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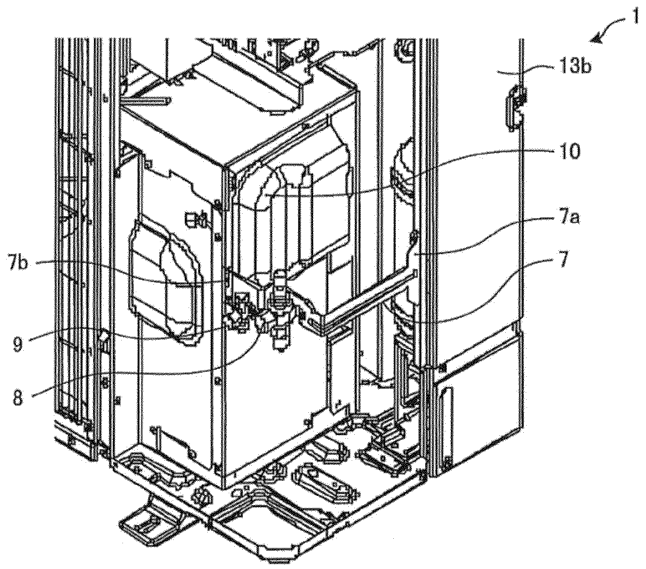
(54) **OUTDOOR MACHINE**

(57) Provided is a low noise outdoor unit in which an increase in the size of the outdoor unit is reduced and the ease of maintenance is maintained. The outdoor unit includes a refrigerant pipe through which refrigerant is circulated, a housing that houses the refrigerant pipe, a sound-proof box that is housed in the housing and surrounds a compressor that causes the refrigerant to be circulated, a connection valve connected to an end of the refrigerant pipe and an external pipe, and a valve bed that fixes the connection valve. The valve bed has one end fixed to an inner surface of the housing and another end fixed to one of side plates of the sound-proof box.

FIG. 3



EP 3 348 936 A1

Description

Technical Field

[0001] The present invention relates to an outdoor unit, and more particularly, to the downsizing of an outdoor unit.

Background Art

[0002] A contour of an outdoor unit, such as a heat pump outdoor unit, is composed of an outer panel. The inside of the outdoor unit is partitioned by a separator into a machine chamber that houses a compressor and other components, and a fan chamber that houses a heat exchanger and a fan. The outer panel is provided with connection valves. The connection valves are connected with an extension pipe including two pipes, that is, an extension pipe through which gas refrigerant flows and an extension pipe through which liquid refrigerant flows, thereby connecting the outdoor unit to an indoor unit.

[0003] The connection valves form ends of a refrigerant pipe of the outdoor unit, and are fixed to a valve bed to reduce the weight of the extension pipe loaded on the connection valves. The valve bed is formed of, for example, sheet metal. One end of the valve bed is fixed to the outer panel and the other end of the valve bed passes through a front surface side of the compressor and is fixed to the separator.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2012-052737

Summary of Invention

Technical Problem

[0005] Incidentally, to achieve a low noise outdoor unit, it is effective to surround the compressor with a sound-proof box formed of sheet metal or other similar member for soundproofing. However, when the valve bed is fixed to each of the outer panel and the separator as in the related art, the sound-proof box, which is larger than the compressor, hinders the arrangement position of the valve bed. To mount the sound-proof box that houses the compressor, the valve bed needs to be arranged, for example, in front of the sound-proof box, or above the sound-proof box, to avoid hindering the sound-proof box. This configuration leads to an increase in the size of the outdoor unit, restrictions on the arrangement space of the outdoor unit, and other inconvenience.

[0006] In particular, when the valve bed is arranged in front of the sound-proof box, the valve bed vertically passes through the front surface side of the sound-proof box. In this arrangement, an access to the sound-proof box is hindered by the valve bed. Consequently, the valve bed has to be detached, leading to deterioration in maintainability.

Solution to Problem

[0007] An outdoor unit according to one embodiment of the present invention includes a refrigerant pipe through which refrigerant is circulated, a housing that houses the refrigerant pipe, a sound-proof box that is housed in the housing and surrounds a compressor that causes the refrigerant to be circulated, a connection valve connected to an end of the refrigerant pipe and an external pipe, and a valve bed that fixes the connection valve. The valve bed has one end fixed to an inner surface of the housing and another end fixed to one of side plates of the sound-proof box. Advantageous Effects of Invention

[0008] In the outdoor unit according to one embodiment of the present invention, one end of the valve bed is fixed to the outer panel, and the other end of the valve bed is fixed to the sound-proof box, thereby arranging the valve bed at a position where the valve bed is prevented from being hindered by the sound-proof box. This structure makes it possible to achieve a low noise outdoor unit in which an increase in the size of the outdoor unit is reduced and the ease of maintenance is maintained.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a schematic view illustrating an outline of a heat pump outdoor unit according to this embodiment.

[Fig. 2] Fig. 2 is a front view illustrating a state where a service panel of the heat pump outdoor unit according to this embodiment is detached.

[Fig. 3] Fig. 3 is an enlarged perspective view illustrating a state where a refrigerant pipe of the heat pump outdoor unit illustrated in Fig. 2 is removed.

[Fig. 4] Fig. 4 is an exploded schematic view illustrating a sound-proof box of the heat pump outdoor unit according to this embodiment.

[Fig. 5] Fig. 5 is an enlarged perspective view illustrating a state where a part of the sound-proof box of the heat pump outdoor unit according to this embodiment is detached.

[Fig. 6] Fig. 6 is a schematic view illustrating an outline of the heat pump outdoor unit according to the embodiment in which the arrangement of the service panel and a blowing grille is changed.

[Fig. 7] Fig. 7 is a partial perspective view illustrating a heat pump outdoor unit according to a modified example of the embodiments.

Description of Embodiments

Embodiments

[0010] In an outdoor unit according to this embodiment, components such as a compressor, a heat exchanger, and a fan are housed in a housing, the compressor is driven to circulate refrigerant through a refrigerant pipe that connects the components and an indoor heat exchanger of an indoor unit connected to the outdoor unit, and a refrigeration cycle is formed. The following embodiments illustrate a heat pump outdoor unit as an example of the outdoor unit. However, other outdoor units for refrigeration cycle may be used.

<Structure of Heat Pump Outdoor Unit 1>

[0011] Fig. 1 is a schematic view illustrating an outline of a heat pump outdoor unit 1 according to this embodiment. As illustrated in Fig. 1, in the heat pump outdoor unit 1, an upper panel 11, a front panel 12, a right side panel 13, a back panel 14, a left side panel 15, and a bottom panel 16 constitute and cover a housing 100. Note that the right side panel 13 and the left side panel 15 may be simply referred to as side panels.

[0012] The front panel 12 includes a blowing grille 23 on the left side of the front panel 12, and the blowing grille 23 is for sucking air into the heat pump outdoor unit 1. The right side panel 13 is divided into a front side part 13a of the right side panel 13 and a back side part 13b of the right side panel 13. A part of the right side of the front panel 12 and the front side part 13a of the right side panel 13 connected to the front panel 12 constitute a service panel 5 that is detachable during a maintenance work. Holes 18 are formed at a lower part of the front panel 12. An extension pipe from an indoor unit, which is not illustrated, is inserted from the holes 18, and is connected to the heat pump outdoor unit 1. Note that the following description illustrates an example in which the blowing grille 23 is arranged on the left side of the front panel 12 and the service panel 5 is arranged on the right side of the front panel 12. However, the arrangement positions of the blowing grille 23 and the service panel 5 are not limited to these positions. For example, the blowing grille 23 may be arranged on the right side of the front panel 12 and a part of the service panel 5 may be composed of the left side of the front panel 12. The holes 18 may be formed in the right side panel 13 and other location, instead of being formed in the front panel 12. Further, the service panel 5 is formed within a range or area where the workability is not impaired. For example, only the front panel 12 may constitute the service panel 5.

[0013] Fig. 2 is a front view illustrating a state where the service panel 5 of the heat pump outdoor unit 1 according to this embodiment is detached. As illustrated in Fig. 2, in the heat pump outdoor unit 1, a fan chamber 2 is formed on the side where the blowing grille 23 is located, and a machine chamber 3 is formed on the side where the service panel 5 is located. The fan chamber 2 and the machine chamber 3 are partitioned by a separator 4 formed of a flat plate or other similar member.

[0014] The machine chamber 3 houses a sound-proof box 10, an electric component box 17, and a refrigerant pipe 20. The machine chamber 3 is exposed when the service panel 5 is detached. The sound-proof box 10 is provided to house the compressor in the sound-proof box 10 and prevent leakage of sound generated during driving of the compressor to the outside, and is arranged adjacent to the separator 4. The electric component box 17 is arranged at a position adjacent to the separator 4 and above the sound-proof box 10, and houses electric components for controlling the compressor and other components. A space formed below the electric component box 17, except for the sound-proof box 10, is an area in which the refrigerant pipe 20 is housed. The fan chamber 2 houses the heat exchanger and the fan, which are not illustrated, and heat is exchanged between the refrigerant circulated in the heat exchanger the air blown by the fan.

[0015] Fig. 3 is an enlarged perspective view illustrating a state where the refrigerant pipe 20 of the heat pump outdoor unit 1 illustrated in Fig. 2 is removed, and illustrates a corner of the machine chamber 3. As illustrated in Fig. 3, when the service panel 5 is detached, a gas valve 8 and a liquid valve 9, which are provided in the machine chamber 3, and a valve bed 7 for fixing the gas valve 8 and the liquid valve 9 are exposed.

[0016] The gas valve 8 forms an end of a gas pipe through which gas refrigerant is circulated, and the liquid valve 9 forms an end of a liquid pipe through which liquid refrigerant is circulated. The gas pipe and the liquid pipe constitute the refrigerant pipe 20 illustrated in Fig. 2. The refrigerant pipe 20 is connected to the extension pipe that leads from the indoor unit, which is not illustrated, and is inserted into the holes 18, through the gas valve 8 and the liquid valve 9.

<Structure of Valve Bed 7>

[0017] The valve bed 7 is a member that supports the gas valve 8 and the liquid valve 9. Both ends of the valve bed 7 are fixed by screws, welding, or other method. The valve bed 7 is formed of a horizontally-long flat plate or other similar member. One end 7a of the valve bed 7 is attached to the inside of the back side part 13b of the right side panel 13, and the other end 7b of the valve bed 7 is attached to a side plate of the sound-proof box 10, to be more specific, the right side plate in this case. The valve bed 7 is provided to receive the weight of the extension pipe connected to each of the gas valve 8 and the liquid valve 9 and reduce a load on the gas valve 8 and the liquid valve 9. Consequently, the valve bed 7 is desirably formed of a material having a high specific strength and a high specific rigidity. Note that the gas valve 8 and the liquid valve 9 are examples of a connection valve according to the present invention, and the

extension pipe is an example of an external pipe that connects the outdoor unit and the indoor unit to each other.

[0018] The one end 7a of the valve bed 7 is fixed to the back side part 13b of the right side panel 13, and the other end 7b is fixed to the right side plate of the sound-proof box 10. With this structure, the dimension in the longitudinal direction of the valve bed 7 can be reduced as compared with a case where the valve bed 7 is fixed to each of the right side panel 13 and the separator 4. Consequently, a bending moment on the valve bed 7 is reduced. During a maintenance work, the service panel 5 is detached in the state where the both ends of the valve bed 7 are fixed.

<Structure of Sound-proof Box 10>

[0019] Fig. 4 is an exploded schematic view illustrating the sound-proof box 10 of the heat pump outdoor unit 1 according to this embodiment. As illustrated in Fig. 4, the sound-proof box 10 is formed of an upper surface plate 10a, a front surface plate 10b, a right side plate 10c, a back plate 10d, a left side plate 10e, and a bottom plate 10f, and surround a compressor 6. The compressor 6 is placed on the upper surface of the bottom plate 10f. The upper surface plate 10a and the front surface plate 10b are detachable. The left side plate 10e of the sound-proof box 10 is arranged adjacent to the fan chamber, and the right side plate 10c of the sound-proof box 10 is arranged at a position that is closest to the right side panel 13. The compressor 6 is housed in the sound-proof box 10 to block the sound generated by the compressor 6. The sound-proof box 10 that houses the compressor 6 is placed on the bottom panel 16 of the heat pump outdoor unit 1.

[0020] Fig. 5 is an enlarged perspective view illustrating a state where a part of the sound-proof box 10 of the heat pump outdoor unit 1 according to this embodiment is detached. In Fig. 5, the illustration of the refrigerant pipe 20 is omitted for ease of explanation. As illustrated in Fig. 5, the other end 7b of the valve bed 7 is fixed to the right side plate 10c of the sound-proof box 10. The upper surface plate 10a and the front surface plate 10b of the sound-proof box 10 are detachable. When the upper surface plate 10a and the front surface plate 10b of the sound-proof box 10 are detached in the state where the other end 7b of the valve bed 7 remains fixed to the right side plate 10c of the sound-proof box 10, the compressor 6 can be exposed from the sound-proof box 10. The other end 7b of the valve bed 7 is fixed to the right side plate 10c, which is closest to the right side panel 13 among the side surfaces of the sound-proof box 10, and thus is prevented from horizontally passing through the front surface of the sound-proof box 10.

[0021] In this manner, in the low noise heat pump outdoor unit 1 in which the compressor 6 is housed in the sound-proof box 10, the one end 7a of the valve bed 7 is fixed to the right side panel 13, and the other end 7b of the valve bed 7 is fixed to the right side plate 10c of the sound-proof box 10. This structure prevents the arrangement position of the valve bed 7 from being hindered by the sound-proof box 10.

<Procedure for Maintenance of Heat Pump Outdoor Unit 1>

[0022] Next, a procedure for maintenance of the heat pump outdoor unit 1 will be described.

[0023] In a maintenance work, first, an operator detaches a part of the housing 100 of the heat pump outdoor unit 1. Specifically, the operator detaches the service panel 5 composed of the right side of the front panel 12 and the front side part 13a of the right side panel 13, thereby bringing the heat pump outdoor unit 1 into the state illustrated in Fig. 2. When a maintenance work is performed only on the refrigerant pipe 20, the maintenance work may be performed in the state illustrated in Fig. 2 in which the refrigerant pipe 20 and the sound-proof box 10 are exposed. At this time, as the one end 7a of the valve bed 7 is fixed to the back side part 13b of the right side panel 13, the valve bed 7 does not have to be detached when the service panel 5 is detached.

[0024] Then, the operator detaches a part of the sound-proof box 10. Specifically, the operator detaches the upper surface plate 10a and the front surface plate 10b of the sound-proof box 10 to thereby bring the heat pump outdoor unit 1 into the state illustrated in Fig. 5 from the state illustrated in Fig. 2 so that the compressor 6 housed in the sound-proof box 10 is exposed. When a maintenance work is performed on the refrigerant pipe 20 and the compressor 6, the maintenance work is performed in the state where the compressor 6 is also exposed.

[0025] At this time, as the other end 7b of the valve bed 7 is fixed to the right side plate 10c of the sound-proof box 10, the valve bed 7 is not located at a position that the valve bed 7 vertically passes through the front surface of the sound-proof box 10. Consequently, the upper surface plate 10a and the front surface plate 10b of the sound-proof box 10 can be detached to expose the compressor 6, without the need for detaching the valve bed 7.

[0026] In this manner, in the heat pump outdoor unit 1, the one end 7a of the valve bed 7 is fixed to the back side part 13b of the right side panel 13 of the housing 100, thereby making it possible to detach the service panel 5 without the need for detaching the valve bed 7. Further, the other end 7b of the valve bed 7 is fixed to the right side plate 10c of the sound-proof box 10, thereby making it possible to access the compressor 6 in the sound-proof box 10, without the need for detaching the valve bed 7. Thus, the sound-proof box 10 is installed in the heat pump outdoor unit 1, thereby improving the soundproofing performance and the maintainability of the heat pump outdoor unit 1. Furthermore, an increase in the size of the heat pump outdoor unit 1 can be prevented.

[0027] Fig. 6 is a schematic view illustrating an outline

of the heat pump outdoor unit 1 according to the embodiment in which the arrangement of the blowing grille 23 and the service panel 5 is changed. As illustrated in Fig. 6, the heat pump outdoor unit 1 may have a structure in which the blowing grille 23 is arranged on the right side of the front panel 12 and the service panel 5 is arranged on the left side of the front panel 12. In this case, the one end 7a of the valve bed 7 is fixed to the inner surface of the left side panel 15 and the other end 7b of the valve bed 7 is fixed to the left side plate 10e of the sound-proof box 10. Consequently, even when the arrangement positions of the blowing grille 23 and the service panel 5 are changed, the arrangement of the valve bed 7 makes it possible to improve the soundproofing performance and maintainability of the heat pump outdoor unit 1, and to prevent an increase in the size of the heat pump outdoor unit 1.

<Modified Example of Embodiments>

[0028] Fig. 7 is a partial perspective view illustrating the heat pump outdoor unit 1 according to a modified example of the embodiments. As illustrated in Fig. 7, the heat pump outdoor unit 1 according to the modified example includes a large sound-proof box 30. The large sound-proof box 30 has a height greater than that of the sound-proof box 10 described in the embodiments, and houses a large compressor in the large sound-proof box 30. On a right side plate 30c of the sound-proof box 30, the other end 7b of the valve bed 7 is arranged and fixed at a position lower than the upper surface plate 10a of the sound-proof box 10. The one end 7a of the valve bed 7 is fixed to the back side part 13b of the right side panel 13.

[0029] In the case where the large sound-proof box 30 is mounted, when the valve bed 7 is fixed to the separator 4 as in the related art, the arrangement position of the valve bed 7 is hindered by the sound-proof box 30. As a countermeasure against this hindering, an excess space is formed above or in front of the sound-proof box 30, and the valve bed 7 is arranged at a position shifted from the position of the sound-proof box 30. Alternatively, the valve bed 7 is curved in the excess space formed above or in front of the sound-proof box 30. These methods lead to an increase in the size of the outdoor unit by an amount equal to the excess space.

[0030] In the modified example, also when the sound-proof box 30 is large, the valve bed 7 is arranged at the same height as that in the embodiments as illustrated in Fig. 5, and the other end 7b is fixed to the right side plate 30c of the sound-proof box 30. Consequently, an excess space does not have to be prepared for preventing the arrangement position of the valve bed 7 from being hindered by the sound-proof box 30, which leads to a reduction in the size of the housing 100 of the heat pump outdoor unit 1 by an amount equal to the excess space.

[0031] In the heat pump outdoor unit 1 according to this embodiment described above, the one end 7a of the valve bed 7 is fixed to the inner surface of the back side part 13b of the right side panel 13 and the other end 7b of the valve bed 7 is fixed to the outer surface of the right side plate 10c of the sound-proof box 10. If the other end of the valve bed is fixed to the separator 4 like in the outdoor unit of the related art, the valve bed 7 vertically passes through in the machine chamber 3, which raises a need for forming an excess area for arranging the valve bed 7. In the structure of this embodiment, the arrangement position of the valve bed 7 is not hindered by the sound-proof box 10, and thus an excess area does not have to be prepared and the housing 100 of the heat pump outdoor unit 1 can be downsized. Further, as the valve bed 7 does not vertically pass through in the machine chamber 3, a maintenance work can be performed on the compressor 6 that is housed in the sound-proof box 10, without the need for detaching the valve bed 7. Consequently, it is possible to control an increase in the size of the heat pump outdoor unit 1 due to the installation of the sound-proof box 10, access the compressor 6 without detaching the valve bed 7, and perform a maintenance work with ease.

[0032] The other end 7b of the valve bed 7 is fixed to a position lower than the upper surface plate 10a of the sound-proof box 10. Consequently, even when the large sound-proof box 30 is mounted, the valve bed 7 can be fixed without changing the height of the valve bed 7. Further, as the arrangement position of the valve bed 7 is not hindered by the sound-proof box 10, an excess space does not have to be prepared above the sound-proof box 10 to arrange the valve bed 7, and thus an increase in the size of the outdoor unit can be prevented.

[0033] In particular, the other end 7b of the valve bed 7 is fixed to the right side plate 10c of the sound-proof box 10. Consequently, the valve bed 7 does not vertically pass through the front surface of the sound-proof box 10. Further, as the right side plate 10c of the sound-proof box 10 is the side surface that is closest to the right side panel 13, the dimension in the longitudinal direction of the valve bed 7 can be reduced as compared with the case where the other end 7b is fixed to the separator 4. Thus, the bending moment on the valve bed 7 is reduced and the valve bed 7 is less likely to be damaged.

[0034] The one end 7a of the valve bed 7 is fixed to the back side part 13b of the right side panel 13. During a maintenance work, the front side part 13a of the right side panel 13 constituting a part of the service panel 5 is detached, and the back side part 13b of the right side panel 13, which does not constitute a part of the service panel 5, is not detached. Consequently, the one end 7a of the valve bed 7 fixed to the back side part 13b of the right side panel 13 does not have to be detached.

[0035] The part of the front panel 12 and the front side part 13a of the right side panel 13, which constitute the service panel 5, are detachable. When the service panel 5 is detached, the refrigerant pipe 20 can be exposed without the need for detaching the valve bed 7 that is fixed to each of the sound-proof box 10 and the back side

part 13b of the right side panel 13.

[0036] The upper surface plate 10a and the front surface plate 10b of the sound-proof box 10 are detachable. When a maintenance work is performed on the compressor 6, the maintenance work can be performed in the state where the upper surface plate 10a and the front surface plate 10b are detached, while the other end 7b of the valve bed 7 remains fixed to the right side plate 10c.

[0037] The extension pipe from the indoor unit is inserted into the holes 18, which are formed at a lower part of the front panel 12, and is connected to each of the gas valve 8 and the liquid valve 9. The load of the extension pipe on the gas valve 8 and the liquid valve 9 is received by the valve bed 7 to which the gas valve 8 and the liquid valve 9 are fixed, which leads to a reduction in the load on the connected part.

[0038] The gas valve 8 is provided at an end of the gas pipe, and the liquid valve 9 is provided at an end of the liquid pipe. The gas pipe and the liquid pipe constitute the refrigerant pipe 20. With this structure, the extension pipe from the connected indoor unit is connected to the refrigerant pipe 20 through the gas valve 8 and the liquid valve 9.

Reference Signs List

[0039] 1 heat pump outdoor unit, 2 fan chamber, 3 machine chamber, 4 separator, 5 service panel, 6 compressor, 7 valve bed, 7a one end, 7b other end, 8 gas valve, 9 liquid valve, 10, 30 sound-proof box, 10a upper surface plate, 10b front surface plate, 10c, 30c right side plate, 10d back plate, 10e left side plate, 10f bottom plate, 11 upper panel, 12 front panel, 13 right side panel, 13a front side part, 13b back side part, 14 back panel, 15 left side panel, 16 bottom panel, 17 electric component box, 18 hole, 20 refrigerant pipe, 23 blowing grille, 100 housing

Claims

1. An outdoor unit comprising:

   a refrigerant pipe through which refrigerant is circulated;
   a housing that houses the refrigerant pipe;
   a sound-proof box that is housed in the housing and surrounds a compressor that causes the refrigerant to be circulated;
   a connection valve connected to an end of the refrigerant pipe and an external pipe; and
   a valve bed that fixes the connection valve, the valve bed having one end fixed to an inner surface of the housing and an other end fixed to one of side plates of the sound-proof box.

2. The outdoor unit of claim 1, wherein the valve bed is fixed to a position lower than an upper surface of the sound-proof box.

3. The outdoor unit of claim 1 or 2, wherein
   the housing includes an upper panel, a front panel, side panels, a back panel, and a bottom panel, and
   the one end of the valve bed is fixed to one of the side panels, and the other end of the valve bed is fixed to one of the side plates of the sound-proof box that is closer to the one of the side panels to which the one end of the valve bed is fixed than is an other one of the side plates.

4. The outdoor unit of claim 3, wherein
   the housing is partitioned into

      a fan chamber that houses a fan and a heat exchanger, and
      a machine chamber that houses the compressor,

   one of the side panels that is closer to the machine chamber than is an other one of the side panels includes a front side part and a back side part, and
   the one end of the valve bed is fixed to the back side part of the one of the side panels.

5. The outdoor unit of claim 4, wherein a side of the machine chamber of the front panel and the front side part of the one of the side panels are detachable.

6. The outdoor unit of any one of claims 1 to 5, wherein at least one of a front surface and an upper surface of the sound-proof box is detachable.

7. The outdoor unit of any one of claims 1 to 6, wherein the housing is provided with a hole through which the external pipe connected to the connection valve is insertable.

8. The outdoor unit of any one of claims 1 to 7, wherein the refrigerant pipe includes a gas pipe through which gas refrigerant is circulated, and a liquid pipe through which liquid refrigerant is circulated, and
   the connection valve includes a gas valve provided at an end of the gas pipe, and a liquid valve provided at an end of the liquid pipe.

FIG. 1

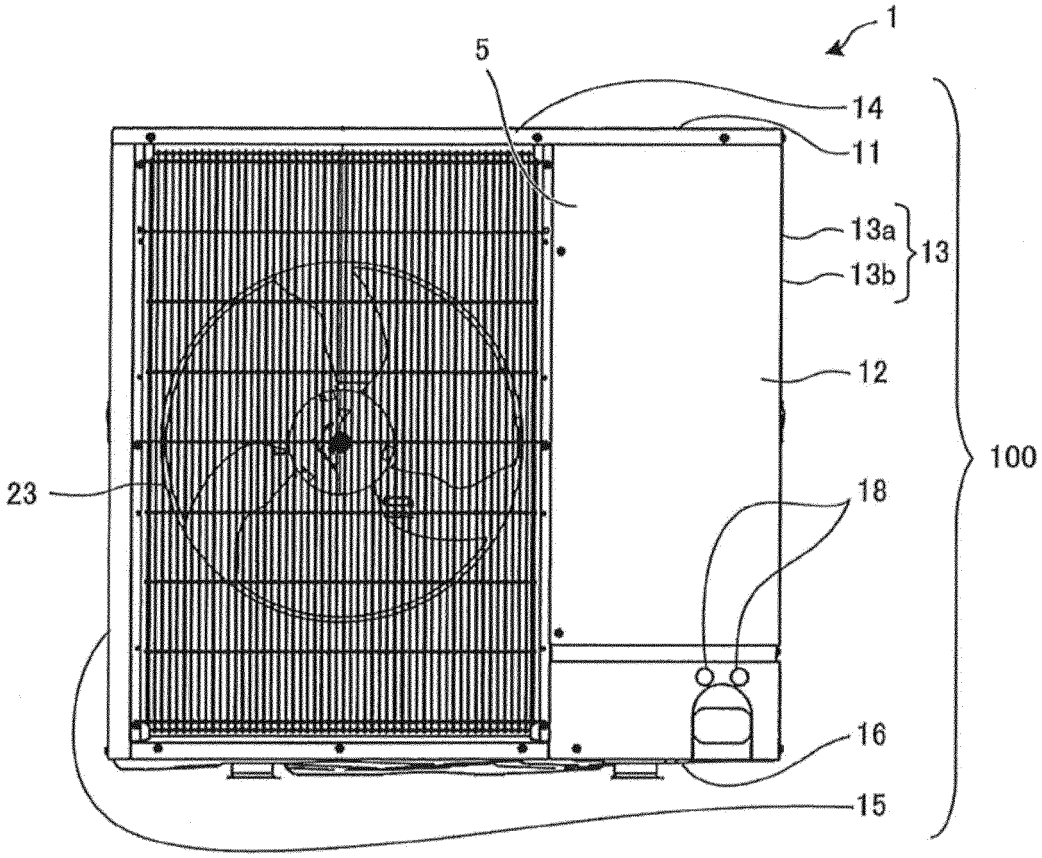


FIG. 2

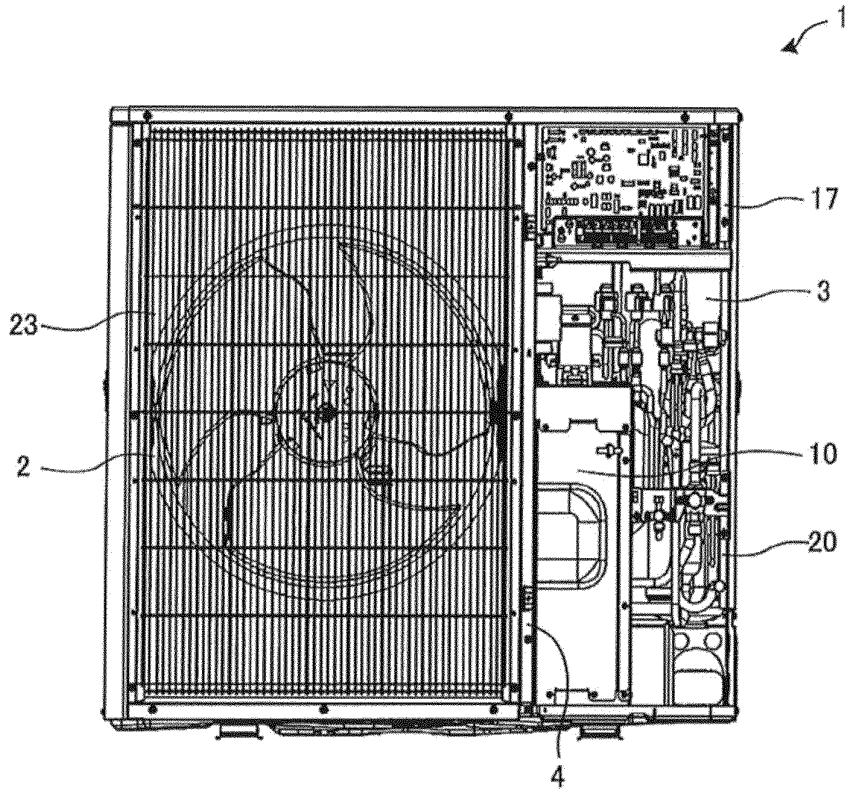


FIG. 3

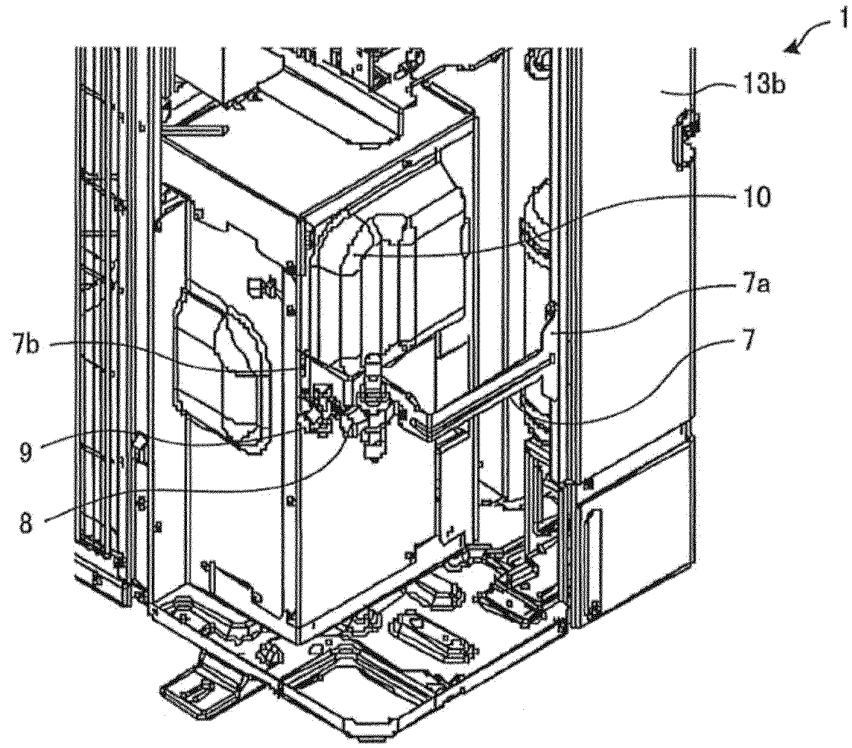


FIG. 4

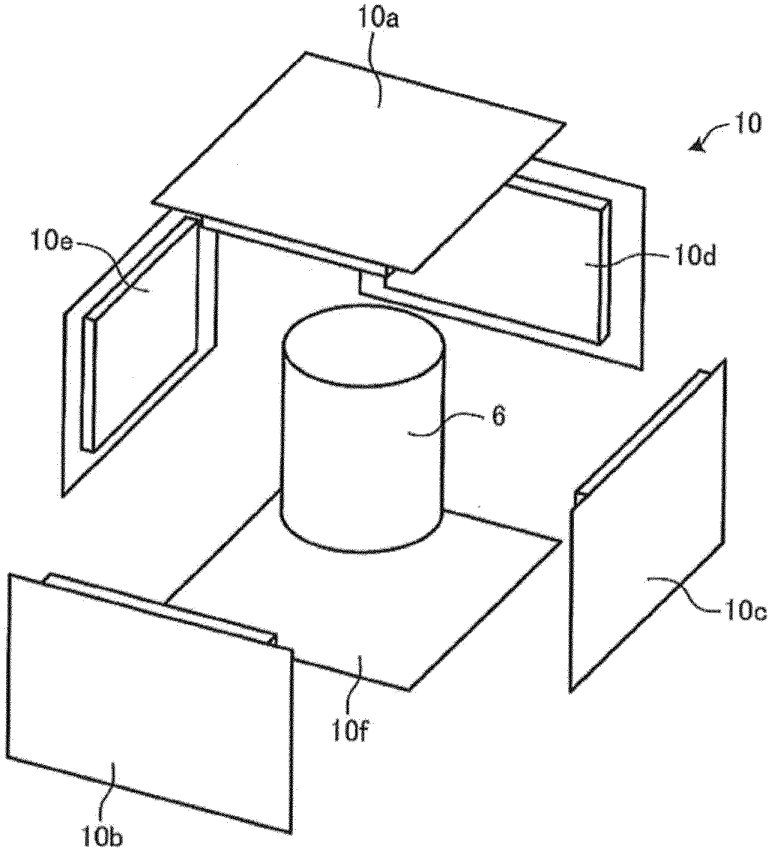


FIG. 5

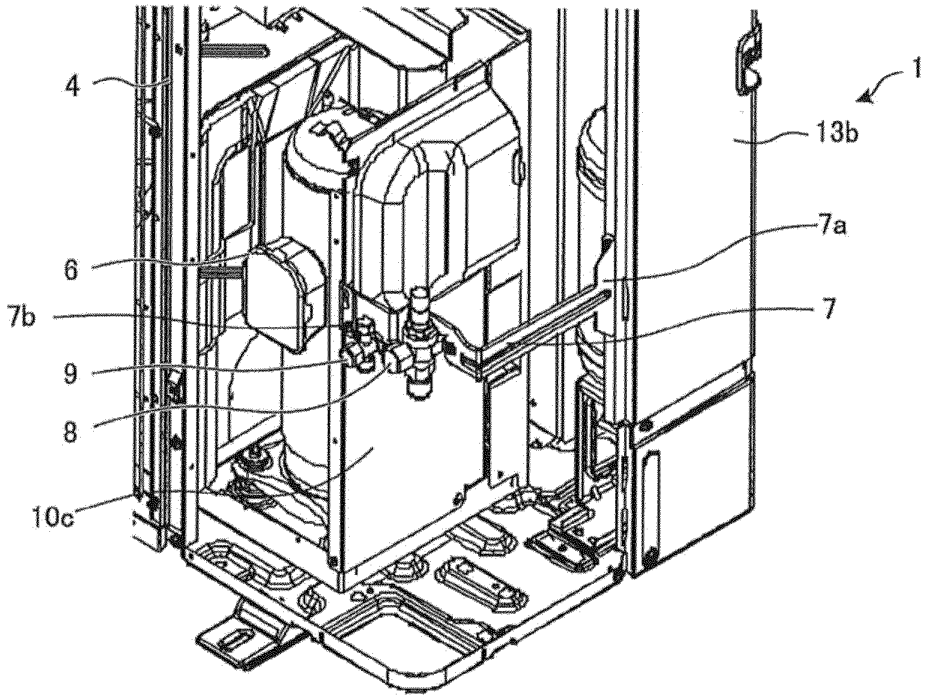


FIG. 6

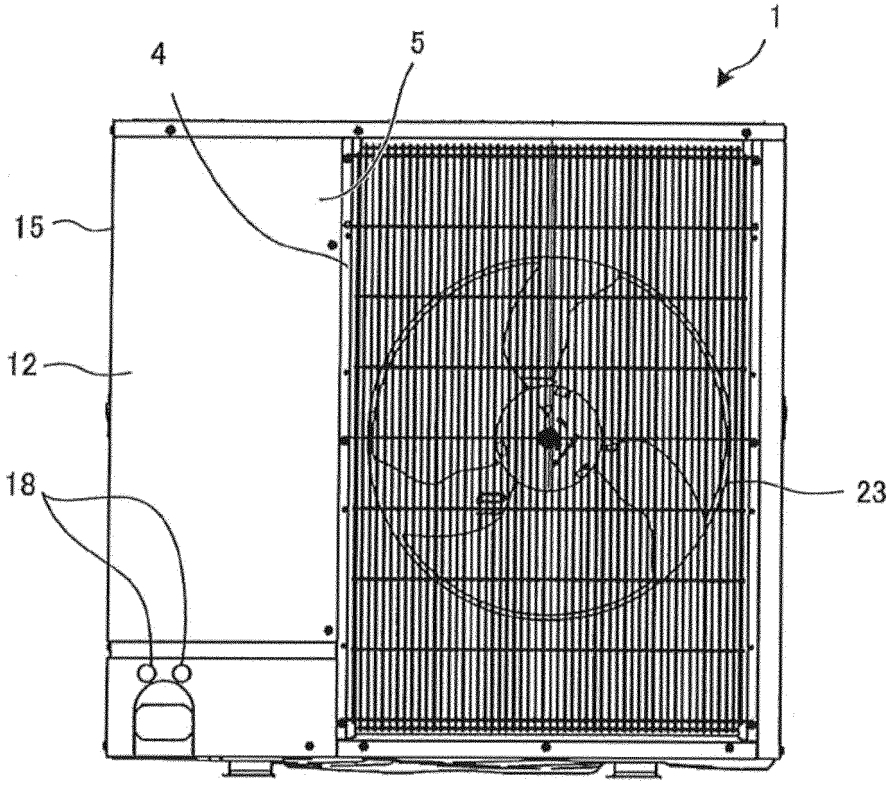
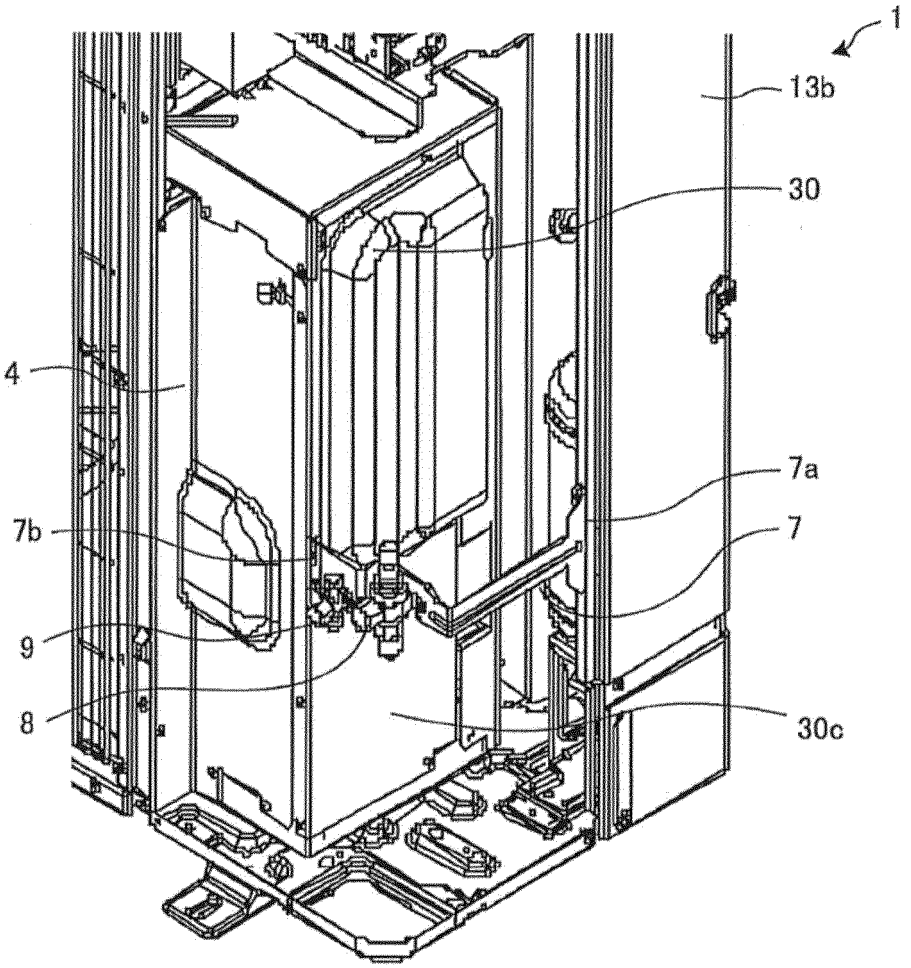


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/083888

A. CLASSIFICATION OF SUBJECT MATTER
F25B41/00(2006.01)i, *F24F1/12*(2011.01)i, *F24F1/32*(2011.01)i, *F24F1/56*(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25B41/00, F24F1/12, F24F1/32, F24F1/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 046644/1989(Laid-open No. 137636/1990) (Mitsubishi Electric Corp.), 16 November 1990 (16.11.1990), specification, page 4, line 7 to page 5, line 6; fig. 1 to 2 (Family: none)	1-6,8
Y	JP 2012-242027 A (Daikin Industries, Ltd.), 10 December 2012 (10.12.2012), paragraphs [0001] to [0002], [0033] to [0035]; fig. 5 (Family: none)	1-8

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
16 January 2017 (16.01.17)	24 January 2017 (24.01.17)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/083888

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-121852 A (Fujitsu General Ltd.), 03 June 2010 (03.06.2010), paragraphs [0001], [0008] to [0011]; fig. 1, 4 (Family: none)	1-8
Y	JP 2007-120900 A (Daikin Industries, Ltd.), 17 May 2007 (17.05.2007), paragraphs [0013] to [0035]; fig. 1 to 6 & US 2009/0044554 A1 paragraphs [0034] to [0066]; fig. 1 to 6 & EP 1953463 A1 & KR 10-2008-0045294 A & CN 101292120 A	1-8
Y	JP 2009-186061 A (Mitsubishi Electric Corp.), 20 August 2009 (20.08.2009), paragraphs [0011] to [0014]; fig. 1 to 3 (Family: none)	3-5,7-8
Y	JP 2013-036697 A (Fujitsu General Ltd.), 21 February 2013 (21.02.2013), paragraphs [0018] to [0019]; fig. 1 to 2 (Family: none)	4-5,7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2012052737 A **[0004]**