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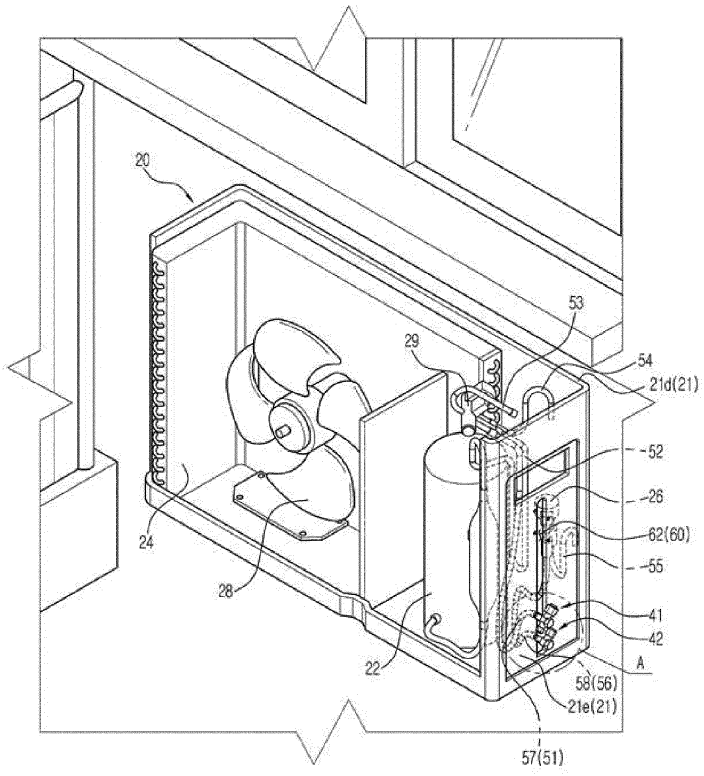
(54) Outdoor unit and air conditioner having the same

(57) An outdoor unit allows the position of the service valve to be changed in order to adapt the outdoor unit to various environments in which the outdoor unit is installed. The outdoor unit of an air conditioner includes a body, a compressor disposed inside the body to compress a refrigerant, an outdoor heat exchanger to cause heat exchange between the refrigerant compressed by the compressor and outdoor air, at least one service valve to regulate the refrigerant flowing into the outdoor heat exchanger, and a guide portion provided at the body to guide a positional shift of the service valve.

FIG. 3



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Description

[0001] The invention relates to an outdoor unit and an air conditioner having the same, in particular to an outdoor unit which allows adjustment of position of a service valve that regulates a refrigerant introduced into and discharged from the outdoor unit.

[0002] An air conditioner, which is an apparatus that evaporates a refrigerant at an ambient temperature to absorb heat from ambient air and discharge the absorbed heat to a different system, includes an evaporator to evaporate the refrigerant to cool the ambient air, a compressor to compress the gaseous refrigerant coming out of the evaporator at high temperature and high pressure, a condenser to condense the compressed gaseous refrigerant coming from the compressor into liquid phase at the ambient temperature, and a capillary tube to decompress the high-pressure liquid refrigerant coming from the condenser.

[0003] The air conditioner may be divided into a split type and an integrated type. The split type air conditioner includes an indoor unit installed indoors to draw in indoor air to cause heat exchange between the indoor air and a refrigerant and discharge the air indoors after heat exchange, and an outdoor unit to cause heat exchange between the refrigerant from the indoor unit and external air to return the refrigerant to an original state thereof, in which heat exchange is allowed to occur between the refrigerant and the indoor air, and supply the refrigerant to the indoor air.

[0004] In general, a service valve to regulate the refrigerant introduced into and discharged from the outdoor unit is coupled at the outer surface of the body of the outdoor unit. Conventionally, the position at which the service valve is installed is limited to a certain place on the outer surface of the body of the outdoor unit, and thus when the outdoor unit is installed in a narrow space or a high-rise building, it may often be difficult to connect pipes to the service valve depending on the position of the outdoor unit.

[0005] In an aspect of one or more embodiments, there is provided an outdoor unit which has a structure that may allow change in the position of a service valve to adapt the outdoor unit to various environments in which the outdoor unit is installed and an air conditioner having the same.

[0006] In an aspect of one or more embodiments, there is provided an outdoor unit of an air conditioner includes a body, a compressor disposed inside the body to compress a refrigerant, an outdoor heat exchanger to cause heat exchange between the refrigerant compressed by the compressor and outdoor air, at least one service valve to regulate the refrigerant flowing into the outdoor heat exchanger, and a guide portion provided at the body to guide a positional shift of the at least one service valve.

[0007] The outdoor unit may further include a capillary tube to lower pressure of the refrigerant which has undergone heat exchange in the heat exchanger, wherein the at least one service valve includes at least one first service valve to regulate the refrigerant flowing into the compressor, and at least one second service valve to regulate the refrigerant flowing out of the capillary tube.

[0008] A pipe connects an inlet of the compressor and one of the at least one service valves may be a flexible pipe of a soft material to allow a positional shift of the one of the at least one service valves along the guide portion.

[0009] The body may include frames, and the at least one service valve is provided at at least one of the frames, wherein at least one position fixing portion to fix a position of the at least one service valve that has shifted along the guide portion may be provided at the at least one frame at which the at least one service valve is positioned.

[0010] The guide portion may include at least one first guide slot to penetrate at least one of the frames and guide shift of the at least one service valve, and at least one second guide slot to penetrate the at least one of the frames and guide, to the position fixing portion, the at least one service valve which has been shifted along the first guide slot. The at least one service valve may include a flange to be coupled with the position fixing portion.

[0011] The flange may have a larger width than the first guide slot and the second guide slot. In accordance with an aspect of one or more embodiments, there is provided an air conditioner having an indoor unit and an outdoor unit includes a body, a compressor disposed inside the body to compress a refrigerant, at least one service valve positioned at an outer surface of the body to regulate the refrigerant flowing into the compressor, a guide portion provided at the body to guide a positional shift of the service valve, and a flexible pipe of a soft material to connect the compressor and the service valve to allow the positional shift of the at least one service valve along the guide portion.

[0012] The body may include frames, and the at least one service valve may provided at at least one of the frames, and the guide portion may include at least one guide slot to penetrate the at least one of the frames to allow the flexible pipe connecting the compressor disposed inside the body and the at least one service valve positioned at the outer surface of the body to be moved.

[0013] The guide slot may have a larger width than a diameter of the flexible pipe. At least one position fixing portion to fix a position of the at least one service valve that has shifted along the guide portion may be provided at the at least one of the frames. The position fixing portion may include a plurality of fixing holes disposed on opposite sides of the guide slot to place the guide slot between the fixing holes.

[0014] The at least one service valve may include a flange to be coupled with the position fixing portion, wherein the flange includes a plurality of fastening holes corresponding to the fixing holes.

[0015] In an aspect of one or more embodiments, there is provided an outdoor unit of an air conditioner including a body; a compressor disposed inside the body to compress a refrigerant; an outdoor heat exchanger to cause

heat exchange between the compressed refrigerant and outdoor air; a plurality of service valves to regulate the refrigerant flowing into the outdoor heat exchanger; a guide portion provided at the body to guide a positional shift of the service valves; and a plurality of flexible pipes of a soft material to connect the compressor and the service valves to allow the positional shift of the service valves along the guide portion.

[0016] The outdoor unit may include a capillary tube to lower pressure of the refrigerant which has undergone heat exchange in the heat exchanger, wherein the plurality of service valves include a first service valve to regulate the refrigerant flowing into the compressor, and a second service valve to regulate the refrigerant flowing out of the capillary tube.

[0017] These and/or other aspects of embodiments will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a view illustrating an air conditioner having an outdoor unit according to an embodiment;
FIG. 2 is a view illustrating a cooling and heating cycle of the air conditioner of FIG. 1;
FIG. 3 is a view illustrating the outdoor unit according to an embodiment;
FIG. 4 is an enlarged view illustrating portion A of FIG. 3;
FIG. 5 is a view illustrating a service valve mounted on the outdoor unit of FIG. 3;
FIG. 6 is a view illustrating the service valve mounted at a different position than the mounting position of the service valve shown in FIG. 5;
FIG. 7 is a view illustrating an air conditioner having an outdoor unit according to an embodiment;
FIG. 8 is a view illustrating a service valve mounted on the outdoor unit of FIG. 7; and
FIG. 9 is a view illustrating the service valve mounted at a different position than the mounting position of the service valve shown in FIG. 8.

[0018] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0019] FIG. 1 is a view illustrating an air conditioner having an outdoor unit according to an embodiment, and FIG. 2 is a view illustrating a cooling and heating cycle of the air conditioner of FIG. 1.

[0020] As shown in FIGS. 1 and 2, an air conditioner 1 includes an indoor unit 10 including a heat exchanger 12 and a fan 14 and installed indoors, and an outdoor unit 20 including a compressor 22, a heat exchanger 24 and a capillary tube 26 and installed outdoors. A refrigerant that has undergone heat exchange in the heat exchanger 12 of the indoor unit 10 flows into the outdoor unit 20 through a first refrigerant pipe 30a. The refrigerant introduced into the outdoor unit 20 is compressed at high temperature and high pressure by the compressor 22, and undergoes heat exchange with the outdoor air in the heat exchanger 24. After undergoing the heat exchange, the refrigerant passes through the capillary tube 26 and flows back into the indoor unit 10 via a second refrigerant pipe 30b.

[0021] Mounted on the outer surface of the outdoor unit 20 are at least one first service valve 41 to regulate the refrigerant flowing into the outdoor unit 20 through the first refrigerant pipe 30a or supplement the refrigerant, and a second service valve 42 to regulate the refrigerant flowing into the indoor unit 10 through the second refrigerant pipe 30b.

[0022] FIG. 3 is a view illustrating the outdoor unit according to an embodiment, FIG. 4 is an enlarged view illustrating portion A of FIG. 3, FIG. 5 is a view illustrating a service valve mounted on the outdoor unit of FIG. 3, and FIG. 6 is a view illustrating the service valve mounted at a different position than the mounting position of the service valve shown in FIG. 5.

[0023] As shown in FIGS. 2 to 6, the outdoor unit 20 includes a body 21 including frames 21a, 21b, 21c, 21d and 21e, a compressor 22 disposed inside the body 21 to compress a refrigerant, a heat exchanger 24 to cause heat exchange between the refrigerant compressed by the compressor 22 and outdoor air, a capillary tube 26 to lower pressure of the refrigerant which has undergone heat exchange in the heat exchanger 24, a fan 28 to increase heat transfer efficiency of the heat exchanger 24, a first service valve 41 and second service valve 42 to regulate the refrigerant flowing from the outdoor unit 20, and connection pipes 50 to connect the compressor 22, heat exchanger 24, capillary tube 26, first service valve 41 and second service valve 42.

[0024] The connection pipes 50 include a first connection pipe 51 to connect the first service valve 41 and a four-way valve 29, a second connection pipe 52 to connect the four-way valve 29 and the inlet of the compressor 22, a third connection pipe 53 to connect the outlet of the compressor 22 and the four-way valve 29, a fourth connection pipe 54 to connect the four-way valve 29 and the inlet of the heat exchanger 24, a fifth connection pipe 55 to connect the outlet of the heat exchanger 24 and the inlet of the capillary tube 26, and a sixth connection pipe 56 to connect the outlet of the capillary tube 26 and the second service valve 42.

[0025] A part or all of the first connection pipe 51 to connect the four-way valve 29 and the first service valve 41 may include a first flexible pipe 57 of a soft material to allow the first service valve 41 to freely move along a guide portion 60, which will be described later, and a part or all of the sixth connection pipe 56 to connect the outlet of the capillary tube 26 and the second service valve 42 may include a second flexible pipe 58 of a soft material to allow the second service valve 42 to freely move along the guide portion 60, which will be described later.

[0026] The first service valve 41 and second service valve 42 may be arranged at at least one of the frames

21a, 21b, 21c, 21d and 21e configuring the body 21. FIGS. 3 to 6 illustrate that the first service valve 41 and second service valve 42 are disposed at the side frame 21e, but embodiments are not limited thereto. The first service valve 41 and second service valve 42 may be disposed at the top frame 21a, bottom frame 21b, front frame 21c or rear frame 21d. Hereinafter, description will be given of the case in which the first service valve 41 and second service valve 42 are disposed at the side frame 21e. The guide portion 60 to guide shift of the first service valve 41 and second service valve 42 is provided at the side frame 21e at which the first service valve 41 and second service valve 42 are mounted.

[0027] The guide portion 60 includes at least one guide slot 62 formed through the side frame 21e to allow the first flexible pipe 57 and second flexible pipe 58 to be shifted while the first flexible pipe 57 connects the four-way valve 29 positioned within the body 21 and the first service valve 41 disposed at the side frame 21e at the outside of the body 21, and the second flexible pipe 58 connects the capillary tube 26 positioned within the body 21 and the second service valve 42 disposed at the side frame 21e at the outside of the body 21.

[0028] The guide slot 62 has a larger width than the diameters of the first flexible pipe 57 and second flexible pipe 58 so that the first flexible pipe 57 and the second flexible pipe 58 may be smoothly shifted.

[0029] As shown in FIGS. 3 to 6, the guide slot 62 may be formed to extend in the vertical direction of the side frame 21e, or to extend in the lateral direction of the side frame 21e, depending on the place and position not shown where the outdoor unit 20 is installed. Depending on positions at which the first service valve 41 and second service valve 42 are disposed, the guide slot 62 may be formed at the top frame 21a, bottom frame 21b, front frame 21c or rear frame 21d, rather than at the side frame 21e. Also, the guide slot 62 may be formed at at least two of the frames 21a, 21b, 21c, 21d and 21e, for example, at the side frame 21e and the front frame 21c connected with the side frame 21e, or at the side frame 21e and the top frame 21a connected with the side frame 21e.

[0030] Provided at the side frame 21e is at least one position fixing portion 70 to fix the position of the first service valve 41 and second service valve 42 which have been shifted along the guide slot 62, along with the guide slot 62.

[0031] The position fixing portion 70 includes a plurality of fixing holes 72a and 72b arranged on both sides of the guide slot 62 to place the guide slot 62 between the fixing holes 72a and 72b. The fixing holes 72a and 72b are formed at positions corresponding to those of a plurality of fastening holes 43a and 44a formed on a first flange 43 and second flange 44 of the first service valve 41 and second service valve 42, which will be described later, so as to fix the first service valve 41 and second service valve 42 to the position fixing portion 70 through fastening members such as bolts and nuts.

[0032] The first service valve 41 includes a valve body 45, a first connector 45a provided at one end of the valve body 45 to be connected with the first refrigerant pipe 30a, a second connector 45b provided at the other end of the valve body 45 to be connected with the first flexible pipe 57, and the first flange 43 radially extending from the valve body 45. The first flange 43 is formed to have a larger width than the guide slot 62 to allow the first service valve 41 to be caught in the guide slot 62, and includes a plurality of fastening holes 43a formed at positions corresponding to those of the fixing holes 72a so as to fix the first service valve 41 to the position fixing portion 70.

[0033] The second service valve 42 includes a valve body 46, a third connector 46a provided at one end of the valve body 46 to be connected with the second refrigerant pipe 30b, a fourth connector 46b provided at the other end of the valve body 46 to be connected with the second flexible pipe 58, and the second flange 44 radially extending from the valve body 46. The second flange 44 is formed to have a larger width than the guide slot 62 to allow the second service valve 42 to be caught in the guide slot 62, and includes a plurality of fastening holes 44a formed at positions corresponding to those of the fixing holes 72b so as to fix the second service valve 42 to the position fixing portion 70.

[0034] When the body 21 is installed as shown in FIG. 3, the operator first shifts the first service valve 41 and second service valve 42 positioned at the lower portion of the side frame 21e to the upper portion of the side frame 21e through the guide slot 62, as shown in FIGS. 5 and 6. After being shifted to the upper portion of the side frame 21e, the first service valve 41 and second service valve 42 are positioned such that the fastening holes 43a and 44a formed in the first flange 43 and second flange 44 are positioned to correspond to the fixing holes 72a and 72b, and securely fastened to the position fixing portion 70 using fixing members such as bolts and nuts. After the first service valve 41 and second service valve 42 are securely fixed in place, work with the refrigerant pipes 30a and 30b for the first service valve 41 and second service valve 42is performed.

[0035] As described above, the positions of the first service valve 41 and second service valve 42 may be changed according to a place and position at which the outdoor unit 20 is installed, and therefore work with the refrigerant pipes 30a and 30b may be facilitated, and an accident such as falling during working on the refrigerant pipes 30a and 30b may be prevented.

[0036] FIG. 7 is a view illustrating an outdoor unit according to an embodiment, FIG. 8 is a view illustrating a service valve mounted on the outdoor unit of FIG. 7, and FIG. 9 is a view illustrating the service valve mounted at a different position than the mounting position of the service valve shown in FIG. 8. In case of the outdoor unit 120 according to an embodiment, the details of the outdoor unit 120 other than a guide portion 160 are the same as those of the outdoor unit 20 in previous embodiments, and therefore description thereof will be omitted.

[0037] As shown in FIGS. 7 to 9, the guide portion 160 includes at least one first guide slot 162 formed through the side frame 21e, and at least one second guide slot 164 extending from the first guide slot 162 in a direction different from the direction in which the first guide slot 162 extends to guide, to the position fixing portion 70, the first service valve 41 and second service valve 42 shifted along the first guide slot 162, in order to allow the first flexible pipe 57 and second flexible pipe 58 to be moved while the first flexible pipe 57 connects the four-way valve 29 positioned within the body 21 and the first service valve 41 disposed at the side frame 21e at the outside of the body 21, and the second flexible pipe 58 connects the capillary tube 26 positioned within the body 21 and the second service valve 42 disposed at the side frame 21e at the outside of the body 21.

[0038] The fixing holes 72a and 72b are disposed around the second guide slot 164 to be arranged on both sides of the second guide slot 164.

[0039] When the body 21 is installed as shown in FIG. 7, the operator first shifts the first service valve 41 and second service valve 42 positioned at the lower portion of the side frame 21e to the upper portion of the side frame 21e through the first guide slot 162, and then shifts the same to the position fixing portion 70 through the second guide slot 164, as shown in FIGS. 8 and 9. While the first service valve 41 and second service valve 42 are seated in the second guide slot 164, the first service valve 41 and second service valve 42 are positioned such that the fastening holes 43a and 44a formed in the first flange 43 and second flange 44 are positioned to correspond to the fixing holes 72a and 72b, and securely fastened to the position fixing portion 70 using the fixing members such as bolts and nuts. When the first service valve 41 and second service valve 42 are securely fixed in place, work with the refrigerant pipes 30a and 30b for the first service valve 41 and second service valve 42may be easily performed.

[0040] As is apparent from the above description, according to embodiments, work with pipes for service valves may be easily performed regardless of places and positions where an outdoor unit is installed.

[0041] Also, accidents occurring during working on the pipes for the service valves may be prevented.

[0042] Although a few embodiments have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. An outdoor unit of an air conditioner comprising:

a body;
a compressor disposed inside the body to compress a refrigerant;
an outdoor heat exchanger to cause heat exchange between the refrigerant compressed by the compressor and outdoor air;
at least one service valve to regulate the refrigerant flowing into the outdoor heat exchanger; and
a guide portion provided at the body to guide a positional shift of the at least one service valve.

2. The outdoor unit according to claim 1, further comprising a capillary tube to lower pressure of the refrigerant which has undergone heat exchange in the heat exchanger,
wherein the at least one service valve includes at least one first service valve to regulate the refrigerant flowing into the compressor, and at least one second service valve to regulate the refrigerant flowing out of the capillary tube.

3. The outdoor unit according to claim 1 or 2, wherein a pipe connects an inlet of the compressor and the one of the at least one service valves, and wherein the pipe is a flexible pipe of a soft material to allow a positional shift of the one of the at least one service valves along the guide portion.

4. The outdoor unit according to any one of the preceding claims, wherein:

the body comprises frames and the at least one service valve is provided at at least one of the frames, and
at least one position fixing portion to fix a position of the at least one service valve that has shifted along the guide portion is provided at the at least one frame at which the at least one service valve is positioned.

5. The outdoor unit according to claim 4, wherein the guide portion comprises:

at least one first guide slot to penetrate at least one of the frames and guide shift of the at least one service valve; and
at least one second guide slot to penetrate the at least one of the frames and guide, to the position fixing portion, the at least one service valve which has been shifted along the first guide slot.

6. The outdoor unit according to claim 5, wherein the at least one service valve comprises a flange configured to be coupled with the position fixing portion.

7. The outdoor unit according to claim 6, wherein the flange has a larger width than the first guide slot and the second guide slot.

8. An air conditioner including an indoor unit and an

outdoor unit, wherein the outdoor unit comprises:

a body;
a compressor disposed inside the body to compress a refrigerant;
at least one service valve positioned at an outer surface of the body to regulate the refrigerant flowing into the compressor;
a guide portion provided at the body to guide a positional shift of the service valve; and
a flexible pipe of a soft material to connect the compressor and the at least one service valve to allow the positional shift of the at least one service valve along the guide portion.

9. The air conditioner according to claim 8, wherein:

the body comprises frames, and the at least one service valve is provided at at least one of the frames; and
the guide portion comprises at least one guide slot to penetrate the at least one of the frames to allow the flexible pipe connecting the compressor disposed inside the body and the at least one service valve positioned at the outer surface of the body to be moved.

10. The air conditioner according to claim 9, wherein the guide slot has a larger width than a diameter of the flexible pipe.

11. The air conditioner according to claim 9, wherein at least one position fixing portion to fix a position of the at least one service valve that has shifted along the guide portion is provided at the at least one of the frames.

12. The air conditioner according to claim 11, wherein the position fixing portion comprises a plurality of fixing holes disposed on opposite sides of the guide slot to place the guide slot between the fixing holes.

13. The air conditioner according to claim 12, wherein the at least one service valve comprises a flange to be coupled with the position fixing portion,
wherein the flange comprises a plurality of fastening holes corresponding to the fixing holes.

FIG. 1

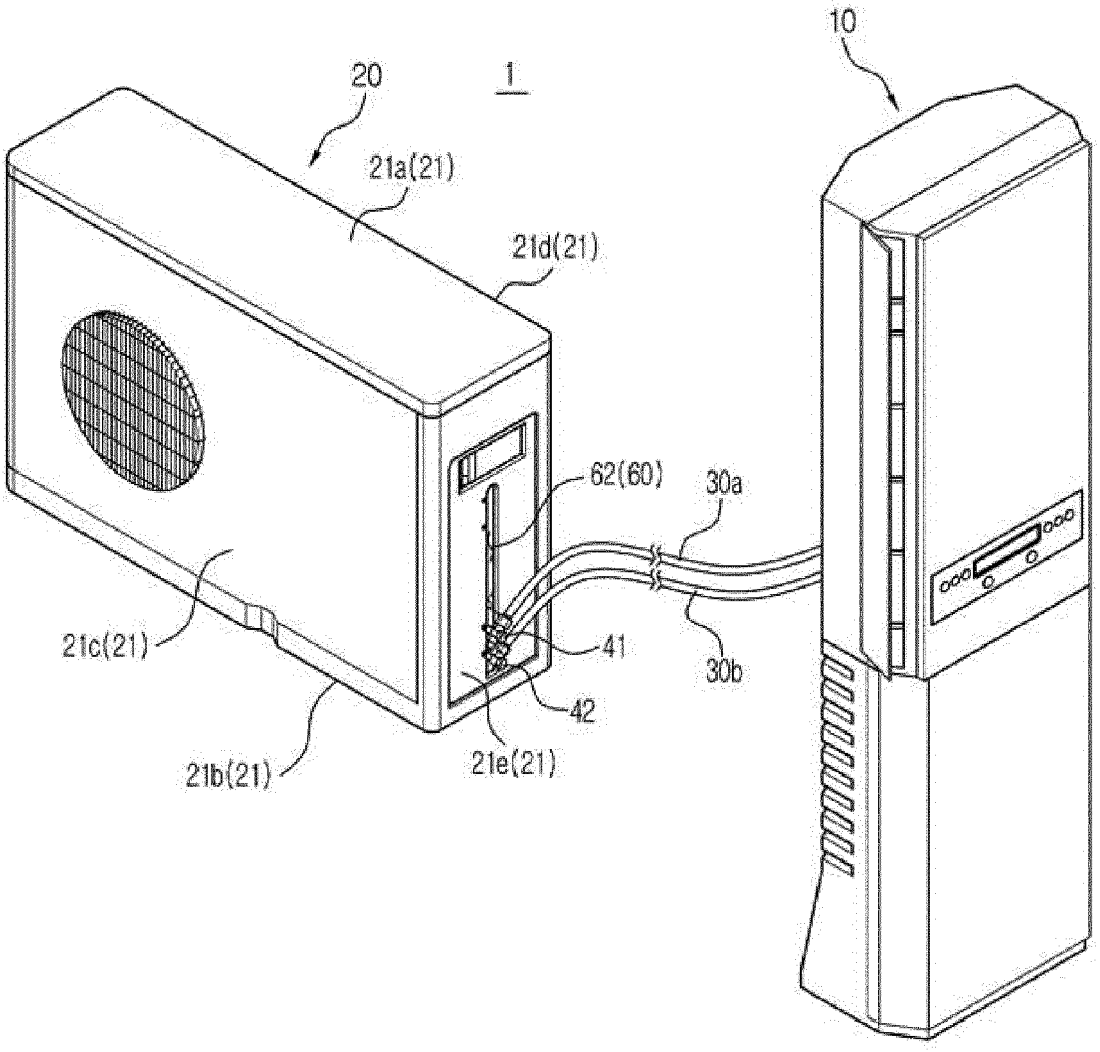

FIG. 2

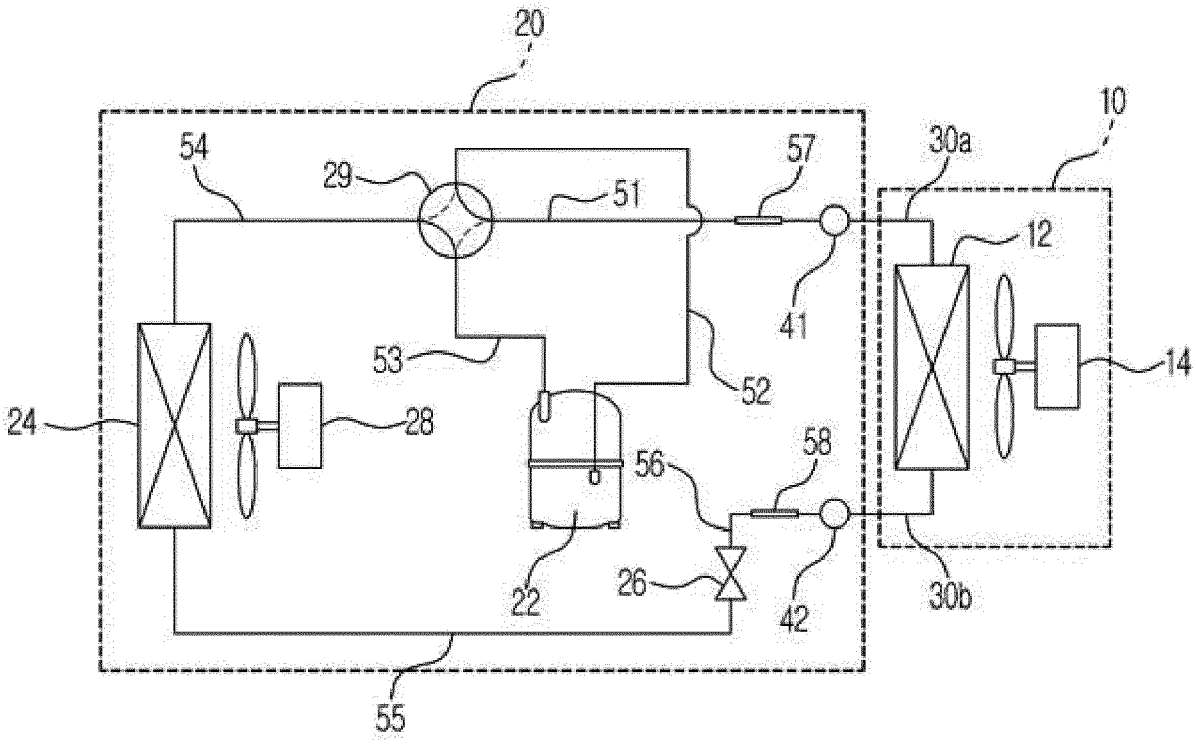

FIG. 3

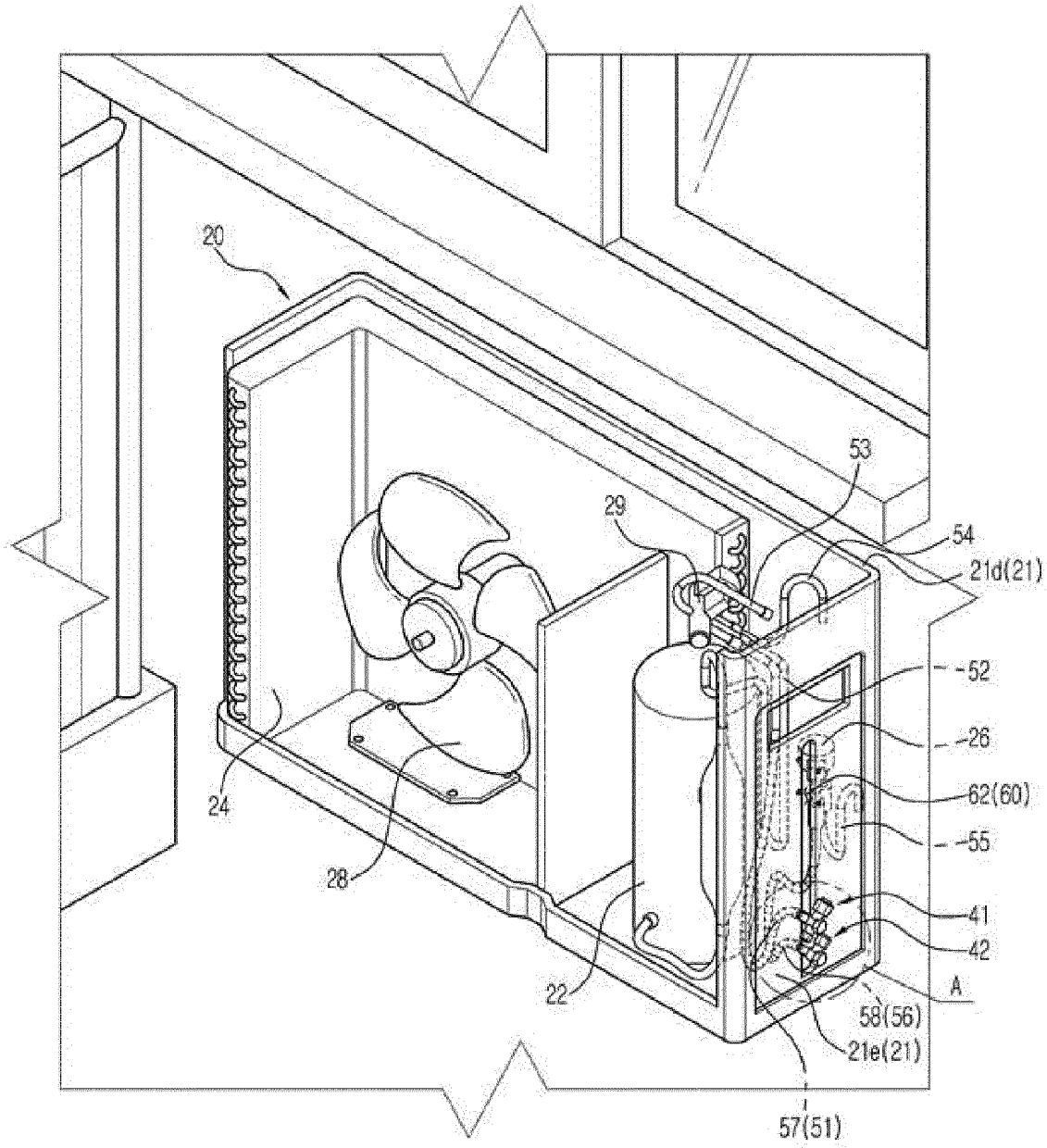

FIG. 4

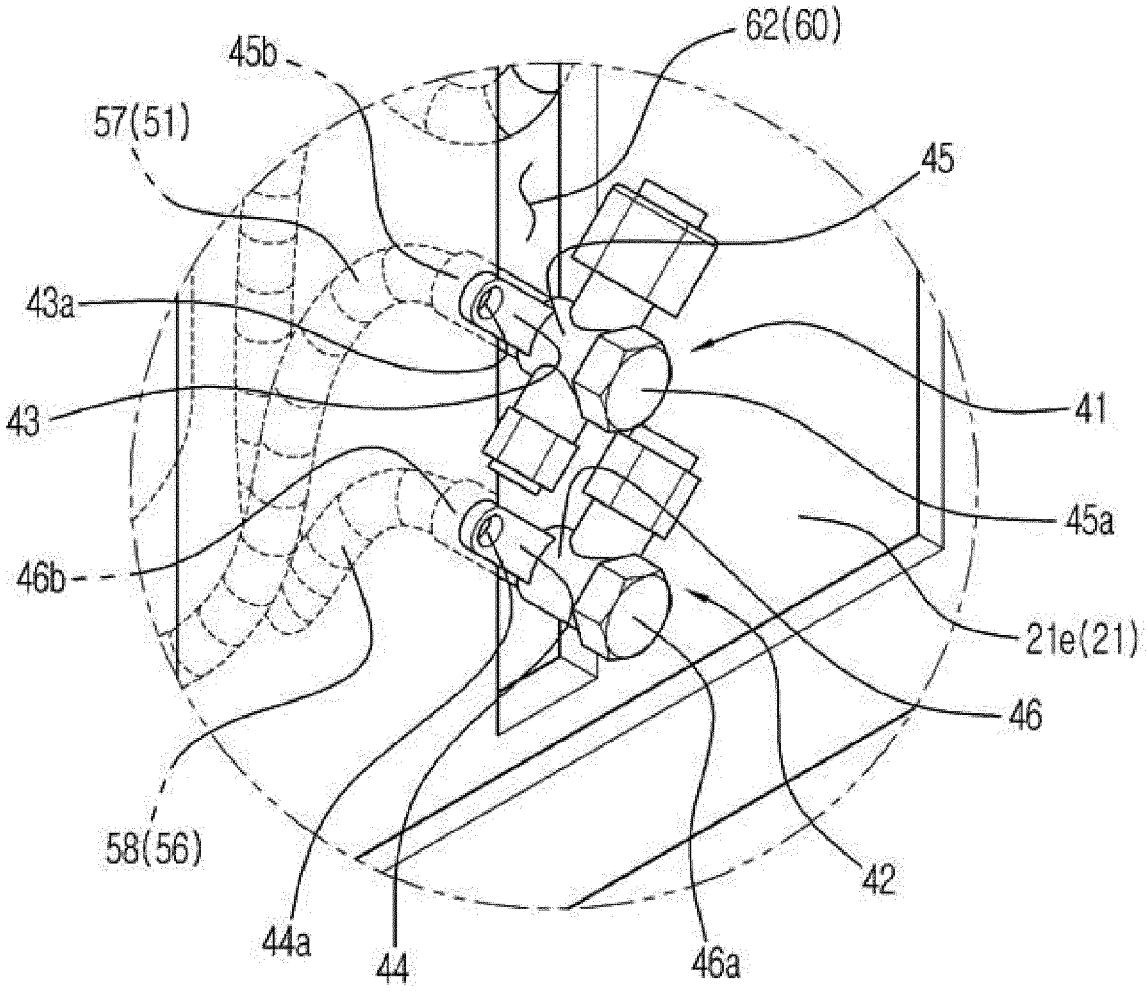

FIG. 5

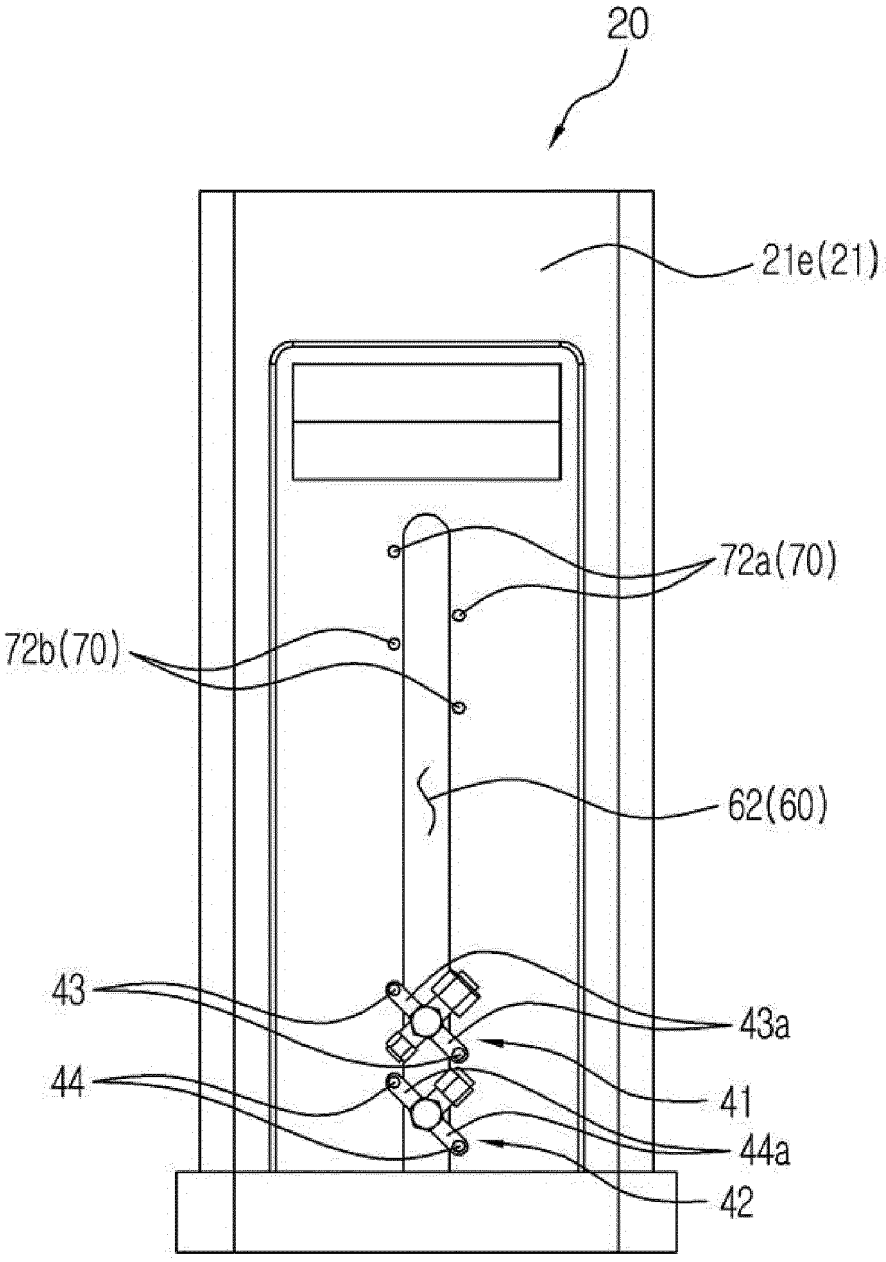

FIG. 6

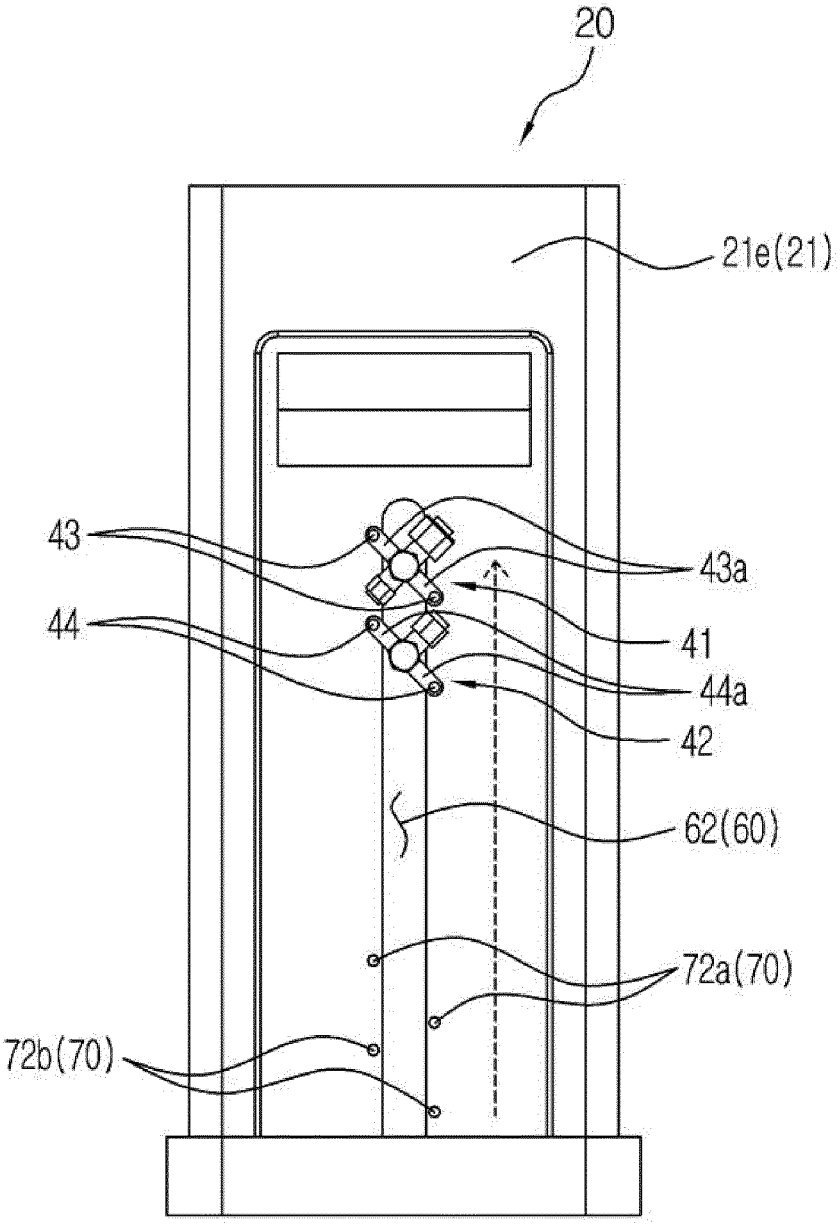

FIG. 7

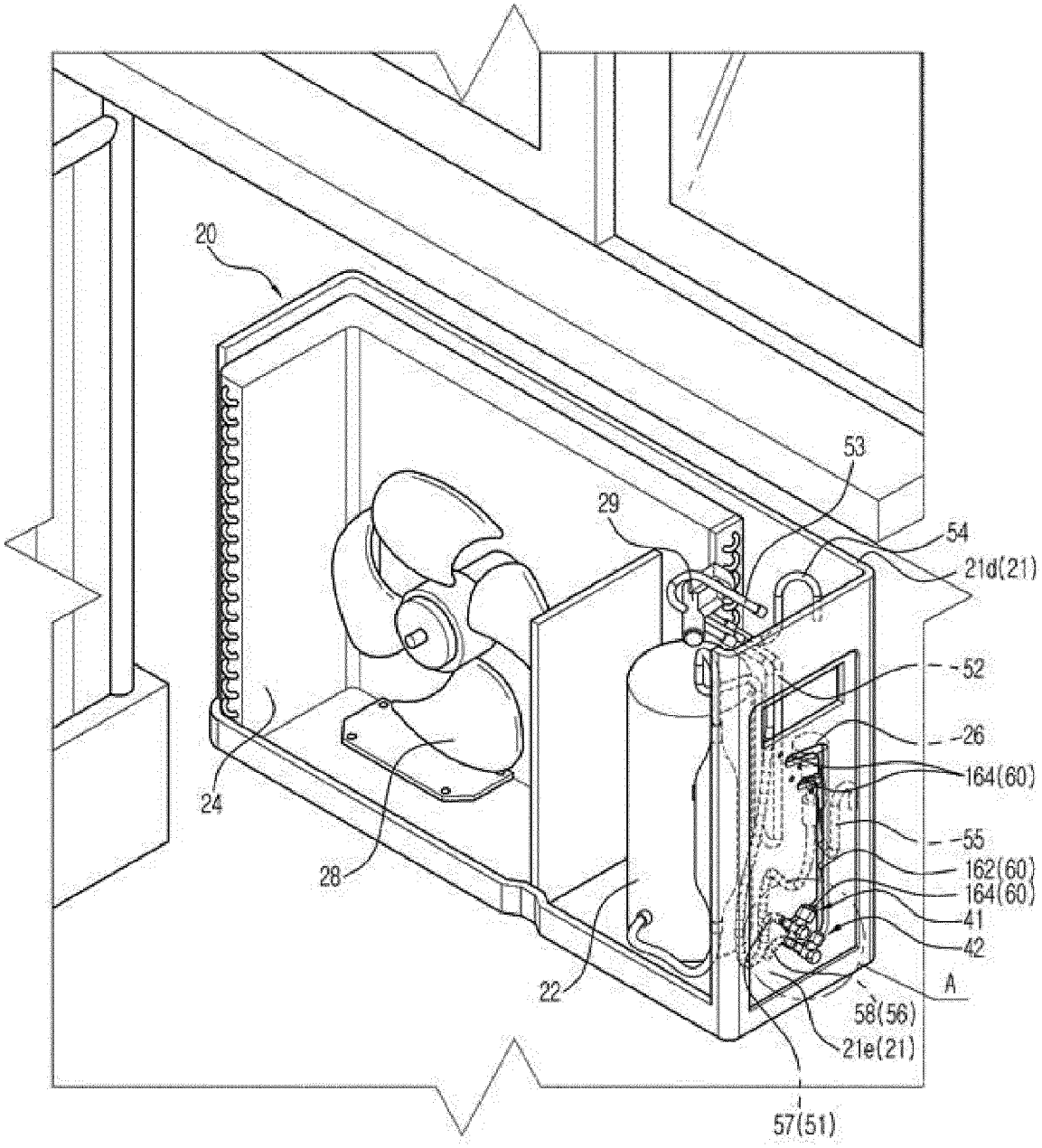
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FIG. 8

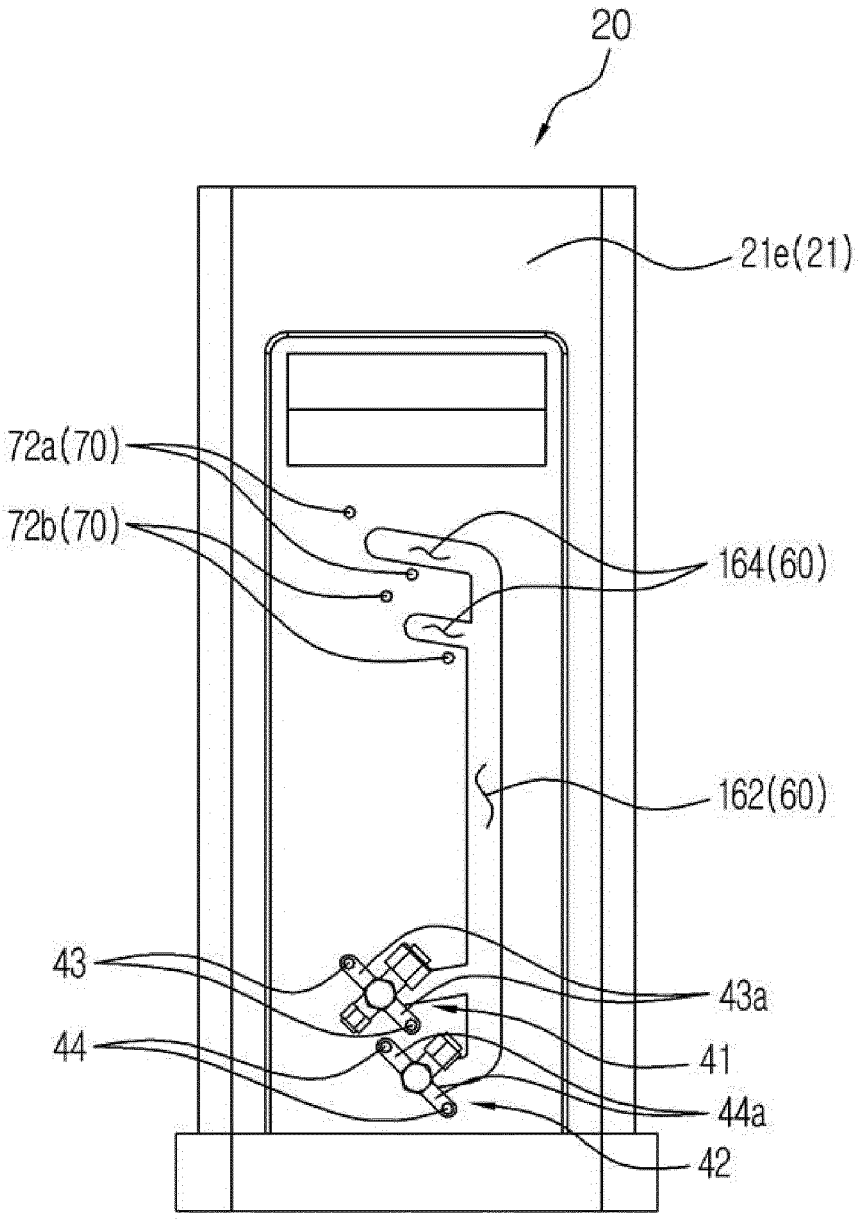

FIG. 9