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(71) Applicant: **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)

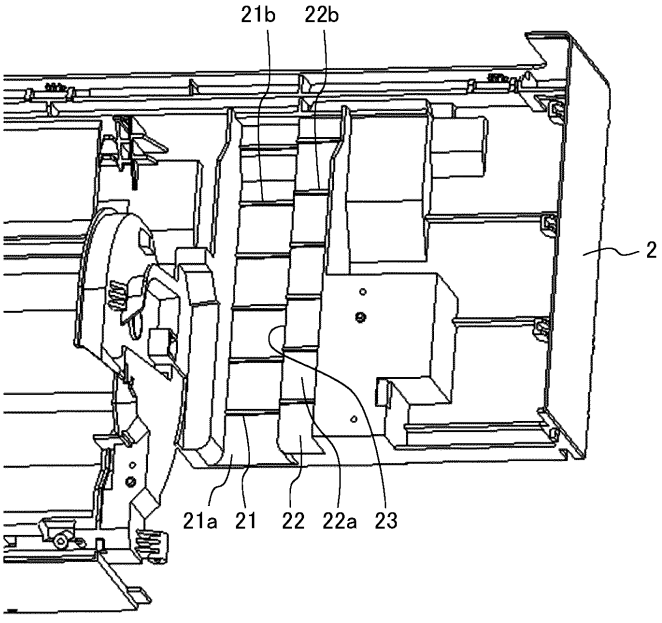
(72) Inventors:
- **TOMOMURA, Keisuke**
  Tokyo 102-0073 (JP)
- **ISHIGAMI, Katsuya**
  Tokyo 102-0073 (JP)

(74) Representative: **Pfenning, Meinig & Partner mbB**
Patent- und Rechtsanwälte
Theresienhöhe 11a
80339 München (DE)

(54) PIPE LAYOUT STRUCTURE AND INDOOR UNIT OF AIR CONDITIONING DEVICE

(57) A pipe setting structure includes a back housing, and a cover attached to the back housing. The back housing has a first recess and a second recess. The first recess is recessed from a surface of the back housing, and includes a first back portion. The second recess is adjacent to the first recess and recessed from the surface of the back housing, and includes a second back portion. The second back portion is located closer to the surface of the back housing than the first back portion. Between the first back portion and the second back portion, a step is provided.

FIG. 4



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Description

Technical Field

[0001] The present disclosure relates to a pipe setting structure, and an indoor unit of an air-conditioning apparatus, which include a back housing that accommodates a pipe or pipes, and a cover attached to the back housing.

Background Art

[0002] In existing air-conditioning apparatuses, an indoor unit is provided with only one space for accommodation of a pipe (see, for example, Patent Literature 1).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2005-106397

Summary of Invention

Technical Problem

[0004] In a technique described in Patent Literature 1, in the case of changing a capacity zone or refrigerant, the models of pipes that can be each set in a pipe accommodation space in an indoor unit are limited. If a pipe has a large diameter, it cannot be accommodated in the pipe accommodation space. If the pipe has a small diameter, it can be accommodated in the pipe accommodation space, but is moved when the indoor unit is installed, since no member that holds down the pipe is provided. Consequently, for example, the pipe is twisted, and thus broken.

[0005] The present disclosure is applied to solve the above problems, and relates to a pipe setting structure and an indoor unit of an air-conditioning apparatus, in which regardless of whether the number of pipes provided in a refrigeration cycle circuit is one or two and the diameter of the pipe or the pipes, the pipe or pipes can be accommodated and secured.

Solution to Problem

[0006] A pipe setting structure according to an embodiment of the present disclosure includes a back housing, and a cover attached to the back housing. The back housing has a first recess and a second recess. The first recess is recessed from a surface of the back housing, and includes a first back portion. The second recess is adjacent to the first recess and recessed from the surface of the back housing, and includes a second back portion. The second back portion is located closer to the surface of the back housing than the first back portion. Between the first back portion and the second back portion, a step is provided.

[0007] An indoor unit of an air-conditioning apparatus according to the embodiment of the present disclosure includes the pipe setting structure as described above.

Advantageous Effects of Invention

[0008] In the pipe setting structure, and the indoor unit of an air-conditioning apparatus according to the embodiment of the present disclosure, the back housing has a first recess and a second recess. The first recess is recessed from a surface of the back housing, and includes a first back portion. The second recess is adjacent to the first recess and recessed from the surface of the back housing, and includes a second back portion. The second back portion is located closer to the surface of the back housing than the first back portion. Between the first back portion and the second back portion, a step is provided. As a result, the first recess serving as a single pipe accommodation space and the second recess serving as another single pipe accommodation space are separated from each other by the step. Therefore, regardless of whether the number of pipes for use in a refrigeration cycle circuit is one or two or the diameter of the pipe or pipes, the pipe or pipes can be accommodated and secured in the pipe accommodation space.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a refrigerant circuit diagram of an air-conditioning apparatus according to Embodiment 1 of the present disclosure.

[Fig. 2] Fig. 2 is an exploded perspective view of an indoor unit of an air-conditioning apparatus according to Embodiment 1 of the present disclosure.

[Fig. 3] Fig. 3 is an enlarged view of a pipe setting structure of the indoor unit of the air-conditioning apparatus according to Embodiment 1 and using a single collecting pipe.

[Fig. 4] Fig. 4 is a perspective view of a back housing of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure.

[Fig. 5] Fig. 5 is a perspective view of a motor attachment component of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure, which is obtained as viewed from the front side.

[Fig. 6] Fig. 6 is a perspective view of the motor attachment component of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure, which is obtained as viewed from the back side.

[Fig. 7] Fig. 7 is a cross-sectional view of the pipe setting structure of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using the single collecting pipe.

[Fig. 8] Fig. 8 is a perspective view of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using the single collecting pipe, and illustrating the indoor unit, with the single collecting pipe accommodated in the indoor unit, as viewed from the back side.

[Fig. 9] Fig. 9 is a perspective view of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using the single collecting pipe, and illustrating the indoor unit, with the single collecting pipe drawn out from the indoor unit, as viewed from the back side.

[Fig. 10] Fig. 10 is a partial enlarged view of the pipe setting structure of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using two pipes.

[Fig. 11] Fig. 11 is a cross-sectional view of the pipe setting structure of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using two pipes.

[Fig. 12] Fig. 12 is a perspective view of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using two pipes, and illustrating the indoor unit, with the pipes accommodated in the indoor unit, as viewed from the back side.

[Fig. 13] Fig. 13 is a perspective view of the indoor unit of the air-conditioning apparatus according to Embodiment 1 of the present disclosure and using two pipes, and illustrating the indoor unit, with the pipes drawn out from the indoor unit, as viewed from the back side.

Description of Embodiments

[0010] An embodiment of the present disclosure will be described below with reference to the drawings. In each of the figures to be referred to below, components that are the same as those in a previous figure are denoted by the same reference signs. The same is true of the entire text of the specification. In cross-sectional views, hatching is omitted as appropriate for ease of viewing. Furthermore, in the entire text of the specification, the forms of components are described by way of example, and their descriptions are not limitative.

Embodiment 1

<Configuration of Air-Conditioning Apparatus 100>

[0011] Fig. 1 is a refrigerant circuit diagram of an air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure. In the air-conditioning apparatus 100 as illustrated in Fig. 1, an outdoor unit 101 and an indoor unit 102 are connected by a gas refrigerant pipe 103 and a liquid refrigerant pipe 104.

[0012] The outdoor unit 101 includes a compressor 105, a four-way valve 106, an outdoor heat exchanger 107, and an expansion valve 108.

[0013] The compressor 105 compresses sucked refrigerant and discharges the compressed refrigerant. The operating frequency of the compressor 105 may be arbitrarily changed by, for example, an inverter circuit in order to change the volume of refrigerant that is sent per unit time by the compressor 105.

[0014] The four-way valve 106 is, for example, a valve that switches the flow of refrigerant between the flow of refrigerant during cooling operation and that during heating operation.

[0015] The outdoor heat exchanger 107 causes heat exchange to be performed between refrigerant and outdoor air. During the cooling operation, the outdoor heat exchanger 107 operates as a condenser to condense and liquefy the refrigerant. During the heating operation, the outdoor heat exchanger 107 operates as an evaporator to evaporate and gasify the refrigerant.

[0016] The expansion valve 108 is a flow control valve. The expansion valve 108 reduces the pressure of refrigerant to expand the refrigerant. In the case where the expansion valve 108 is, for example, an electronic expansion valve, its opening degree can be controlled in response to an instruction from a controller (not illustrated) or other devices.

[0017] The indoor unit 102 includes an indoor heat exchanger 109. The indoor heat exchanger 109 allows heat exchange between, for example, the air to be conditioned and refrigerant. During cooling operation, the indoor heat exchanger 109 operates as an evaporator to evaporate and gasify refrigerant. During heating operation, the indoor heat exchanger 109 operates as a condenser to condense and liquefy refrigerant.

[0018] By virtue of the above configuration of the air-conditioning apparatus 100, the flow of the refrigerant can be switched by the four-way valve 106 of the outdoor unit 101, whereby the cooling operation or the heating operation can be performed.

<Configuration of Indoor Unit 102 of Air-Conditioning Apparatus 100>

[0019] Fig. 2 is an exploded perspective view of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure. As illustrated in Fig. 2, within an outer shell of the air-conditioning apparatus 100, a design panel 1 and a back housing 2 are provided on a front side and a back side of the outer shell, respectively. Between the design panel 1 and the back housing 2, the indoor heat exchanger 109, a collecting pipe 3, a motor attachment component 4 serving as a cover, an air-flow direction adjusting device 5, and an electrical component box 6 are provided.

Configuration of Pipe setting structure 7>

[0020] Fig. 3 is an enlarged view of a pipe setting structure 7 of the indoor unit 102 of the air-conditioning appa-

ratus 100 according to Embodiment 1 of the present disclosure and using a single collecting pipe 3. As illustrated in Fig. 3, the indoor unit 102 of the air-conditioning apparatus 100 includes the pipe setting structure 7. The pipe setting structure 7 includes the back housing 2 and the motor attachment component 4 attached to the back housing 2. In the pipe setting structure 7, the single collecting pipe 3 is sandwiched and secured between the back housing 2 and the motor attachment component 4. Each of the back housing 2 and the motor attachment component 4 is made of resin, and formed to have a uniform wall thickness.

Configuration of Back Housing 2 in Pipe setting structure 7>

[0021] Fig. 4 is a perspective view of the back housing 2 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure. As illustrated in Fig. 4, the back housing 2 has a first recess 21 and a second recess 22. Each of the first recess 21 and the second recess 22 is a rectangular pipe accommodation space that allows a single pipe to be accommodated therein.

[0022] The first recess 21 is recessed from a surface of the back housing 2, and includes a first back portion 21a. The first back portion 21a is a flat surface. The first back portion 21a has protrusion ridge portions 21b that extend in a horizontal direction, that is, a direction perpendicular to an extending direction of a pipe (not illustrated) accommodated in the pipe accommodation space of the first recess 21, and the direction perpendicular to the extending direction of the pipe is a vertical direction. Because of provision of the protrusion ridge portions 21b, the contact area between the back housing 2 and the pipe (not illustrated) set in the first recess 21 is reduced, thereby preventing a force from being excessively exerted on the pipe when the pipe is accommodated in and held down by the motor attachment component 4.

[0023] The second recess 22 is adjacent to the first recess 21 and recessed from the surface of the back housing 2, and includes a second back portion 22a. The second back portion 22a is a flat surface. The second back portion 22a has protrusion ridge portions 22b that extend in the horizontal direction, which is perpendicular to the direction in which a pipe accommodated in the pipe accommodation space of the second recess 22 extends; that is, which is perpendicular to the vertical direction. Because of provision of the protrusion ridge portions 22b, the contact area between the back housing 2 and the pipe (not illustrated) set in the first recess 21 is reduced, thereby preventing a force from being excessively exerted on the pipe when the pipe is accommodated and held down by the motor attachment component 4.

[0024] The second back portion 22a is located closer to the surface of the back housing 2 than the first back portion 21a. Between the first back portion 21a and the second back portion 22a, a step 23 is formed as a planar portion that extends in the vertical direction and is parallel to the depth of the back housing 2. The step 23 separates the first recess 21 and the second recess 22 that serve as respective pipe accommodation spaces, such that respective pipes can be set in the first recess 21 and the second recess 22. In such a manner, the step 23 separates the pipe accommodation spaces. It is therefore possible to prevent movement of the single collecting pipe 3. The first recess 21 and the second recess 22 define a rectangular space in which the first back portion 21a, the step 23, and the second back portion 22a are continuous with each other. In Embodiment 1, the first recess 21 is located close to the indoor heat exchanger 109, and the second recess 22 is located farther from the indoor heat exchanger 109 than the first recess 21. This, however, is not limitative. The second recess 22 may be located close to the indoor heat exchanger 109, and the first recess 21 may be located farther from the indoor heat exchanger 109 than the second recess 22.

<Configuration of Motor Attachment Component 4 in Pipe Setting Structure 7>

[0025] Fig. 5 is a perspective view of the motor attachment component 4 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure, which is obtained as viewed from the front side. Fig. 6 is a perspective view of the motor attachment component 4 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure, which is obtained as viewed from the back side.

[0026] As illustrated in Fig. 5, the motor attachment component 4, which is attached to the surface of the back housing 2, is provided. To the motor attachment component 4, a motor (not illustrated) is attached. The motor is an indispensable component for the indoor unit 102 of the air-conditioning apparatus 100. The motor attachment component 4 is a plate having a uniform wall thickness and extending along the surface of the back housing 2.

[0027] As illustrated in Fig. 6, a body 41 of the motor attachment component 4 has ribs 42 on the back side. The ribs 42 extend in the horizontal direction and projects into the first recess 21, while covering the first recess 21 and second recess 22. Each of the ribs 42 has a projecting portion 42a that projects into the first recess 21 and holds down a pipe (not illustrated) accommodated in the first recess 21. To be more specific, the projecting portion 42a of the rib 42 projects from the body 41 of the motor attachment component 4 into the first recess 21 located on the back side. The projecting portion 42a of the rib 42 that projects into the first recess 21 has a reinforcing rib 43 at a central portion of the projecting portion 42a. In consideration of workability, the projecting portion 42a of the rib 42 that projects into the first recess 21 is chamfered such that a corner of the projecting portion 42a is shaped into a corner portion 42b, in order to prevent the rib 42

from being brought into contact with a corner of the back housing 2 when holding down the pipe (not illustrated).

[0028] The rib 42 has a connecting portion 42c. The connecting portion 42c extends in the horizontal direction, from the projecting portion 42a projecting into the first recess 21, and extends over the second recess 22. The connecting portion 42c of the rib 42 that extends over the second recess 22 holds down a pipe (not illustrated) accommodated in the second recess 22. The connecting portion 42c of the rib 42 that extends over the second recess 22 projects from the body 41 of the motor attachment component 4 toward the back side. The connecting portion 42c of the rib 42 that extends over the second recess 22 may be projected into the second recess 22.

[0029] The rib 42 has the projecting portion 42a that projects into the first recess 21 and the connecting portion 42c that extends over the second recess 22 such that the projecting portion 42a and the connecting portion 42c are continuous with each other. Thus, the rib 42 is a plate-like body that linearly extends in the horizontal direction, which is perpendicular to the extending direction of a pipe accommodated in the pipe accommodation space; that is, which is perpendicular to the vertical direction. The rib 42 is a plate-like body that extends and horizontally projects from the body 41 located on the front side toward the back side.

[0030] The number of the ribs 42 is four; that is, the four ribs 42 are arranged and spaced from each other in the vertical direction. When the motor attachment component 4 is attached to the back housing 2, the ribs 42 hold down and secure a pipe (not illustrated).

<Setting State of Single Collecting Pipe 3 in Pipe Setting Structure 7>

[0031] Fig. 7 is a cross-sectional view of the pipe setting structure 7 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure and using the single collecting pipe 3. As illustrated in Fig. 7, the pipe accommodation space is partitioned by the step 23. Thus, if the number of collecting pipes 3 to be set is only one, the collecting pipe 3 can be accommodated in the first recess 21 only. It should be noted that the collecting pipe 3 contains, for example, a gas pipe 31 and a liquid pipe 32, and is covered with a heat insulator 33 having elastic resilience.

[0032] In the first recess 21 as illustrated by way of example, the single collecting pipe 3 covered with the heat insulator 33 having elastic resilience is accommodated such that the collecting pipe 3 bites into the ribs 42. Furthermore, at the first back portion 21a, the single collecting pipe 3 covered with the heat insulator 33 having elastic resilience is accommodated such that the collecting pipe 3 bites into the protrusion ridge portions 21 b.

[0033] Although it is described later, in the second recess 22 as well, the single collecting pipe 3 covered with the heat insulator 33 having elastic resilience may be accommodated such that the collecting pipe 3 bites into the ribs 42. Furthermore, at the second back portion 22a, the single collecting pipe 3 covered with the heat insulator 33 having elastic resilience may be accommodated such that the collecting pipe 3 bites into the protrusion ridge portions 22b.

<Setting of Collecting pipe 3 of Indoor Unit 102>

[0034] Fig. 8 is a perspective view of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 and using the single collecting pipe 3, and illustrating the indoor unit 102, with the single collecting pipe 3 accommodated in the indoor unit 102, as viewed from the back side. Fig. 9 is a perspective view of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 and using the single collecting pipe 3, and illustrating the indoor unit 102, with the single collecting pipe 3 drawn out from the indoor unit 102, as seen from the back side.

[0035] The direction in which the single collecting pipe 3 is drawn varies as illustrated in Figs. 8 and 9. To be more specific, the direction varies in accordance with where the indoor unit 102 of the air-conditioning apparatus 100 is installed. In the indoor unit 102 of the air-conditioning apparatus 100, the single collecting pipe 3 is accommodated into the first recess 21, using the back housing 2 and the motor attachment component 4, while being held down and secured by the ribs 42. At the time of installing the indoor unit 102 of the air-conditioning apparatus 100, the single collecting pipe 3 may be drawn from the position where the collecting pipe 3 is located when accommodated, to another position, as in the case of drawing the collecting pipe 3 rightwards as illustrated in Fig. 8 or rearwards as illustrated in Fig. 9. At this time, part of the single collecting pipe 3 that extends in the vertical direction in the indoor unit 102 of the air-conditioning apparatus 100 is secured. When drawn in various directions, the collecting pipe 3 can be prevented from being broken or twisted. It is therefore possible to reduce the possibility that a problem such as a refrigerant leak will occur due to brakeage or twisting of the single collecting pipe 3.

<Setting of Two Pipes in Pipe setting structure 7>

[0036] Fig. 10 is a partial enlarged view of the pipe setting structure 7 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure and using two pipes 34 and 35. As illustrated in Fig. 10, the pipe accommodation space is partitioned by the step 23. Thus, in the case where two pipes 34 and 35 are set, the pipes 34 and 35 can be accommodated in the first and second recesses 21 and 22, respectively. It should be noted that of the two pipes 34 and 35, the pipe 34 contains, for example, a gas pipe 36 and is covered with an heat insulator 33 having elastic resilience, and the pipe 35 contains, for example, a liquid

pipe 37 and is also covered with an heat insulator 33 having elastic resilience.

<Setting of Two Pipes 34 and 35 in Pipe setting structure 7>

[0037] Fig. 11 is a cross-sectional view of the pipe setting structure 7 of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure and using the two pipes 34 and 35.

[0038] As illustrated in Fig. 11, in the first recess 21, the single pipe 34 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 34 bites into the ribs 42. Furthermore, at the first back portion 21a, the single pipe 34 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 34 bites into the protrusion ridge portions 21b. Since the space in the first recess 21 is larger than the space in the second recess 22, the pipe 34 containing the gas pipe 36 and having a greater diameter than the diameter of the pipe 35 containing the liquid pipe 37 is set in the first recess 21.

[0039] In the second recess 22, the single pipe 35 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 35 bites into the rib 42. The pipe 35 set in the second recess 22 and covered with the heat insulator 33 is formed to have an outside diameter greater than the depth of the second recess 22. Thus, the pipe 35 partially projects from the second recess 22 and bites into the ribs 42. It should be noted that in the case where the connecting portion 42c of each of the ribs 42 that extend over the second recess 22 is formed to project into the second recess 22, the pipe 35 set in the second recess 22 bites into the ribs 42 even if the pipe 35 does not project from the second recess 22 toward the front side. In addition, at the second back portion 22a, the pipe 35 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 35 bites into the protrusion ridge portions 22b.

<Setting of Two Pipes 34 and 35 in Indoor Unit 102>

[0040] Fig. 12 is a perspective view of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure and using the two pipes 34 and 35, and illustrating the indoor unit 102, with the pipes 34 and 35 accommodated in the indoor unit 102, as viewed from the back side. Fig. 13 is a perspective view of the indoor unit 102 of the air-conditioning apparatus 100 according to Embodiment 1 of the present disclosure and using the two pipes 34 and 35, and illustrating the indoor unit 102, with the pipes 34 and 35 drawn out from the indoor unit 102, as viewed from the back side.

[0041] The direction in which the two pipes 34 and 35 are drawn varies as illustrated in Figs. 12 and 13. To be more specific, the direction varies in accordance with where the indoor unit 102 of the air-conditioning apparatus 100 is installed. It should be noted that in the indoor unit 102 of the air-conditioning apparatus 100, the two pipes 34 and 35 are accommodated into the two first and second recesses 21 and 22, using the back housing 2 and the motor attachment component 4, while being held down and secured by the ribs 42. At the time of installing the indoor unit 102 of the air-conditioning apparatus 100, the two pipes 34 and 35 may be drawn from the position where the pipes 34 and 35 are located when accommodated, to another position, as in the case of drawing the pipes 34 and 35 rightwards as illustrated in Fig. 12 or rearwards as illustrated in Fig. 13. At this time, part of each of the two pipes 34 and 35 that extends in the vertical direction in the indoor unit 102 of the air-conditioning apparatus 100 is secured. When drawn in various directions, the pipes 34 and 35 can be prevented from being broken or twisted. It is therefore possible to reduce the possibility that a problem such as a refrigerant leak will occur due to breakage or twisting of the two pipes 34 and 35.

<Advantages of Embodiment 1>

[0042] According to Embodiment 1, the pipe setting structure 7 includes the back housing 2. The pipe setting structure 7 also includes the motor attachment component 4 serving as a cover that is attached to the back housing 2. The back housing 2 has the first recess 21 that is recessed from the surface of the back housing 2, and that includes the first back portion 21a. The back housing 2 has the second recess 22 that is adjacent to the first recess 21 and recessed from the surface of the back housing 2, and that includes the second back portion 22a. The second back portion 22a is located closer to the surface of the back housing 2 than the first back portion 21a. The step 23 is provided between the first back portion 21a and the second back portion 22a.

[0043] In the above configuration, the first recess 21 and the second recess 22 that are respective pipe accommodation spaces are separated from each other by the step 23. Thus, one of the pipes 3, 34, and 35 that are of different models can be accommodated and secured within at least one of the first recess 21 and the second recess 22. Thus, even if the model of the pipe 3, 34, or 35 to be accommodated is changed from the present mode to another model in accordance with the changing of the capacity zone or refrigerant, the pipe accommodation space can flexibly adapt to the changing of the model of the pipe. Therefore, regardless of whether the number of pipes for use in a refrigeration cycle circuit is one or two, or the diameter of the pipe or pipes, the pipe or pipes can be accommodated and secured in the pipe accommodation space. Furthermore, the first and second recesses 21 and 22 are different from each other in depth. Therefore, when the two pipes 34 and 35 are set in the first and second recesses 21 and 22, respectively, the two pipes 34 and 35 are offset relative to each other in the direction along the depth of each of the recesses 21 and 22, and are positioned relative to each other.

[0044] According to Embodiment 1, the motor attachment component 4 serving as a cover includes the ribs 42 that projects into the first recess 21, while covering the first recess 21 and the second recess 22, with the motor attachment component 4 attached.

[0045] In the above configuration, the first back portion 21a is located closer to the back side than the second back portion 22a. Thus, in the case where the pipe 3 or 34 is accommodated in the first recess 21, the ribs 42 projected into the first recess 21 prevent the pipe 3 or 34 from moving within the first recess 21. Therefore, the pipe 3 or 34 provided in a refrigeration cycle circuit and accommodated into the first recess 21 can be secured within the first recess 21, regardless of the diameter of the pipe 3 or 34.

[0046] According to Embodiment 1, each of the ribs 42 has the connecting portion 42c that is continuous with the projecting portion 42a projecting into the first recess 21, and that extends over the second recess 22.

[0047] In the above configuration, the ribs 42 can simultaneously hold down the two pipes 34 and 35 that are accommodated in the first and second recesses 21 and 22, respectively, and that are located at different depths from the surface of the back housing 2. Furthermore, the ribs 42 connects with the first recess 21 and the second recess 22, and can thus maintain a high strength with a simple structure.

[0048] According to Embodiment 1, in each of the ribs 42, at the central portion of the projecting portion 42a that projects into the first recess 21, the reinforcing rib 43 is provided.

[0049] In the above configuration, the projecting portion 42a of each rib 42 that projects into the first recess 21 has a large area, and the strength of the projecting portion 42a of the rib 42 is low. However, since the reinforcing rib 43 is provided, a high strength of the rib 42 is maintained.

[0050] According to Embodiment 1, a plurality of ribs 42, for example, four ribs 42, are arranged side by side.

[0051] In the above configuration, in the case where the two pipes 34 and 35 are accommodated in the first recess 21 and the second recess 22, respectively, such that the two pipes 34 and 35 are located at different depths from the surface of the back housing 2, the plurality of ribs 42 simultaneously hold down the two pipes 34 and 35 at respective positions. Thus, the pipes 34 and 35 can be more firmly secured.

[0052] According to Embodiment 1, the first recess 21 and the second recess 22 are respective pipe accommodation spaces. The ribs 42 are plate-like bodies that linearly extend in a direction crossing the extending direction of the pipe 3, 34, or 35 accommodated in the pipe accommodation space

[0053] In the above configuration, the high strength of each of the ribs 42 can be maintained with a simple structure. Furthermore, since the ribs 42 are plate-like bodies that linearly extend in the direction crossing the direction in which the pipe 3, 34, or 35 accommodated in the pipe accommodation space extends, the pipe 3, 34, or 35, which would move in the extending direction of the pipe 3, 34, or 35 if the ribs 42 were not provided, can be more firmly secured by the ribs 42 that extend in the direction crossing the extending direction of the pipe 3, 34, or 35.

[0054] According to Embodiment 1, at the first back portion 21a and the second back portion 22a, the protrusion ridge portions 21b and 22b are provided, respectively, to extend in the direction crossing the direction in which the pipe 3, 34, or 35 accommodated in the pipe accommodation space extends.

[0055] In the above configuration, since the protrusion ridge portions 21b and 22b extend in the direction crossing the direction in which the pipe 3, 34, or 35 accommodated in the pipe accommodation spaces at the first and second back portions 21a and 22a extends, the pipe 3, 34, or 35, which would move in the direction in which the pipe 3, 34, or 35 extends if the protrusion edge portions 21b and 22b were not provided, can be more firmly secured by the protrusion ridge portions 21b and 22b that extend in the direction crossing the direction in which the pipe 3, 34, or 35 extends.

[0056] According to Embodiment 1, in at least one of the first back portion 21a and the second back portion 22a, the pipe 3, 34, or 35 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 3, 34, or 35 bites into the protrusion ridge portion 21b or 22b.

[0057] In the above configuration, the protrusion ridge portion 21b or 22b bites into the pipe 3, 34, or 35 covered with the heat insulator 33 having elastic resilience, whereby the pipe 3, 34, or 35 can be more firmly secured.

[0058] According to Embodiment 1, in at least one of the first recess 21 and the second recess 22, the pipe 3, 34, or 35 covered with the heat insulator 33 having elastic resilience is accommodated such that the pipe 3, 34, or 35 bites into the rib 42.

[0059] In the above configuration, the rib 42 bites into the pipe 3, 34, or 35 covered with the heat insulator 33 having elastic resilience. Thus, the pipe 3, 34, or 35 can be more firmly secured.

[0060] According to Embodiment 1, in each rib 42, the projecting portion 42a projecting into the first recess 21 is chamfered such that a corner of the projecting portion 42a is shaped into the corner portion 42b.

[0061] In the above configuration, since the projecting portion 42a of each rib 42 is chamfered such that the corner of the projecting portion 42a of the rib 42 is shaped into the corner portion 42b, the rib 42 is easily inserted into the first recess 21 in which the pipe 3 or 34 is accommodated. Therefore, the pipe can be more efficiently set.

[0062] According to Embodiment 1, a combination of the first recess 21 and the second recess 22 is a rectangular space in which the first back portion 21a, the step 23, and the second back portion 22a are continuous with each other.

[0063] In the above configuration, each of the first re-

cess 21 and the second recess 22 is a rectangular space in which an associated one of the pipe 3, 34, or 35 having a cylindrical shape is accommodated, with space provided between the accommodated pipe and the recess. Thus, the pipe accommodation space can flexibly adapt to changing of the model of the pipe 3, 34, or 35 that is made in accordance with changing of the capacity zone or refrigerant. Therefore, regardless of whether the number of pipes for use in a refrigeration cycle circuit is one or two, or the diameter of the pipe or pipes, the pipe or pies can be accommodated and secured in the pipe accommodation space.

[0064] According to Embodiment 1, the indoor unit 102 of the air-conditioning apparatus 100 includes the pipe setting structure 7.

[0065] In the above configuration, in the pipe setting structure 7 included in the indoor unit 102 of the air-conditioning apparatus 100, the first recess 21 serving as a single pipe accommodation space, and the second recess 22 serving as another single pipe accommodation space are separated from each other by the step 23. Thus, one of the pipes 3, 34, and 35 that are of different models can be accommodated and secured in at least one of the first recess 21 and the second recess 22. Thus, the pipe accommodation space can flexibly adapt to changing of the model of the pipe 3, 34, or 35 that is made in accordance with changing of the capacity zone or refrigerant. Therefore, regardless of whether the number of pipes for use in a refrigeration cycle circuit is one or two, or the diameter of the pipe or pies, the pipe or pipes can be accommodated and secured in the pipe accommodation space.

<Others>

[0066] With respect to the above embodiment, the air-conditioning apparatus 100 is described above as an example of a refrigeration cycle apparatus. This description, however, is not limitative. For example, the above embodiment can be also applied to another type of refrigeration cycle apparatus such as a refrigerating apparatus or freezing apparatus. Furthermore, the pipe setting structure 7 can be applied to not only the refrigeration cycle apparatus, but a fan, a ventilator, or other apparatuses. Reference Signs List

[0067] 1 design panel, 2 back housing, 3 collecting pipe, 4 motor attachment component, 5 air-flow direction adjusting device 5, 6 electrical component box, 7 pipe setting structure, 21 first recess, 21a first back portion, 21b protrusion ridge portion, 22 second recess, 22a second back portion, 22b protrusion ridge portion, 23 step, 31 gas pipe, 32 liquid pipe, 33 heat insulator, 34 pipe, 35 pipe, 36 gas pipe, 37 liquid pipe, 41 body, 42 rib, 42a projecting portion, 42b corner portion, 42c connecting portion, 43 reinforcing rib, 100 air-conditioning apparatus, 101 outdoor unit, 102 indoor unit, 103 gas refrigerant pipe, 104 liquid refrigerant pipe, 105 compressor, 106 four-way valve, 107 outdoor heat exchanger, 108 expansion valve, 109 indoor heat exchanger

Claims

1. A pipe setting structure comprising:

   a back housing; and
   a cover attached to the back housing,
   wherein the back housing has a first recess and a second recess, the first recess being recessed from a surface of the back housing and including a first back portion, the second recess being adjacent to the first recess and recessed from the surface of the back housing, and including a second back portion,
   wherein the second back portion is located closer to the surface of the back housing than the first back portion, and
   wherein a step is provided between the first back portion and the second back portion.

2. The pipe setting structure of claim 1, wherein the cover includes a rib that projects into the first recess, while covering the first recess and the second recess.

3. The pipe setting structure of claim 2, wherein the rib has a connecting portion that is continuous with a projecting portion projecting into the first recess, and that extends over the second recess.

4. The pipe setting structure of claim 2 or 3, wherein the rib has a reinforcing rib that is located at a central portion of a projecting portion of the rib that projects into the first recess.

5. The pipe setting structure of any one of claims 2 to 4, wherein a plurality of the ribs are arranged side by side.

6. The pipe setting structure of any one of claims 3 to 5, wherein each of the first recess and the second recess is a pipe accommodation space, and
   wherein the rib is a plate-like body that linearly extends in a direction crossing a direction in which a pipe accommodated in the pipe accommodation space extends.

7. The pipe setting structure of claim 6, wherein the first back portion and the second back portion each has protrusion ridge portions, the protrusion ridge portions extending in the direction crossing the direction in which the pipe accommodated in the pipe accommodation space extends.

8. The pipe setting structure of claim 7, wherein at at least one of the first back portion and the second

back portion, a pipe covered with a heat insulator having elastic resilience is accommodated such that the pipe bites into the protrusion ridge portions.

9. The pipe setting structure of any one of claims 2 to 8, wherein in at least one of the first recess and the second recess, a pipe covered with a heat insulator having elastic resilience is accommodated such that the pipe bites into the rib.

10. The pipe setting structure of any one of claims 2 to 9, wherein the rib includes a projecting portion that projects into the first recess, and that is chamfered.

11. The pipe setting structure of any one of claims 1 to 10, wherein the first recess and the second recess define a rectangular space in which the first back portion, the step, and the second back portion are continuous with each other.

12. An indoor unit of an air-conditioning apparatus, comprising the pipe setting structure of any one of claims 1 to 11.

FIG. 1

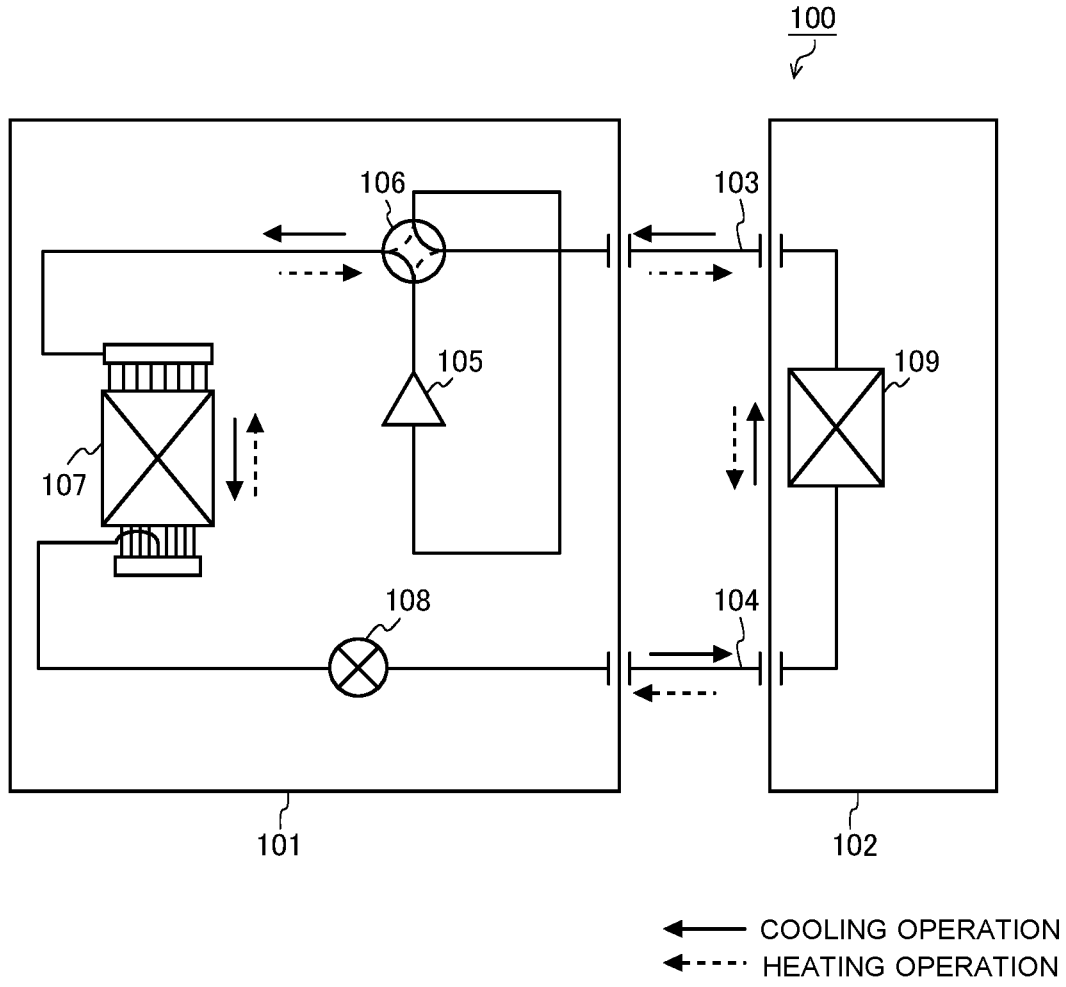

100
106
103
105
109
107
108
104
101
102
COOLING OPERATION
HEATING OPERATION

FIG. 2

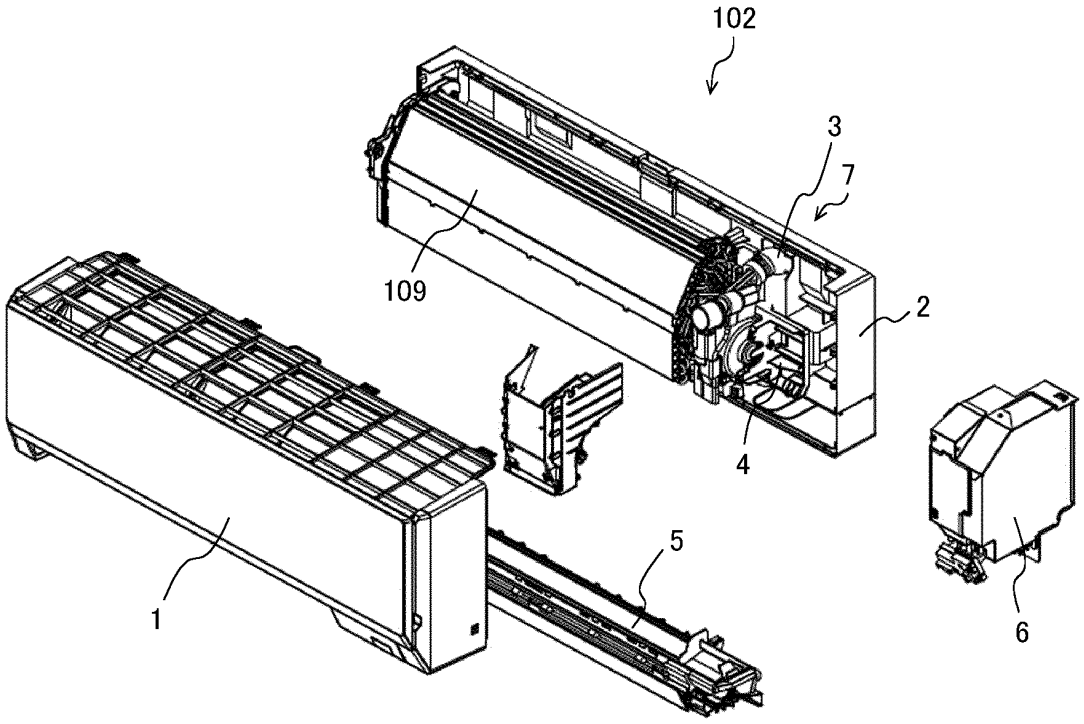


FIG. 3

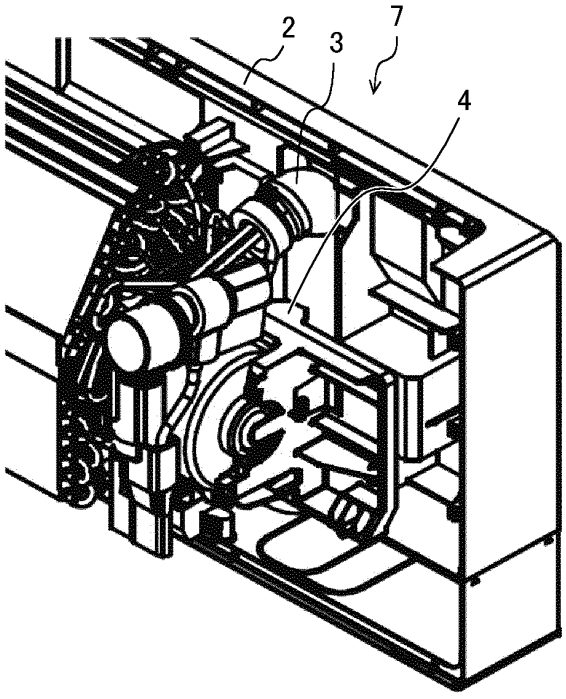


FIG. 4

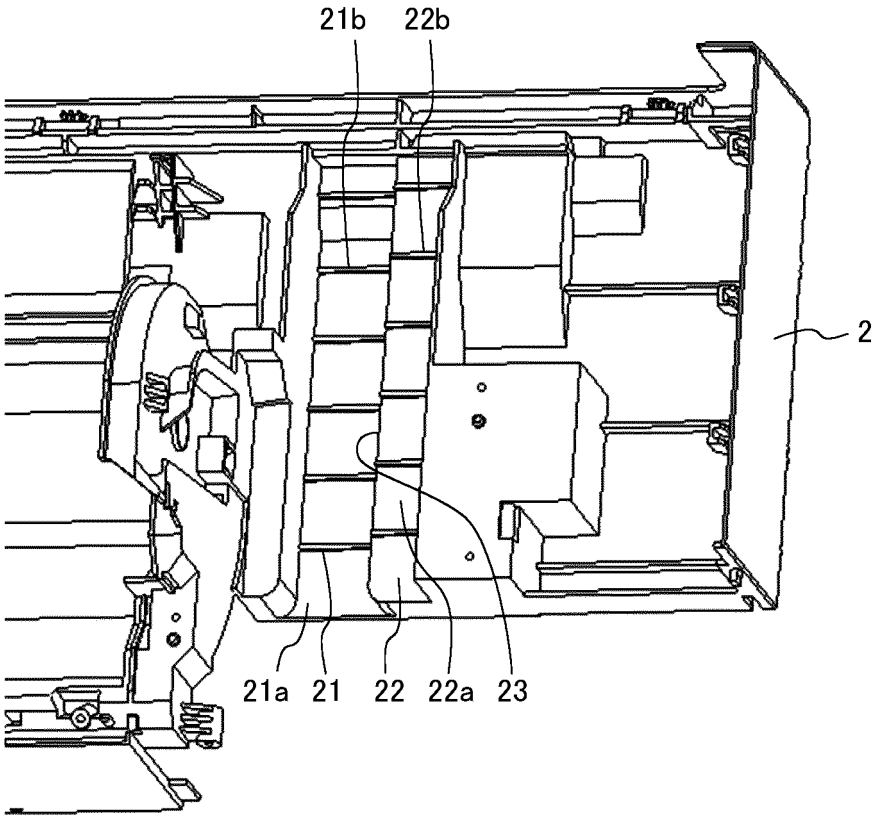


FIG. 5

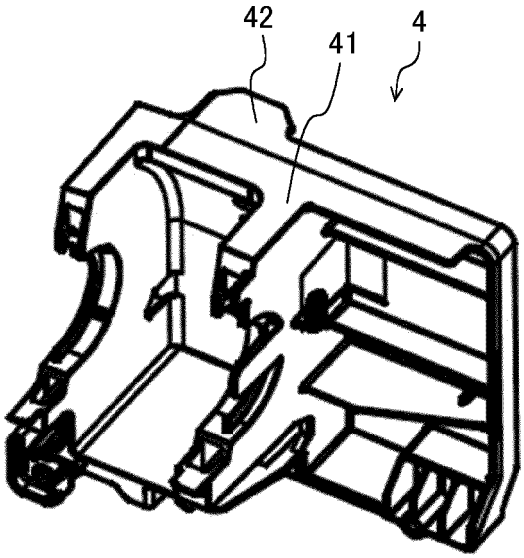
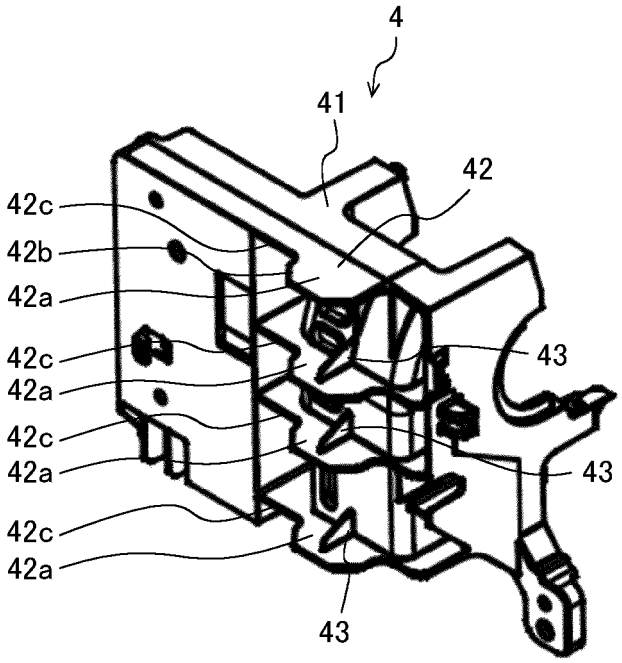


FIG. 6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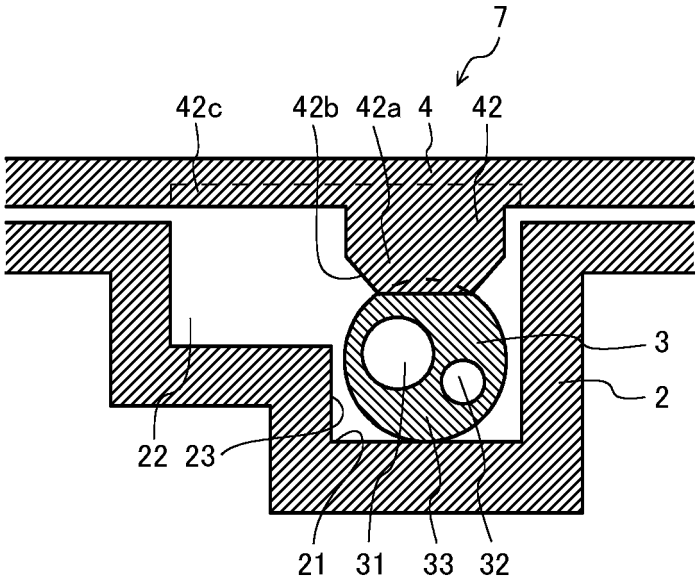
42a
42c
42a
42c
42a
43
43
43

FIG. 7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32

FIG. 8

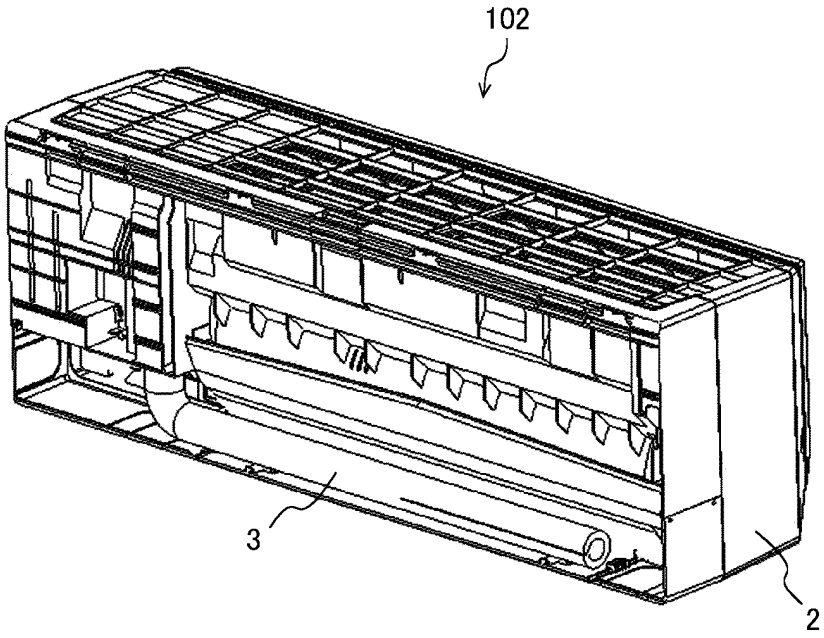


FIG. 9

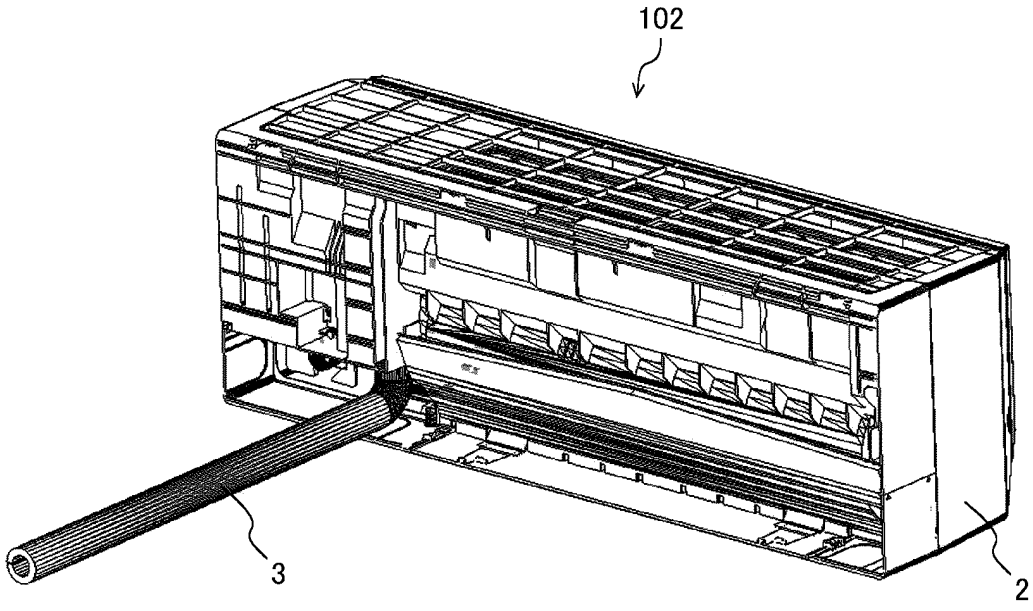


FIG. 10

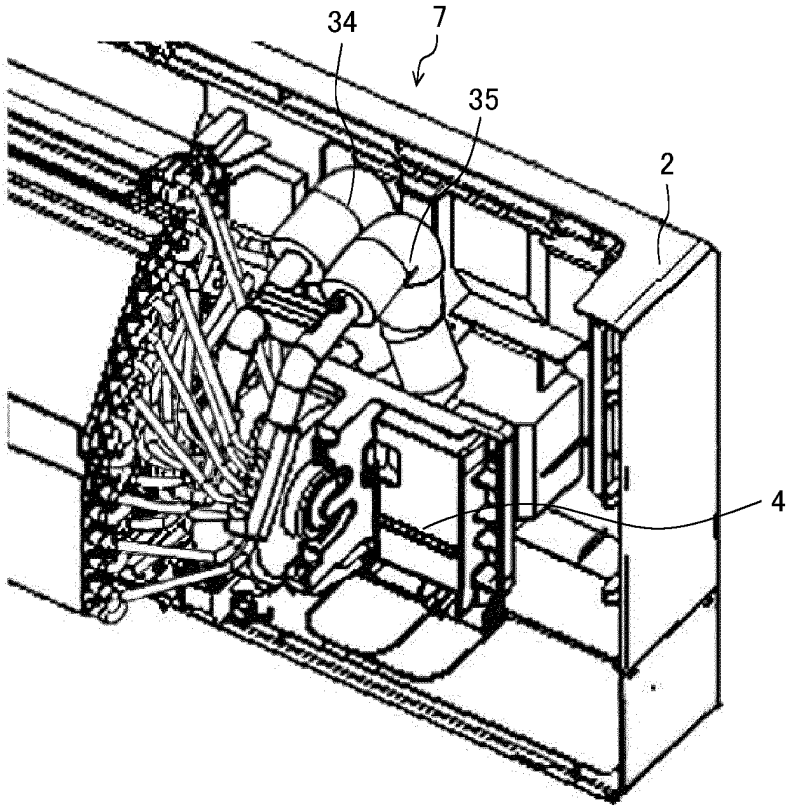


FIG. 11

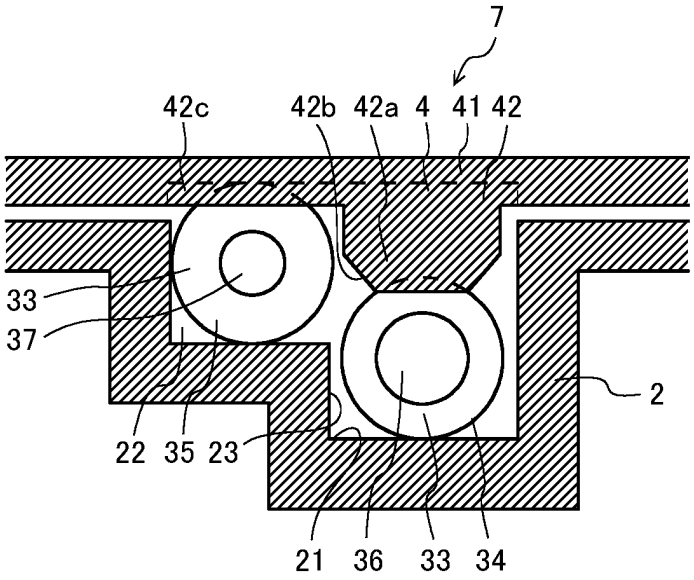


FIG. 12

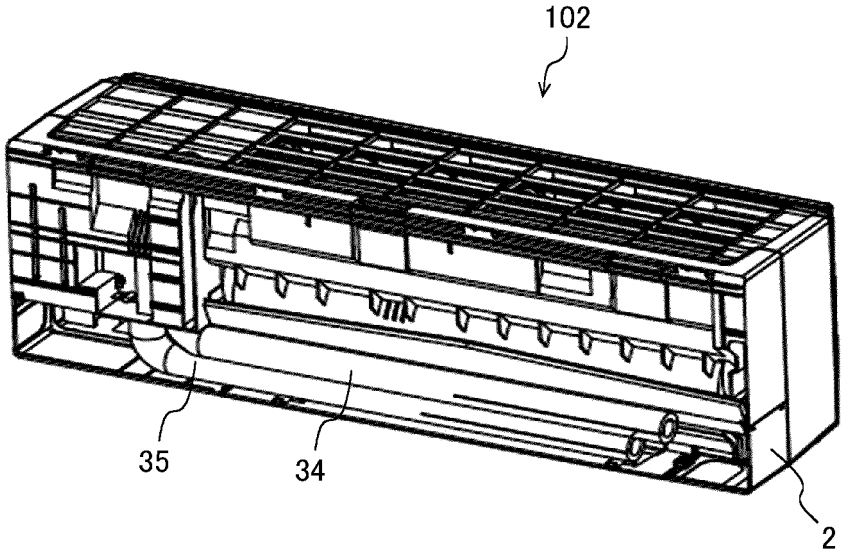
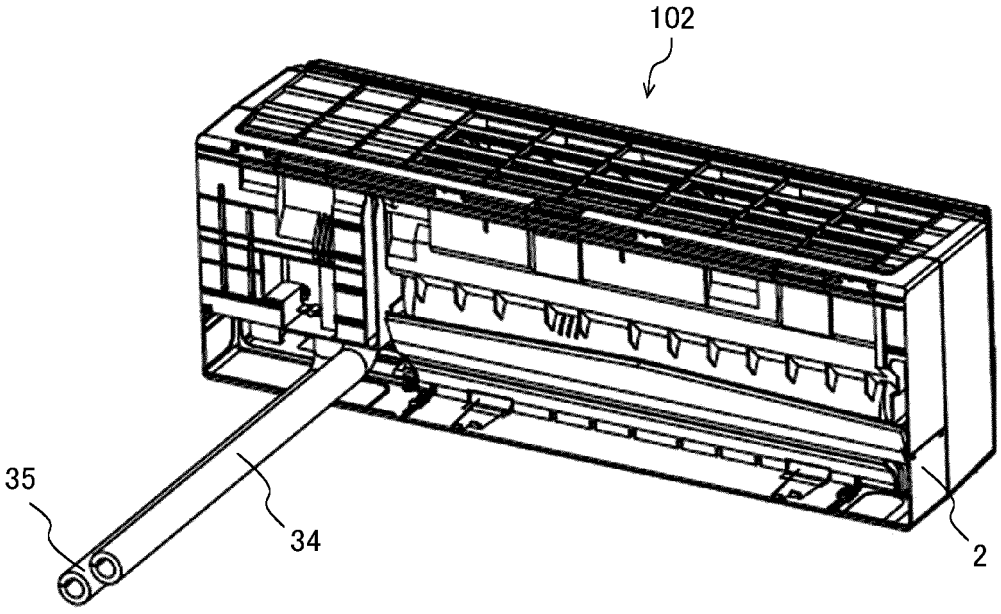


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/004652

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. F24F13/20(2006.01)i, F24F1/00(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)
Int. Cl. F24F13/20, F24F1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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	JP 48-9521 Y1 (MITSUBISHI ELECTRIC CORP.) 13 March 1973, column 1, line 20, to column 2, line 33, fig. 1, 2 (Family: none)	1-12
Y	JP 56-74537 A (TOKYO SHIBAURA ELECTRIC CO., LTD.) 20 June 1981, page 1, right column, line 6, to page 3, lower right column, line 9, fig. 2-8 (Family: none)	1-12

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search 29.03.2018	Date of mailing of the international search report 10.04.2018
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

- JP 2005106397 A **[0003]**