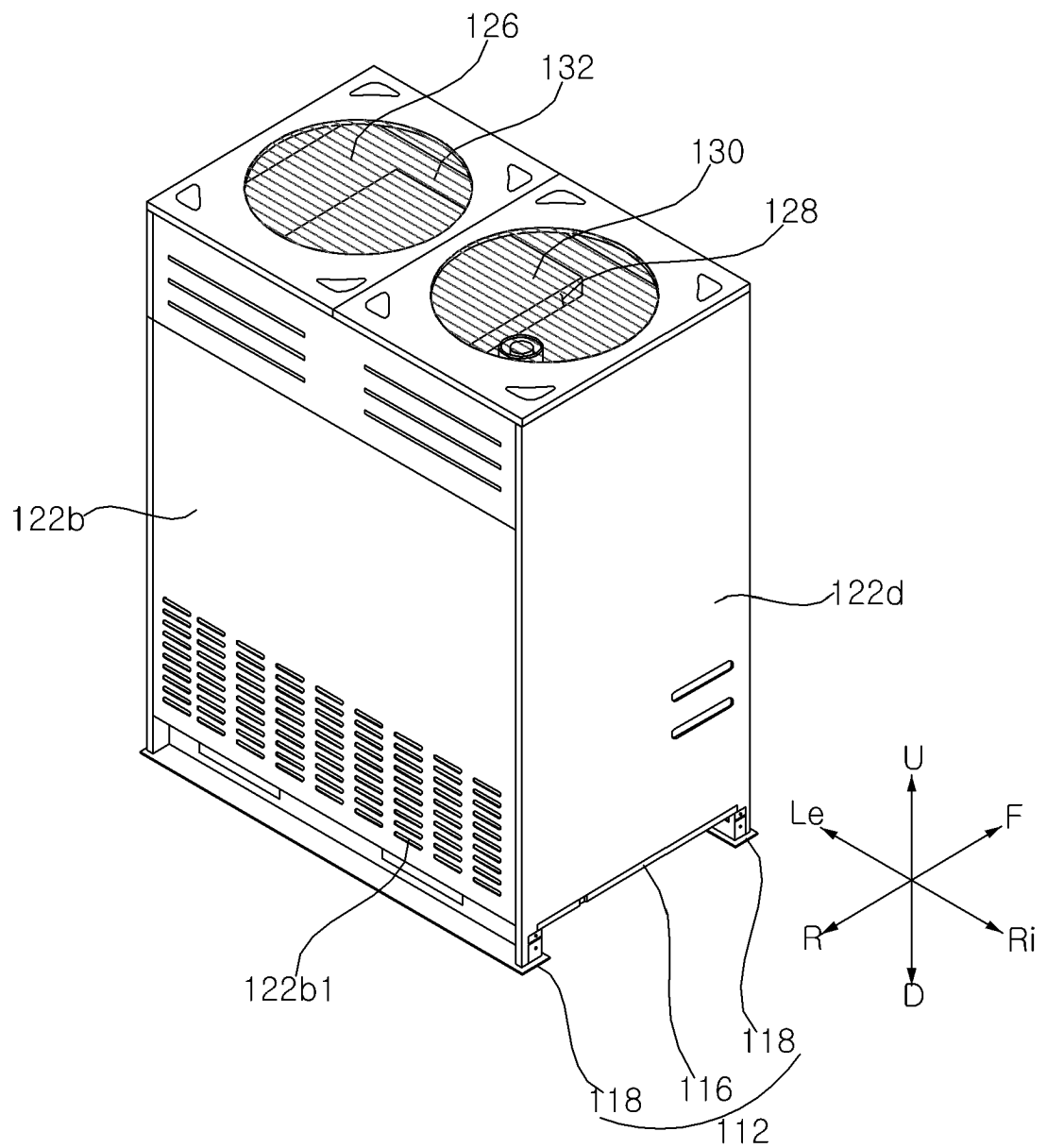


Fig. 5

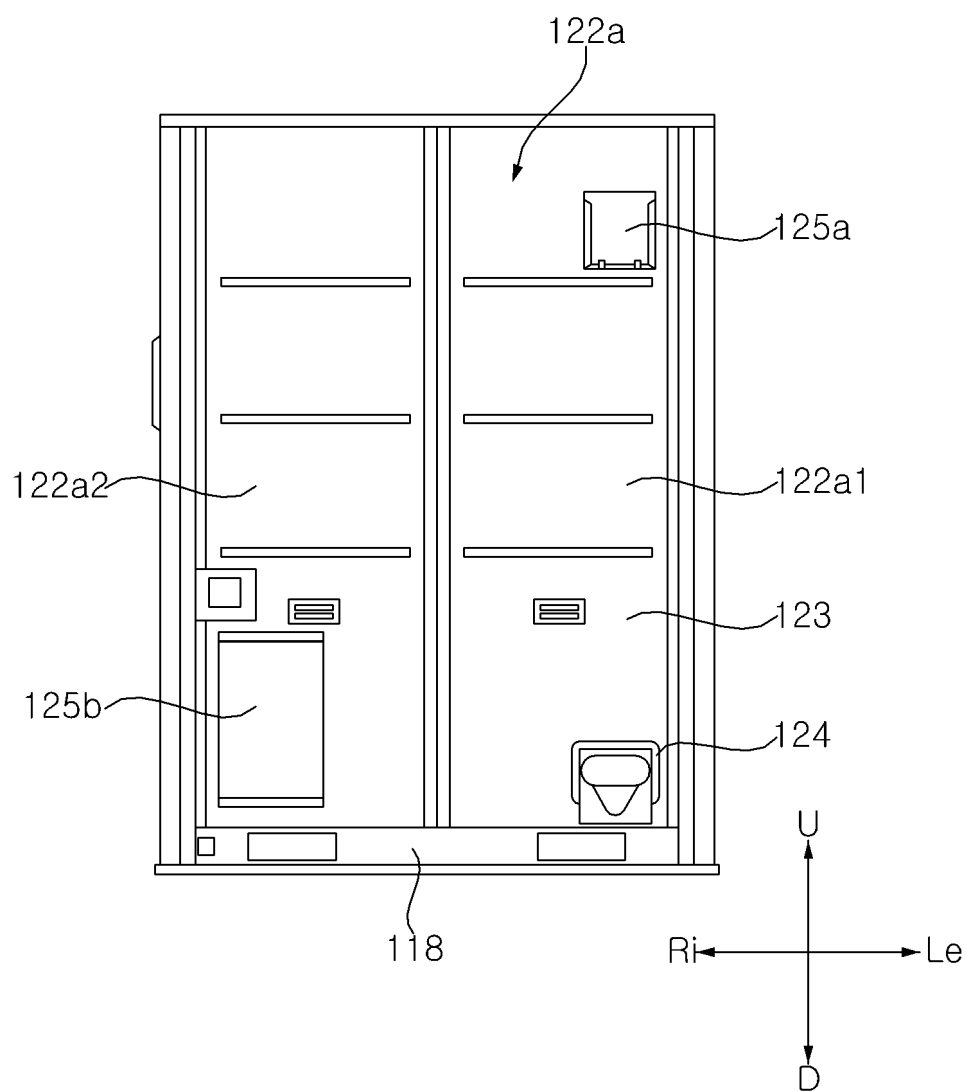


Fig. 6

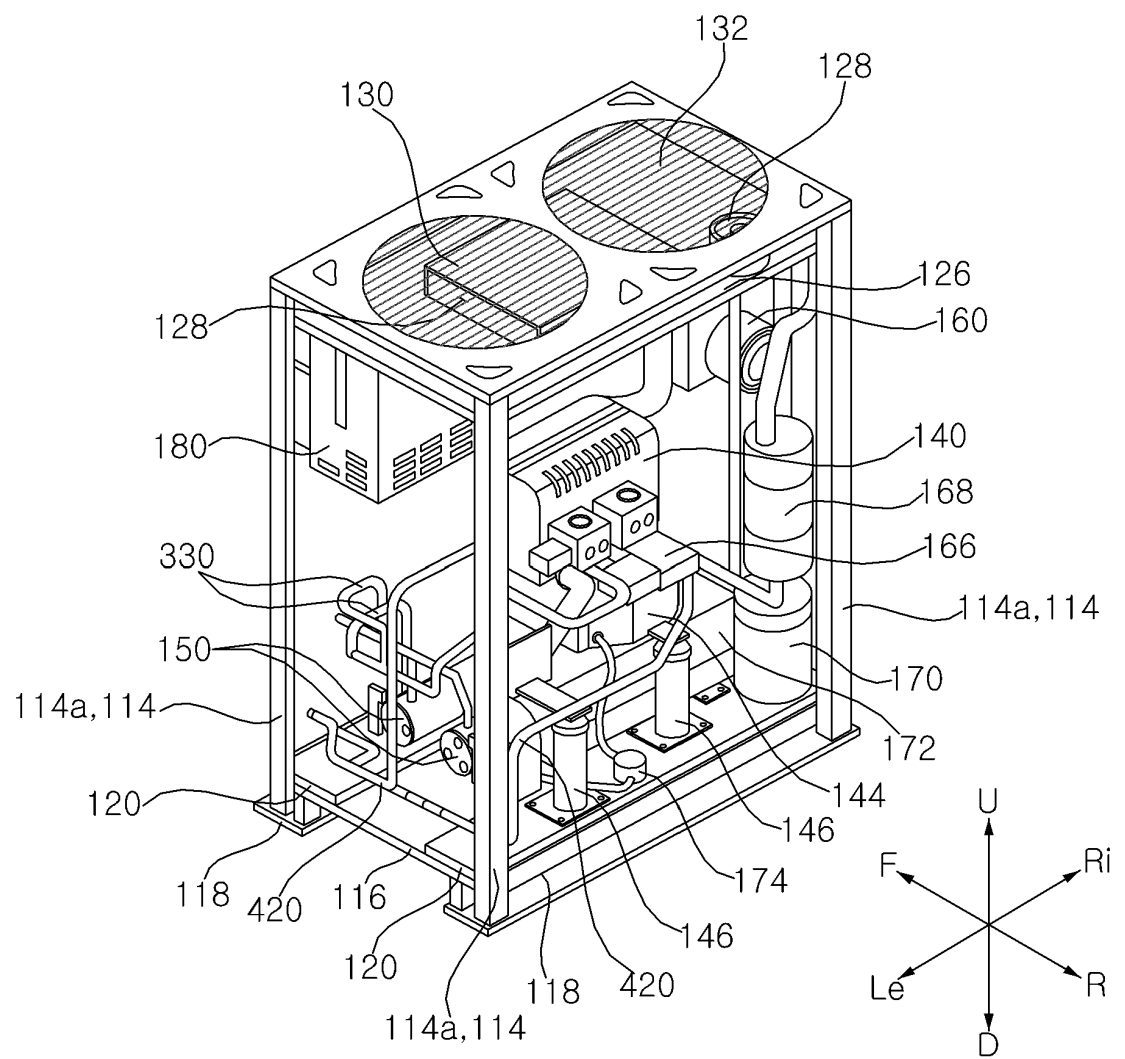


Fig. 7

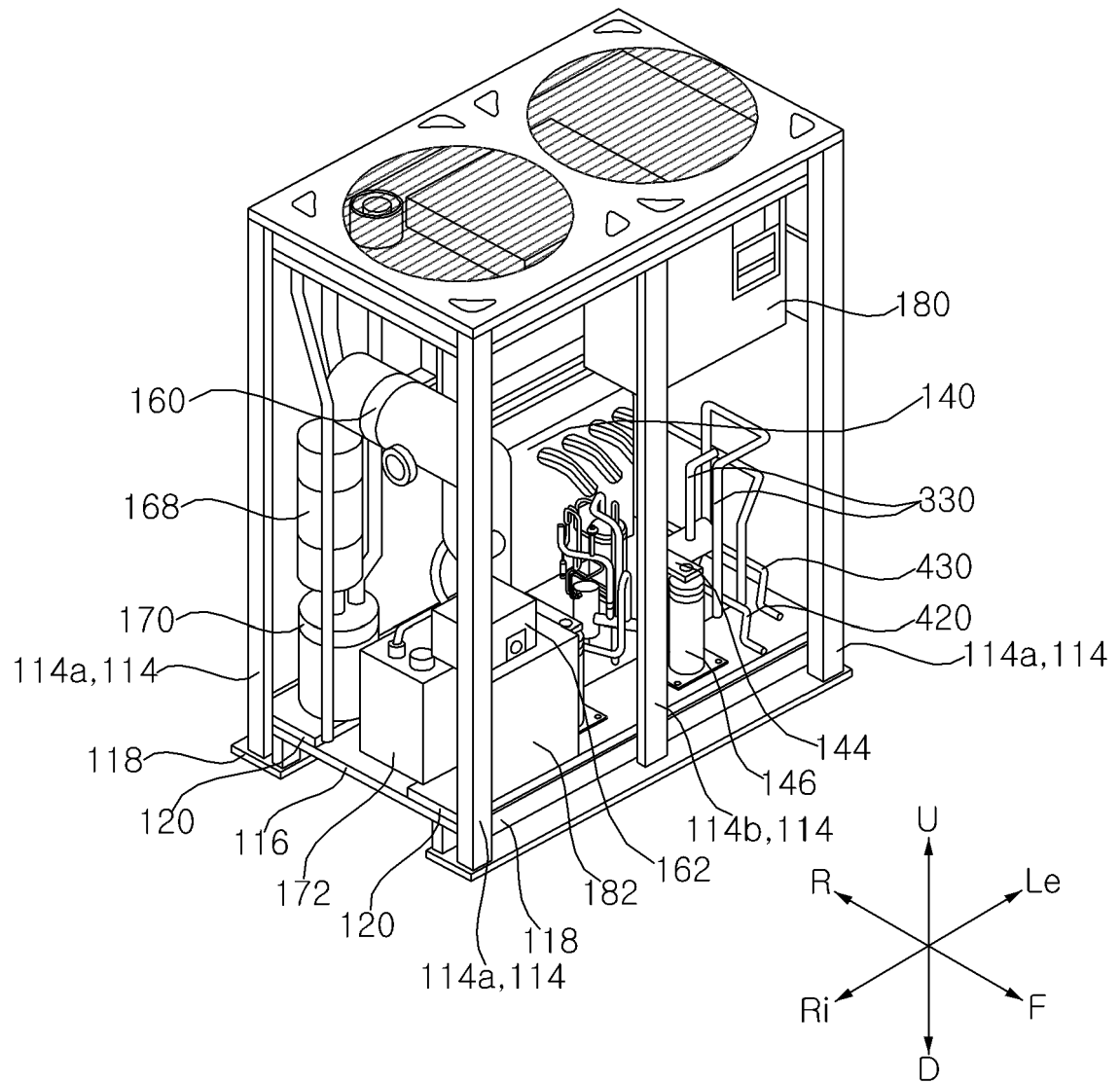


Fig. 8

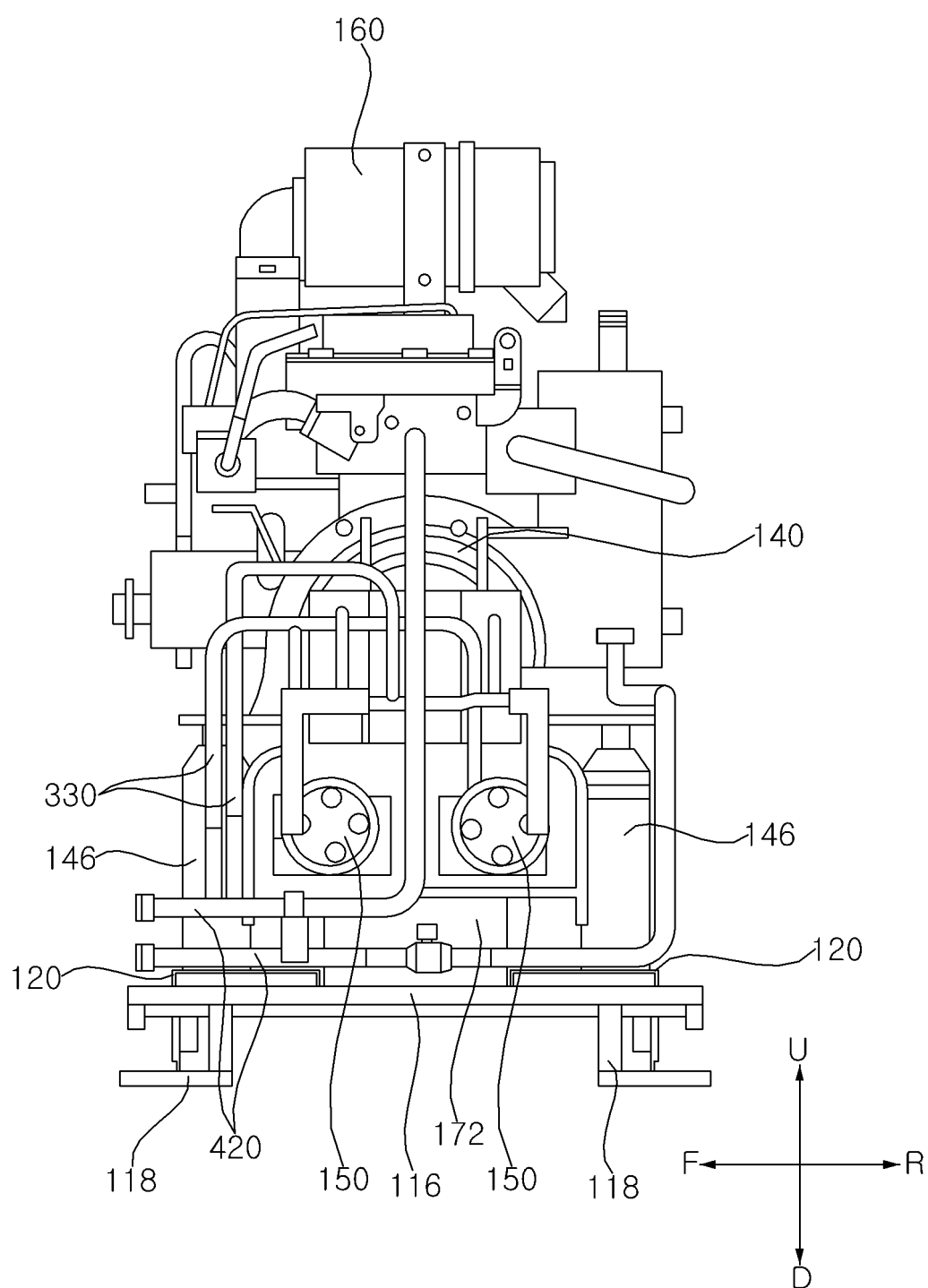


Fig. 9

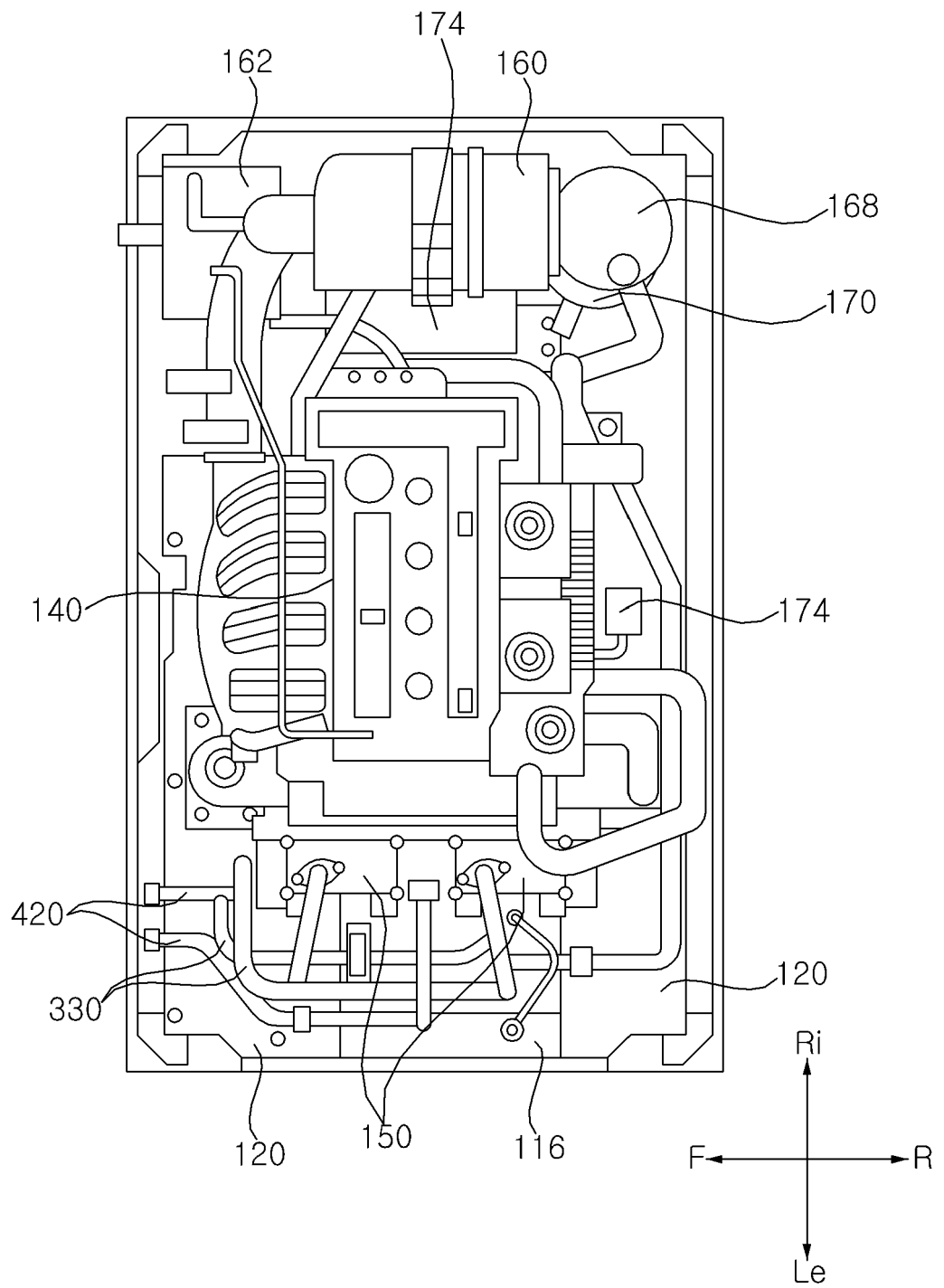


Fig. 10

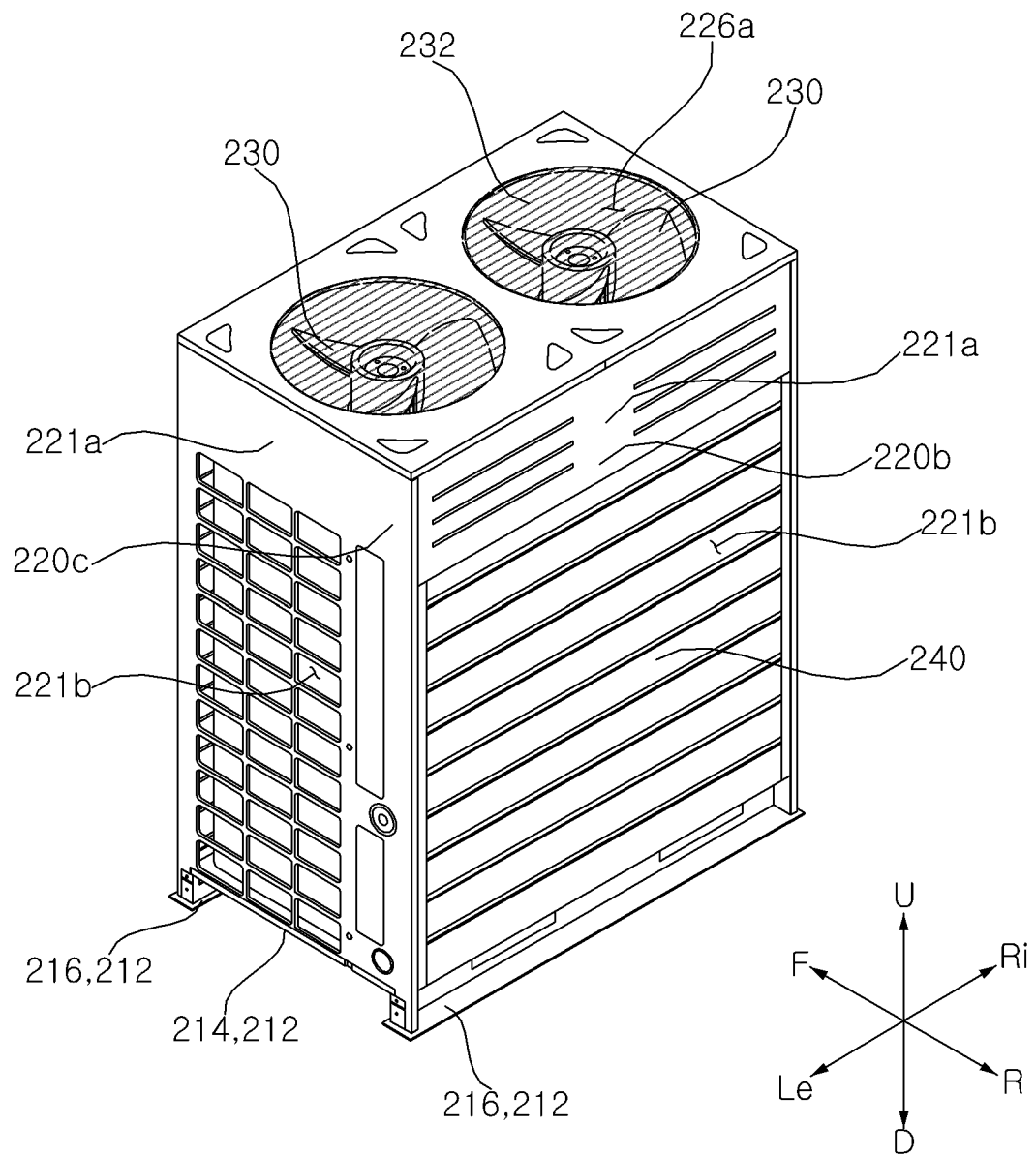


Fig. 11

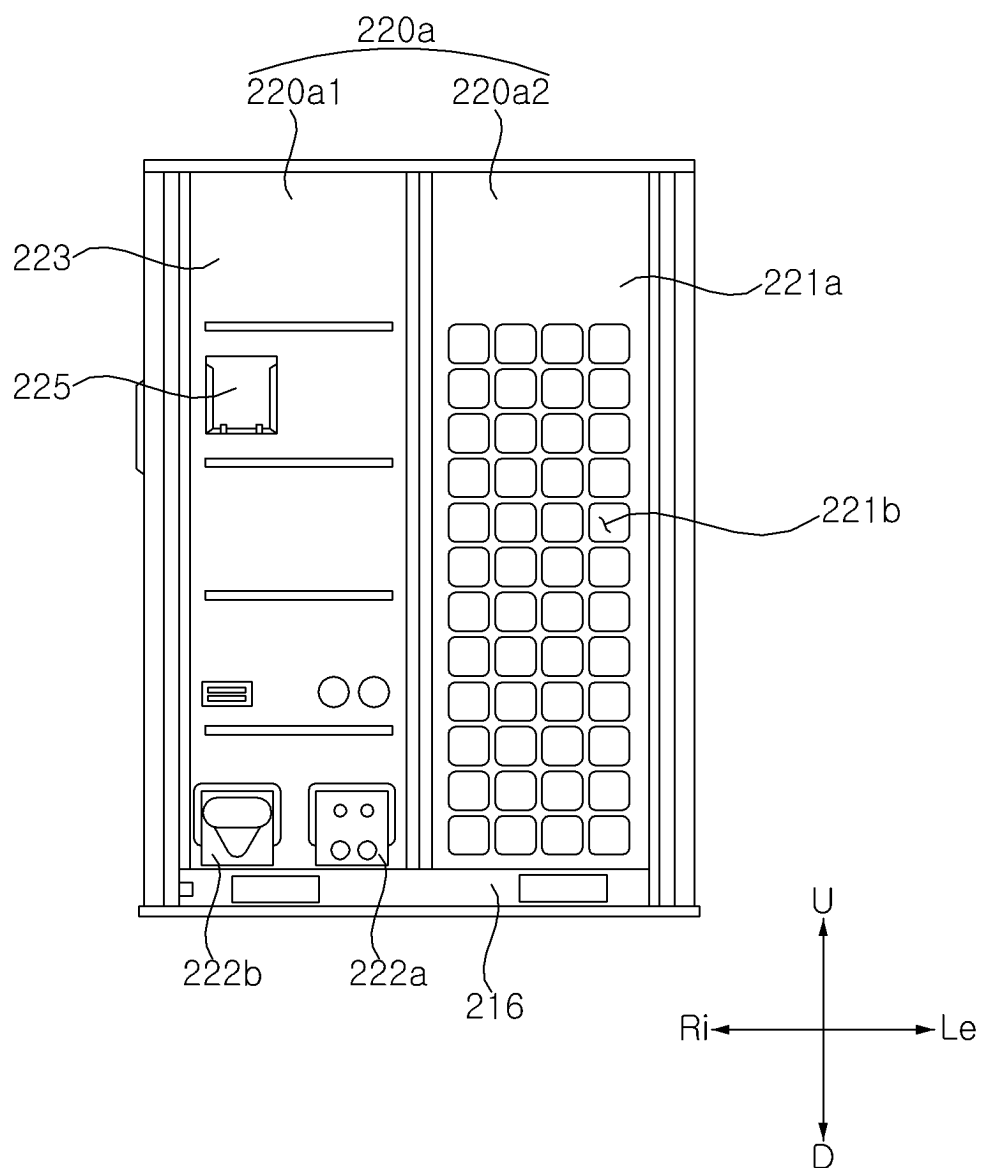


Fig. 12

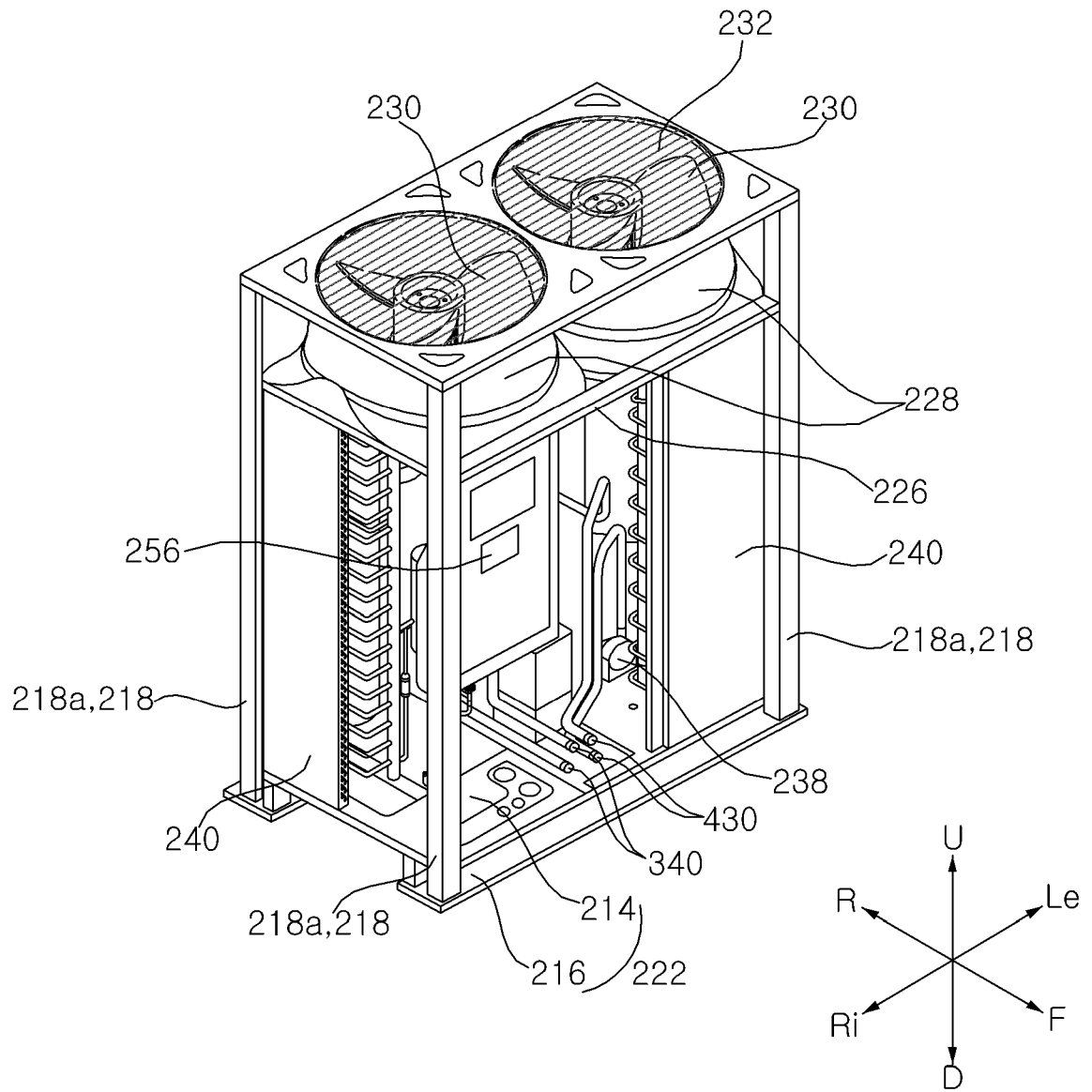


Fig. 13

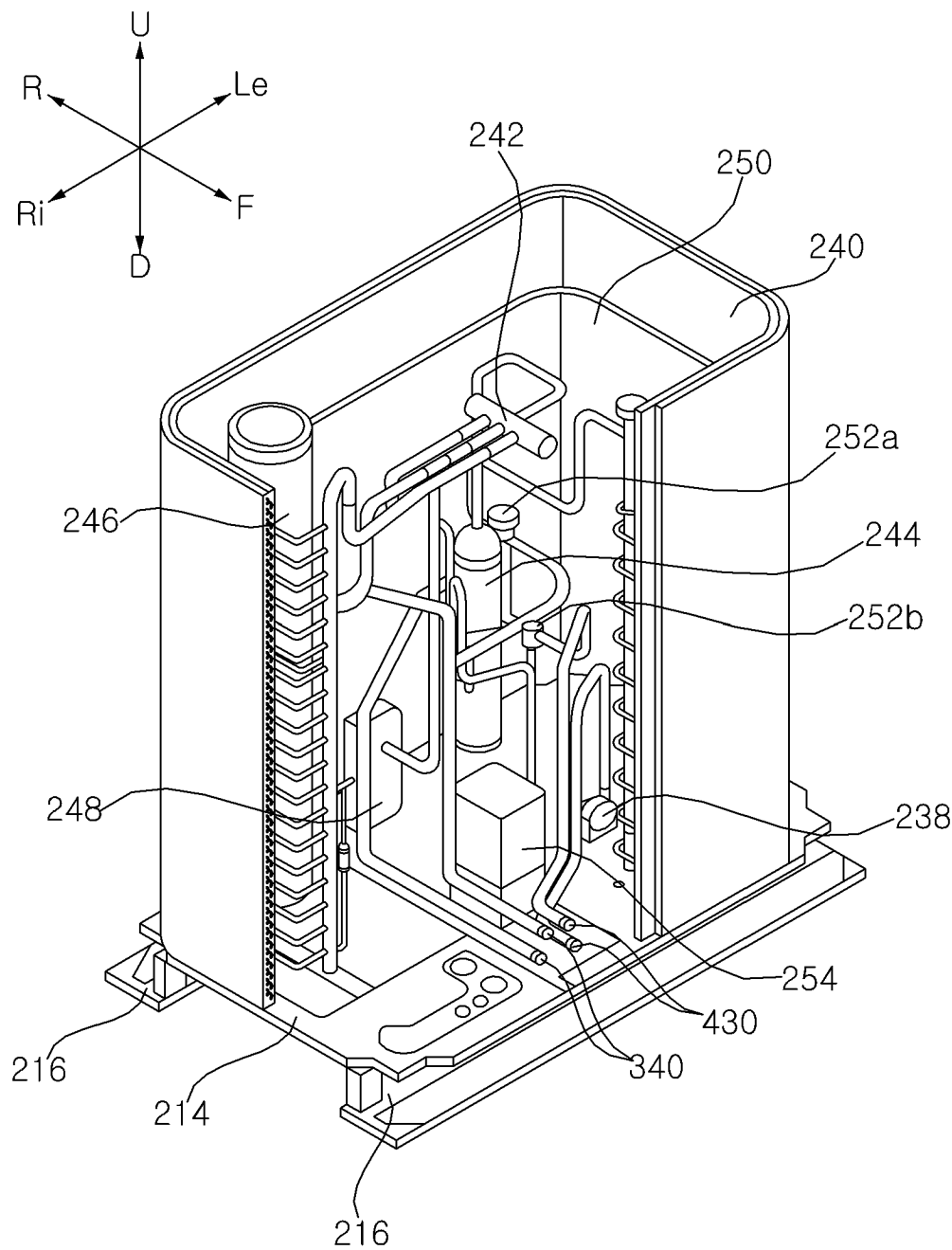


Fig. 14

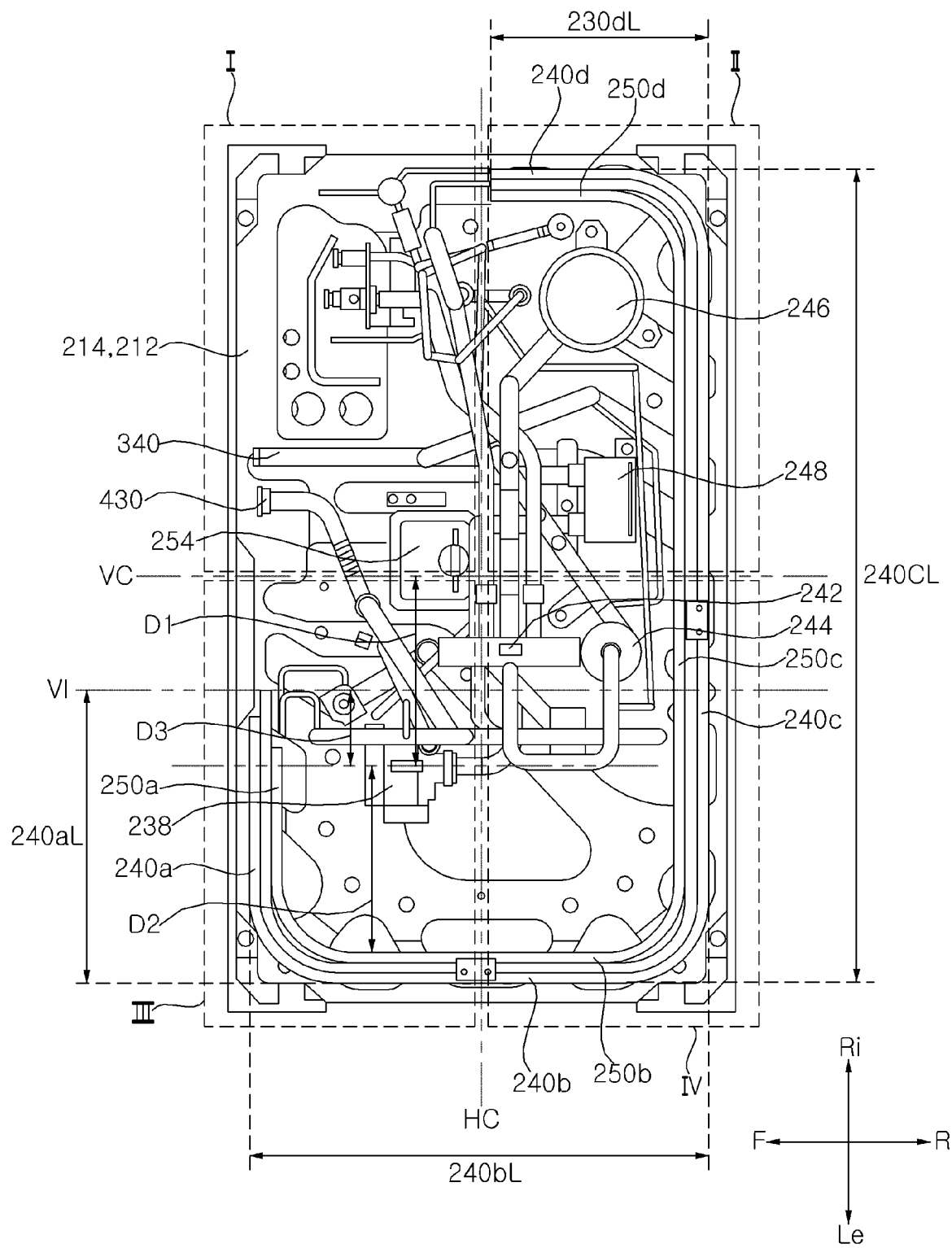


Fig. 15

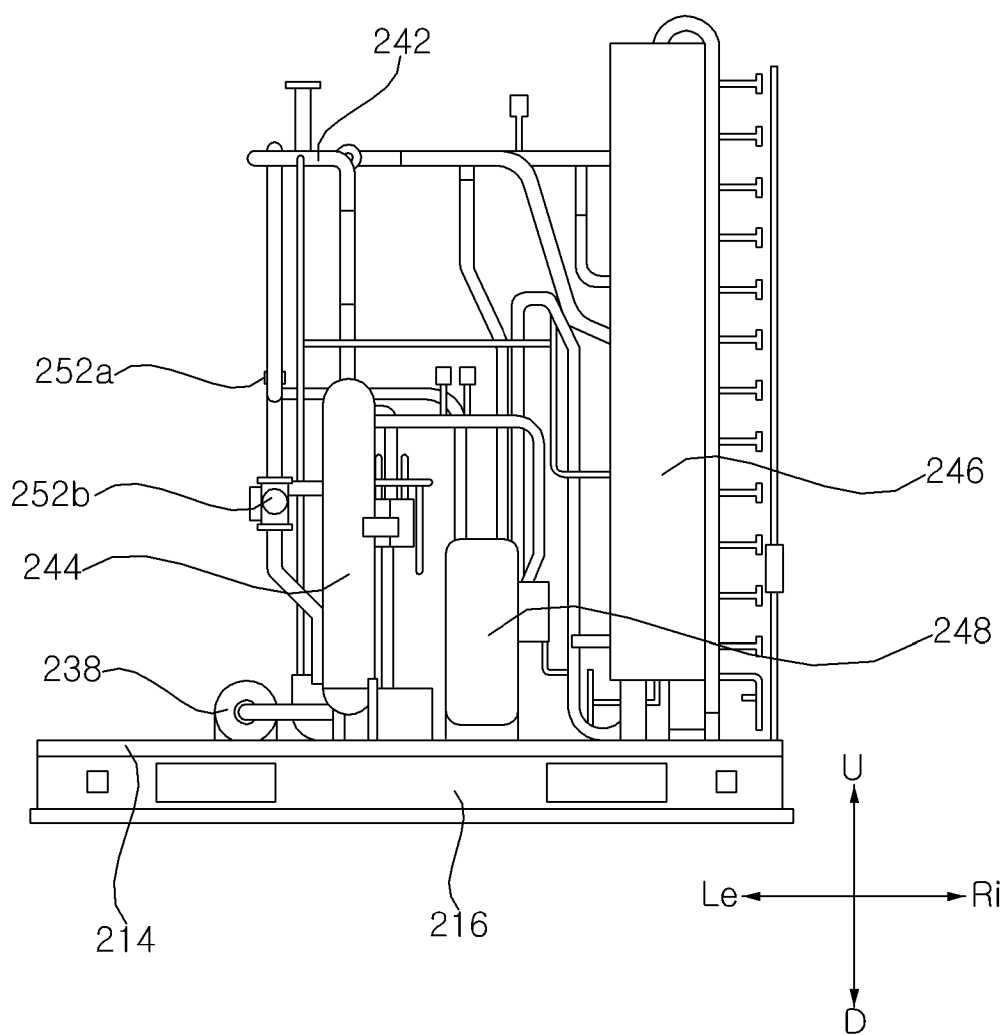


Fig. 16

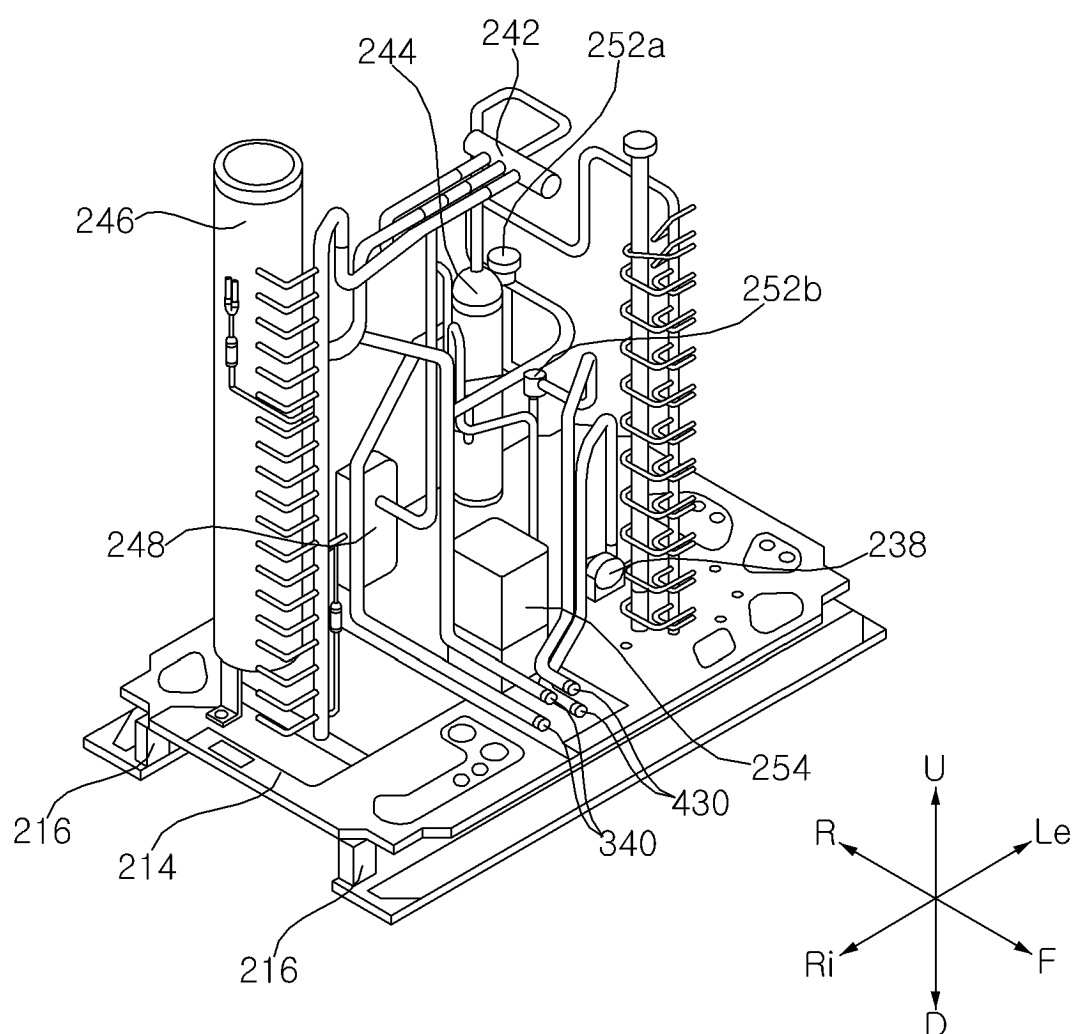


Fig. 17

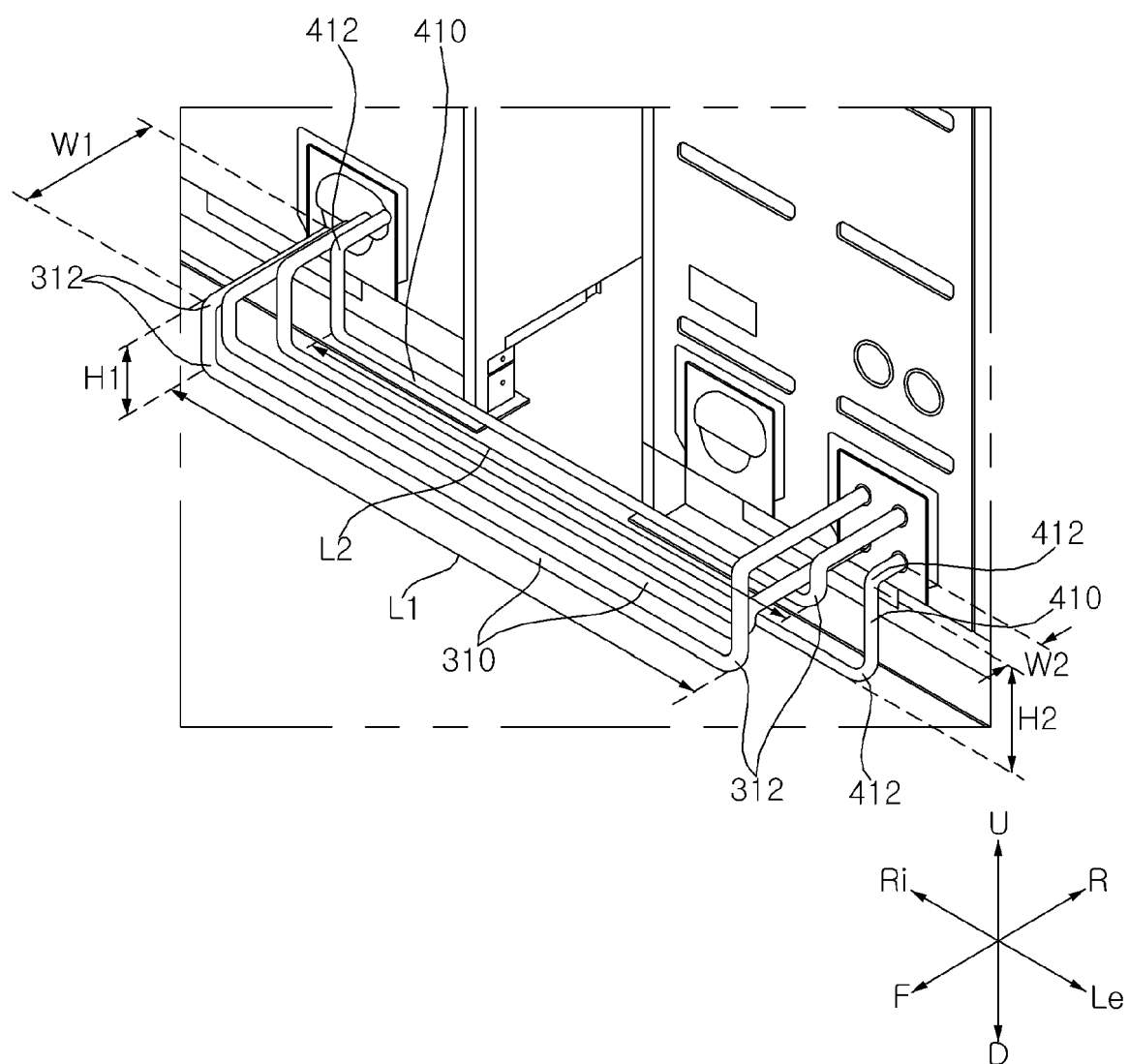
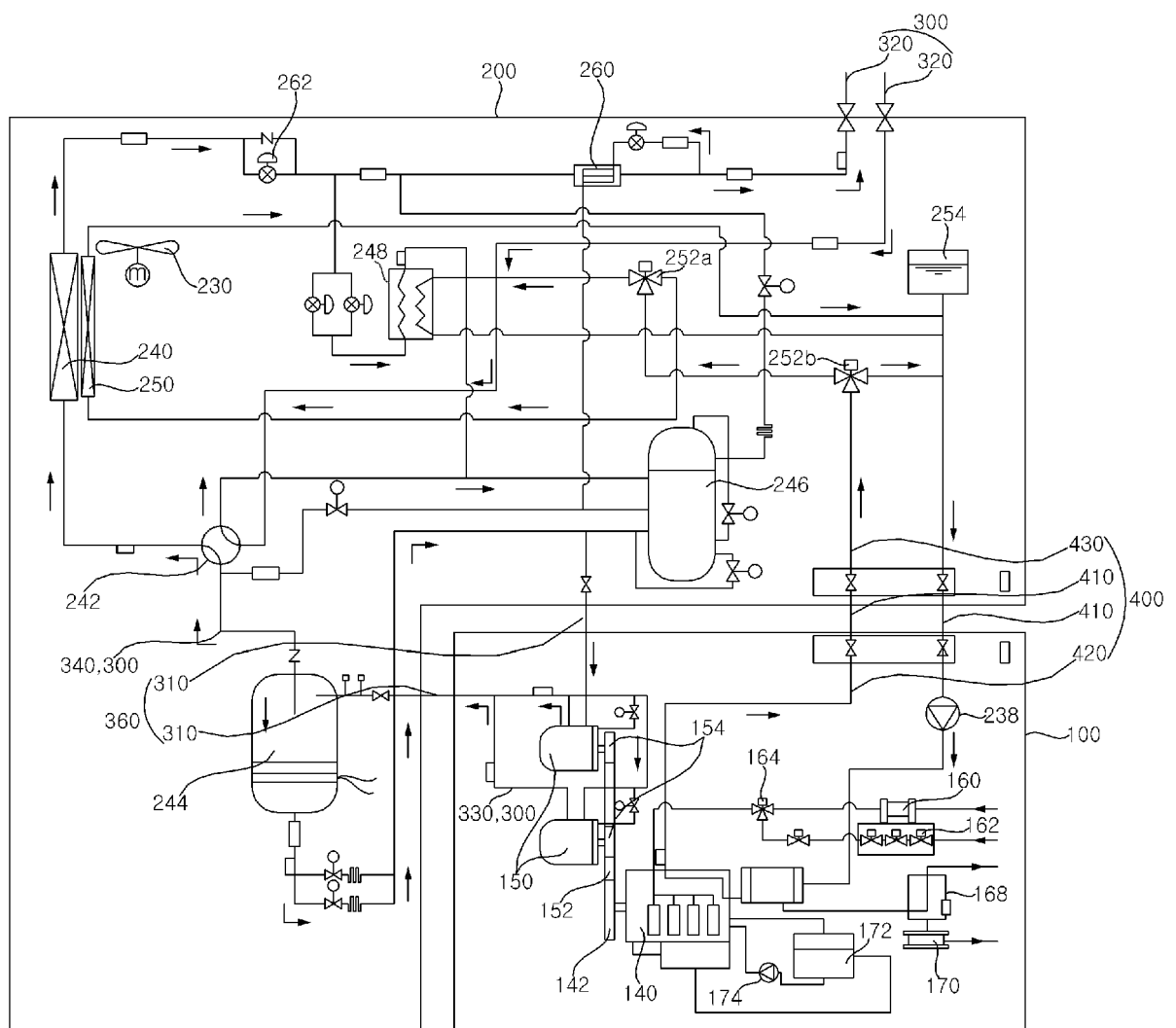


Fig. 18



REFERENCES CITED IN THE DESCRIPTION

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