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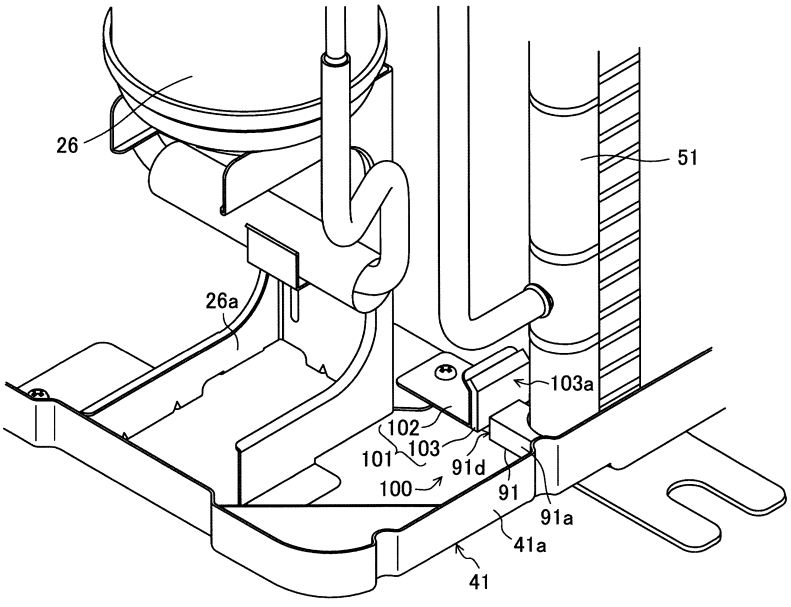
(54) OUTDOOR UNIT FOR AIR CONDITIONER

(57) A limiter (101) is connected to an accumulator leg (26a) near a first header collection pipe (51) in an outdoor unit (11). The limiter (101) extends from the accumulator leg (26a) toward the first header collection pipe (51) to limit movement of the first header collection pipe (51).

FIG.8



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to outdoor units of air conditioners, particularly to measures to prevent misalignment of header collection pipes of a heat exchanger mounted on the outdoor unit.

BACKGROUND ART

[0002] Parallel flow heat exchangers mounted on outdoor units of air conditioners have been known. For example, a heat exchanger disclosed by Patent Document 1 includes two standing aluminum header collection pipes, a plurality of flat pipes arranged in a vertical direction between the two header collection pipes, each of which is inserted in one of the header collection pipes at one end, and is inserted in the other header collection pipe at the other end, and a plurality of fins joined to the flat pipes. In this heat exchanger, a refrigerant flowing in the flat pipes and air passing between the fins exchange heat.

[0003] In some heat exchangers, insulating rubber members are provided on a bottom plate of a casing to support the header collection pipes from below. This can isolate the heat exchanger from vibration, and can insulate the header collection pipes from the bottom plate to prevent corrosion (electrolytic corrosion) of the header collection pipes.

CITATION LIST

PATENT DOCUMENT

[0004] [Patent Document 1] Japanese Unexamined Patent Publication No. 2010-249388

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0005] When the rubber members are fixed with an adhesive, condensed water dripped from the heat exchanger enters the adhesive to reduce adhesion of the adhesive, and the rubber members may be misaligned. Further, when the refrigerant is condensed in the heat exchanger in a cooling operation, the rubber members may be softened and deformed by heat of condensation. In these cases, the header collection pipes on the rubber members may greatly be misaligned. When the heat exchanger is tilted because of the misalignment, and connection pipes, etc. are distorted, the connection pipes are resonated with vibration of the compressor to generate noise.

[0006] In view of the foregoing, the present disclosure has been achieved to prevent the generation of noise caused by the misalignment of the header collection pipes.

SOLUTION TO THE PROBLEM

[0007] A first aspect of the present disclosure is directed to an outdoor unit of an air conditioner. The outdoor unit includes: a casing (40); a heat exchanger (23) including two header collection pipes (51, 52) standing in the casing (40), a plurality of flat pipes (53) arranged in a vertical direction between the two header collection pipes (51, 52), each of which is inserted in one of the header collection pipes (51, 52) at one end, and is inserted in the other header collection pipe (51, 52) at the other end, and a plurality of fins (55) joined to the flat pipes (53); a support (91b) provided on a bottom plate (41) of the casing (40) to support one of the header collection pipes (51, 52) from below; and a limiter (101) extending from a part near the one of the header collection pipes (51, 52) toward the one of the header collection pipes (51, 52) to limit movement of the one of the header collection pipes (51, 52).

[0008] In the first aspect of the present disclosure, the limiter (101) is provided near the one of the header collection pipes (51, 52), and the limiter (101) limits the movement of the one of the header collection pipes (51, 52). Thus, for example, even when the heat exchanger (23) is tilted to cause great misalignment of the one of the header collection pipes (51, 52), the limiter (101) reduces the misalignment of the one of the header collection pipes (51, 52).

[0009] According to a second aspect of the present disclosure related to the first aspect of the present disclosure, an insulating externally contacting part (91c) is provided to externally contacts the one of the header collection pipes (51, 52), and the limiter (101) limits the movement of the one of the header collection pipes (51, 52) through the externally contacting part (91 c).

[0010] In the second aspect of the present disclosure, the movement of the one of the header collection pipes (51, 52) is limited with the insulating externally contacting part (91c) interposed between the one of the header collection pipes (51, 52) and the limiter (101). Thus, the one of the header collection pipes (51, 52) and the limiter (101) are insulated by the externally contacting part (91c).

[0011] According to a third aspect of the present disclosure related to the second aspect of the present disclosure, the limiter (101) is in surface contact with the externally contacting part (91c) to limit the movement of the one of the header collection pipes (51, 52).

[0012] In the third aspect of the present disclosure, the limiter (101) is in surface contact with the externally contacting part (91c). Thus, the limiter (101) can stably limit the movement of the one of the header collection pipes (51, 52) through the externally contacting part (91c).

[0013] According to a fourth aspect of the present disclosure related to the second or third aspect of the present disclosure, the support (91b) is insulative, and

supports the one of the header collection pipes (51, 52) from below with a top surface of the support (91b) in contact with a lower surface of the one of the header collection pipes (51, 52), and the externally contacting part (91c) is formed continuously with the support (91b), and protrudes upward from the top surface of the support (91b) to externally contact the one of the header collection pipes (51, 52).

[0014] In the fourth aspect of the present disclosure, the externally contacting part (91c) and the support (91b) are integrally formed of an insulating material. Thus, the one of the header collection pipes (51, 52) is insulated from the bottom plate (41), and the one of the header collection pipes (51, 52) is insulated from the limiter (101). This reduces parts count.

[0015] In a fifth aspect of the present disclosure related to the first aspect of the present disclosure, the limiter (101) directly contacts the one of the header collection pipes (51, 52) to limit the movement of the one of the header collection pipes (51, 52).

[0016] In the fifth aspect of the present disclosure, nothing is interposed between the one of the header collection pipes (51, 52) and the limiter (101). This increases positional accuracy of the one of the header collection pipes (51, 52) whose movement is limited by the limiter (101).

[0017] In a sixth aspect of the present disclosure related to any one of the first to fifth aspects of the present disclosure, the limiter (101) limits the movement of the one of the header collection pipes (51, 52) in a direction substantially horizontal and substantially vertical to a direction of extension of the flat pipes (53).

[0018] The heat exchanger (23) is easily tilted in the direction substantially horizontal and substantially vertical to the direction of extension of the flat pipes (53), and the one of the header collection pipes (51, 52) is easily misaligned in the same direction. However, in the sixth aspect of the present disclosure, the limiter (101) is located in the direction in which the one of the header collection pipes (51, 52) is easily misaligned relative to the position of the one of the header collection pipes (51, 52). Thus, the misalignment of the frequently used first header collection pipe (51) can surely be reduced.

ADVANTAGES OF THE INVENTION

[0019] According to the first aspect of the present disclosure, the limiter (101) is provided near the one of the header collection pipes (51, 52) so that the limiter (101) limits the movement of the one of the header collection pipes (51, 52). Thus, the misalignment of the one of the header collection pipes (51, 52) can be reduced, and an attitude of the outdoor heat exchanger (23) can be maintained with stability. This can prevent tilting of the outdoor heat exchanger (23) and distortion of connection pipes (75, 76), and can prevent resonance of vibration of the compressor (21) caused by the distortion, thereby preventing generation of noise.

[0020] According to the second aspect of the present disclosure, the insulating externally contacting part (91c) is provided to externally contacts the one of the header collection pipes (51, 52), and the movement of the one of the header collection pipes (51, 52) is limited with the externally contacting part (91c) interposed between the limiter (101) and the one of the header collection pipes (51, 52). This can insulate the one of the header collection pipes (51, 52) from the limiter (101) by the externally contacting part (91c), and can prevent corrosion (electrolytic corrosion) of the one of the header collection pipes (51, 52).

[0021] According to the third aspect of the present disclosure, the movement of the one of the header collection pipes (51, 52) is limited with the limiter (101) and the externally contacting part (91c) brought into surface contact. Thus, the limiter (101) can stably limit the movement of the one of the header collection pipes through the externally contacting part (91c), the misalignment of the one of the header collection pipes (51, 52) can surely be reduced, and the generation of noise can be prevented with high reliability.

[0022] According to the fourth aspect of the present disclosure, the externally contacting part (91c) and the support (91b) for supporting the one of the header collection pipes (51, 52) from below are integrally formed of an insulating material. This can insulate the one of the header collection pipes (51, 52) from the bottom plate (41), can insulate the one of the header collection pipes (51, 52) from the limiter (101), and can surely prevent corrosion (electrolytic corrosion) of the one of the header collection pipes (51, 52). Further, parts count can be reduced to reduce the cost and size of the parts.

[0023] According to the fifth aspect of the present disclosure, the one of the header collection pipes (51, 52) is brought into direct contact with the limiter (101) to limit the movement of the one of the header collection pipes (51, 52). This can increase positional accuracy of the one of the header collection pipes (51, 52) whose movement is limited by the limiter (101).

[0024] According to the sixth aspect of the present disclosure, the limiter (101) is located in the direction in which the heat exchanger (23) is easily tilted and the one of the header collection pipes (51, 52) is easily misaligned relative to the position of the one of the header collection pipes (51, 52). This can surely reduce the misalignment of the frequently used header collection pipe (51, 52), and can prevent the generation of noise with high reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

[FIG. 1] FIG. 1 is a refrigerant circuit diagram illustrating a schematic configuration of an air conditioner of a first embodiment.

[FIG. 2] FIG. 2 is a perspective view illustrating ap-

pearance of an outdoor unit of the first embodiment.
[FIG. 3] FIG. 3 is a plan view of the outdoor unit of the first embodiment with a top plate removed.
[FIG. 4] FIG. 4 is a perspective view illustrating how an outdoor heat exchanger of the first embodiment is placed.
[FIG. 5] FIG. 5 is a partial cross-sectional view of the outdoor heat exchanger of the first embodiment.
[FIG. 6] FIG. 6 is an enlarged cross-sectional view taken along the line VI-VI in FIG. 5.
[FIG. 7] FIG. 7 is a perspective view of the outdoor unit of the first embodiment with the top plate and side plates removed.
[FIG. 8] FIG. 8 is an enlarged view illustrating a major part (a misalignment reduction structure) of FIG. 7.
[FIG. 9] FIG. 9 is a plan view illustrating a misalignment reduction structure of the first embodiment.
[FIG. 10] FIG. 10 is a cross-sectional view taken along the line X-X in FIG. 9.
[FIG. 11] FIG. 11 is a vertical cross-sectional view illustrating a misalignment reduction structure of another embodiment.
[FIG. 12] FIGS. 12(a) and 12(b) are vertical cross-sectional views illustrating a misalignment reduction structure of another embodiment.
[FIG. 13] FIGS. 13(a) and 13(b) are vertical cross-sectional views illustrating a misalignment reduction structure of another embodiment.
[FIG. 14] FIG. 14 is a plan view illustrating a misalignment reduction structure of another embodiment.

DESCRIPTION OF EMBODIMENTS

[0026] Embodiments of the present disclosure will be described in detail with reference to the drawings. The following embodiments are merely illustrative, and should not be construed as limiting the invention, applications thereof, or use thereof.

[First Embodiment]

[0027] A first embodiment of the present disclosure will be described below. An outdoor unit (2) of the present embodiment constitutes part of an air conditioner (10), and is placed outside, for example. A general configuration of the air conditioner (10) will be described first, and a configuration of the outdoor unit (2) will subsequently be described.

[General Configuration of Air Conditioner]

[0028] As shown in FIG. 1, the air conditioner (10) includes an outdoor unit (11) and an indoor unit (12). The outdoor unit (11) and the indoor unit (12) are connected through a liquid communication pipe (13) and a gas communication pipe (14). The outdoor unit (11), the indoor unit (12), the liquid communication pipe (13), and the gas communication pipe (14) constitute a refrigerant circuit (20).

[0029] The refrigerant circuit (20) includes a compressor (21), a four-way switching valve (22), an outdoor heat exchanger (23), an expansion valve (24), an indoor heat exchanger (25), and an accumulator (26). The compressor (21), the four-way switching valve (22), the outdoor heat exchanger (23), the expansion valve (24), and the accumulator (26) are contained in the outdoor unit (11). The outdoor unit (11) is provided with an outdoor fan (15) for feeding outdoor air to the outdoor heat exchanger (23). The indoor heat exchanger (25) is contained in the indoor unit (12). The indoor unit (12) is provided with an indoor fan (16) for feeding indoor air to the indoor heat exchanger (25).

[0030] The compressor (21) is connected to a first port of the four-way switching valve (22) at a discharge end, and is connected to a second port of the four-way switching valve (22) at a suction end through the accumulator (26). In the refrigerant circuit (20), the outdoor heat exchanger (23), the expansion valve (24), and the indoor heat exchanger (25) are arranged in this order between a third port and a fourth port of the four-way switching valve (22).

[0031] The compressor (21) is a scroll or rotary hermetic compressor. The four-way switching valve (22) is switched between a first state in which the first port communicates with the third port, and the second port communicates with the fourth port (a state illustrated by a solid line in FIG. 1), and a second state in which the first port communicates with the fourth port, and the second port communicates with the third port (a state illustrated by a broken line in FIG. 1). The expansion valve (24) is a so-called electronic expansion valve.

[0032] The outdoor heat exchanger (23) is configured to exchange heat between the outdoor air and the refrigerant, and constitutes a heat exchanger of the present disclosure. The outdoor heat exchanger (23) will be described later. The indoor heat exchanger (25) is configured to exchange heat between the indoor air and the refrigerant. The indoor heat exchanger (25) is constituted of a so-called cross-fin type fin and tube heat exchanger including at least one circular heat transfer pipe.

[0033] The accumulator (26) separates the refrigerant into a gaseous refrigerant and a liquid refrigerant, and sends the gaseous refrigerant only to the compressor (21).

[Working Mechanism of Air Conditioner]

[0034] The air conditioner (10) selectively performs a cooling operation and a heating operation.

[0035] In the cooling operation, the refrigerant circuit (20) performs a refrigeration cycle with the four-way switching valve (22) set in the first state. In this state, the refrigerant circulates through the outdoor heat exchanger (23), the expansion valve (24), the indoor heat exchanger (25), and the accumulator (26) in this order. In the outdoor

heat exchanger (23), the refrigerant discharged from the compressor (21) dissipates heat to the outdoor air to condensate. In the indoor heat exchanger (25), the refrigerant expanded through the expansion valve (24) absorbs heat from the indoor air to evaporate. The indoor unit (12) feeds the sucked indoor air to the indoor heat exchanger (25), and blows the air cooled in the indoor heat exchanger (25) to the inside of the room.

[0036] In the heating operation, the refrigerant circuit (20) performs the refrigeration cycle with the four-way switching valve (22) set in the second state. In this state, the refrigerant circulates through the indoor heat exchanger (25), the expansion valve (24), the outdoor heat exchanger (23), and the accumulator (26) in this order. In the indoor heat exchanger (25), the refrigerant discharged from the compressor (21) dissipates heat to the indoor air to condensate. The indoor unit (12) feeds the sucked indoor air to the indoor heat exchanger (25), and blows the air heated in the indoor heat exchanger (25) to the inside of the room. In the outdoor heat exchanger (23), the refrigerant expanded through the expansion valve (24) absorbs heat from the outdoor air to evaporate.

[Configuration of Outdoor Unit]

[0037] The outdoor unit (11) will be described with reference to FIGS. 2 and 3. In the following description, the terms "upper," "lower," "left," "right," "front," and "rear" designate directions relative to the outdoor unit (11) viewed from a front side thereof unless otherwise specified.

[0038] The outdoor unit (11) includes a casing (40). The casing (40) is a vertically-oriented rectangular parallelepiped housing made of iron, and constitutes a casing of the present disclosure. The casing (40) includes a bottom plate (41), a front side plate (42a), a left side plate (42b), a rear side plate (42c), and a right side plate (42d) which are arranged to stand on the bottom plate (41), and a top plate (43) arranged on upper ends of the side plates (42a-42d). A side to side direction of the casing is regarded as a lengthwise direction.

[0039] A divider plate (44) is arranged to stand in the casing (40) to extend rearward from the front side plate (42a) (in a crosswise direction) in the shape of an arc when viewed in plan. The divider plate (44) divides space inside the casing (40) into a blower chamber (S1) on the left and a machine chamber (S2) on the right. The blower chamber (S1) contains the outdoor heat exchanger (23) and the outdoor fan (15). The machine chamber (S2) contains the compressor (21), the four-way switching valve (22) (not shown in FIG. 3), the expansion valve (24) (not shown in FIG. 3), and the accumulator (26).

[0040] A rear inlet (45a) is opened in the rear side plate (42c) of the casing (40) near the blower chamber (S1), and a left inlet (45b) is opened in the left side plate (42b). The two inlets (45a, 45b) are provided to suck the air (the outdoor air) into the blower chamber (S1).

[0041] An outlet (46) is opened in the front side plate (42a) of the casing (40) near the blower chamber (S1). The outlet (46) is provided to blow the air (the outdoor air) in the blower chamber (S1) to the outside. A fan grill (47) is fitted in the outlet (46).

[Configuration of Outdoor Heat Exchanger]

[0042] The outdoor heat exchanger (23) will be described with reference to FIGS. 3-6.

[0043] As shown in FIGS. 3 and 4, the outdoor heat exchanger (23) is substantially L-shaped when viewed in plan, and is arranged in the blower chamber (S1) to face the two inlets (45a, 45b).

[0044] As shown in FIG. 5, the outdoor heat exchanger (23) includes a first header collection pipe (51), a second header collection pipe (52), a plurality of flat pipes (53), and a plurality of fins (55). The first header collection pipe (51), the second header collection pipe (52), the flat pipes (53), and the fins (55) are made of aluminum, and are joined together by brazing.

[0045] Each of the first header collection pipe (51) and the second header collection pipe (52) is in the shape of a long cylinder with closed ends. As shown in FIG. 3, the first header collection pipe (51) is arranged to stand between the rear side plate (42c) and the divider plate (44), and the second header collection pipe (52) is arranged to stand at a corner formed by the front side plate (42a) and the left side plate (42b) in the blower chamber (S1).

[0046] As shown in FIG. 6, each of the flat pipes (53) is a heat transfer pipe having a flat oblong cross section, and a plurality of fluid channels (54) are formed to be aligned inside the pipe. As shown in FIG. 5, the flat pipes (53) are arranged at regular spacings in the vertical direction to be substantially parallel to each other with their flat surfaces facing each other.

[0047] As shown in FIGS. 3 and 4, each of the flat pipes (53) is substantially L-shaped when viewed in plan, and has a long side part (53a) extending in the side to side direction (the lengthwise direction) in FIG. 3, and a short side part (53b) extending in a front to back direction (the crosswise direction) in FIG. 3. The long side part (53a) of the flat pipe (53) faces the rear inlet (45a), and an end thereof is inserted in the first header collection pipe (51) so that the fluid channels (54) inside the flat pipe communicate with the inside of the first header collection pipe (51). The short side part (53b) of the flat pipe (53) faces the left inlet (45b), and an end thereof is inserted in the second header collection pipe (52) so that the fluid channels (54) inside the flat pipe communicate with the inside of the second header collection pipe (52).

[0048] As shown in FIGS. 5 and 6, the fins (55) are vertically-oriented flat fins formed by pressing a metal plate. The fins (55) are arranged at regular spacings in the direction of extension of the flat pipes (53) so that the air (the outdoor air) passes between the adjacent fins (55) from the inlets (45a, 45b) to the blower chamber (S1). Each of the fins (55) is provided with notches (56) formed in a side of the fin closer to the inlets (45a, 45b),

i.e., on a windward side of the fin, at regular spacings in the vertical direction. The flat pipes (53) are inserted in leeward parts of the notches (56).

[0049] As shown in FIG. 5, the outdoor heat exchanger (23) is classified into an upper main heat exchange region (61) and a lower auxiliary heat exchange region (62), and each of the heat exchange regions (61, 62) is classified into three vertically arranged heat exchange sections (61a-61c, 62a-62c). Specifically, the main heat exchange region (61) includes a first main heat exchange section (61a), a second main heat exchange section (61b), and a third main heat exchange section (61c) from bottom to top. The auxiliary heat exchange region (62) includes a first auxiliary heat exchange section (62a), a second auxiliary heat exchange section (62b), and a third auxiliary heat exchange section (62c) from bottom to top. The number of the flat pipes (53) constituting each of the main heat exchange sections (61 a-61c) is larger than the number of the flat pipes (53) constituting each of the auxiliary heat exchange sections (62a-62c).

[0050] Space inside the first header collection pipe (51) is divided into an upper space (71) and a lower space (72) by a divider plate (51a). The upper space (71) communicates with all the flat pipes (53) constituting the main heat exchange region (61), and the lower space (72) communicates with all the flat pipes (53) constituting the auxiliary heat exchange region (62). The first header collection pipe (51) is connected to a gas connection pipe (75) and a liquid connection pipe (76). The gas connection pipe (75) is connected to an upper part of the first header collection pipe (51) at one end to communicate with the upper space (71), and is connected to the third port of the four-way switching valve (22) at the other end. The liquid connection pipe (76) is connected to a lower part of the first header collection pipe (51) at one end to communicate with the lower space (72), and is connected to the expansion valve (24) at the other end.

[0051] Space inside the second header collection pipe (52) is divided into a main space (81) corresponding to the main heat exchange region (61), and an auxiliary space (82) corresponding to the auxiliary heat exchange region (62). The main space (81) is divided into a first space (81a), a second space (81b), and a third space (81c) from bottom to top by two divider plates (52a). Each of the spaces (81a-81c) communicates with all the flat pipes (53) constituting the corresponding main heat exchange section (61a-61c).

[0052] The auxiliary space (82) is divided into a fourth space (82a), a fifth space (82b), and a sixth space (82c) from bottom to top by two divider plates (52b). Each of the spaces (82a-82c) communicates with all the flat pipes (53) constituting the corresponding auxiliary heat exchange section (62a-62c).

[0053] Two communication pipes (85, 86) are attached to the second header collection pipe (52). A first communication pipe (85) is connected to the second space (81b) at one end, and is connected to the fifth space (82b) at the other end. A second communication pipe (86) is connected to the third space (81c) at one end, and is connected to the fourth space (82a) at the other end. In the second header collection pipe (52), the first space (81a) and the sixth space (82c) form a single continuous space.

[0054] As shown in FIGS. 4 and 7, the outdoor heat exchanger (23) is supported by three rubber members (91-93) and four mounting members (95) in the casing (40).

[0055] Two mounting members (95) are attached to each of the header collection pipes (51, 52). As shown in FIG. 7, each of the mounting members (95) includes an aluminum bracket (96), an iron mounting plate (97), and an insulating resin cover (98). The bracket (96) is fixed to the corresponding header collection pipe (51, 52). The mounting plate (97) is fixed to the corresponding side plate (42b, 42c) of the casing (40). The bracket (96) and the mounting plate (97) are fixed and insulated from each other in the resin cover (98). This prevents electric contact between the header collection pipe (51, 52) and the casing (40) to prevent corrosion (electrolytic corrosion) of the header collection pipe (51, 52).

[0056] As shown in FIG. 4, each of the rubber members (91-93) is a substantially plate-shaped insulating rubber member, and is fixed onto the bottom plate (41) with an adhesive. A first rubber member (91) is provided between the rear side plate (42c) and the divider plate (44) to support the first header collection pipe (51) from below. A second rubber member (92) is provided at a corner formed by the rear side plate (42c) and the left side plate (42b) to support the fins (55) from below. A third rubber member (93) is provided at a corner formed by the front side plate (42a) and the left side plate (42b) to support the second header collection pipe (52) from below. The three rubber members (91-93) isolate the outdoor heat exchanger (23) from vibration, and prevent electric contact between the outdoor heat exchanger (23) and the casing (40) to prevent corrosion (electrolytic corrosion) of the outdoor heat exchanger (23).

[Misalignment Reduction Structure]

[0057] As shown in FIGS. 8-10, the outdoor unit (2) of the present embodiment is provided with a misalignment reduction structure (100) to reduce misalignment of the first header collection pipe (51). The misalignment reduction structure (100) includes an accumulator leg (26a), a limiter (101), and the first rubber member (91).

[0058] The accumulator leg (26a) is a member for supporting the limiter (101), and is arranged near the first header collection pipe (51). Specifically, the accumulator leg (26a) is arranged immediately below the accumulator (26) located in front of the first header collection pipe (51), and is fixed with screws to a top surface of the bottom plate (41) to support the accumulator (26) from below.

[0059] The limiter (101) is connected to the accumulator leg (26a). The limiter (101) laterally limits the movement of the first header collection pipe (51), and includes

a limiting plate (102) and a cushion sheet (103).

[0060] The limiting plate (102) is formed by bending an iron plate, and includes an extending part (102a), a limiting surface (102b), and a guiding part (102c).

[0061] The extending part (102a) is fixed with the screws fixing the accumulator leg (26a) to the bottom plate (41) to be connected to the accumulator leg (26a). The extending part (102a) extends in a substantially horizontal direction from the accumulator leg (26a) to the first header collection pipe (51) behind the accumulator leg (26a).

[0062] The limiting surface (102b) is formed by bending a rear end of the extending part (102a) (an end closer to the first header collection pipe (51)) by approximately 90 degrees, and extends upward in a perpendicular direction. The limiting surface (102b) is substantially parallel to a front surface (91d) of a receiving part (91a) (described later) in which a lower end of the first header collection pipe (51) is inserted. The movement of the first header collection pipe (51) is limited by contact between the front surface (91d) of the receiving part (91a) and the cushion sheet (103) on the limiting surface (102b).

[0063] The guiding part (102c) is formed by bending an upper end of the limiting surface (102b) forward (in a direction away from the first header collection pipe (51)) by approximately 45 degrees. The guiding part (102c) is formed to increase a gap between the limiter (101) and a rear standing wall (41a) of the bottom plate (41), and guides the first header collection pipe (51) to the gap when the first header collection pipe (51) is mounted.

[0064] The cushion sheet (103) is a rubber sheet, and is adhered to rear surfaces of the limiting surface (102b) and the guiding part (102c) (surfaces facing the first header collection pipe (51)). The cushion sheet (103) prevents vibration of the accumulator (26) from propagating to parts around the accumulator (26) through the limiting plate (102).

[0065] As shown in FIG. 9, the first rubber member (91) is substantially rectangular when viewed in plan. One of long side surfaces of the first rubber member (91) is in contact with the rear standing wall (41 a) of the bottom plate (41), and a back surface of the first rubber member (91) is fixed to the top surface of the bottom plate (41) with an adhesive. The receiving part (91 a) is formed on the right side of the first rubber member (91).

[0066] The receiving part (91a) is positioned at a gap between the limiter (101) and the standing wall (41 a), and a lower end of the first header collection pipe (51) is inserted therein. The receiving part (91a) includes a support (91b) and an externally contacting part (91c).

[0067] The support (91b) is a part supporting the first header collection pipe (51) from below, and has a flat top surface. A lower surface of the first header collection pipe (51) comes into contact with the top surface.

[0068] The externally contacting part (91c) is a part which externally contacts the first header collection pipe (51), and is substantially in the shape of a ring protruding upward from the top surface of the support (91b).

[0069] The front surface (91d) of the receiving part (91a) extends in the perpendicular direction. The front surface (91d) of the receiving part (91a) and the cushion sheet (103) on the limiting surface (102b) face substantially parallel to each other with a small gap interposed therebetween.

[Reduction of Misalignment of First Header Collection Pipe]

[0070] In the outdoor unit (2), the first rubber member (91) may laterally be misaligned due to reduced adhesion of the adhesive, or the first rubber member (91) may be softened and deformed by heat of condensation. This may possibly cause great misalignment of the first header collection pipe (51) on the first rubber member (91).

[0071] In many cases, the misalignment of the first header collection pipe (51) is caused by tilting of the outdoor heat exchanger (23). When the outdoor heat exchanger (23) is substantially L-shaped when viewed in plan as in the present embodiment, the outdoor heat exchanger (23) is often tilted rearward (in a direction vertical to the direction of extension of the long side part (53a) of the flat pipe (53)), and the lower end of the first header collection pipe (51) is misaligned forward.

[0072] In the outdoor unit (2) of the present embodiment, the limiter (101) is provided near the first header collection pipe (51). The lower end of the first header collection pipe (51) is inserted in the receiving part (91a), and the front surface (91d) of the receiving part (91a) and the limiter (101) (the cushion sheet (103)) face substantially parallel to each other with a small gap interposed therebetween. Thus, even if the first header collection pipe (51) moves forward together with the receiving part (91 a), the front surface (91d) of the receiving part (91a) contacts the limiter (101) (the cushion sheet (103)), and the first header collection pipe (51) cannot move forward anymore. This can reduce the forward misalignment of the first header collection pipe (51).

-Advantages of Embodiment-

[0073] In the present embodiment, the limiter (101) is provided near the first header collection pipe (51) so that the limiter (101) limits the movement of the first header collection pipe (51). Thus, the misalignment of the first header collection pipe (51) can be reduced, and an attitude of the outdoor heat exchanger (23) can be maintained with stability. This can prevent tilting of the outdoor heat exchanger (23) and distortion of connection pipes (75, 76), and can prevent the connection pipes from resonating with vibration of the compressor (21) caused by the distortion, thereby preventing generation of noise.

[0074] In the present embodiment, the first header collection pipe (51) is inserted in the receiving part (91a) of the insulating first rubber member (91). Thus, the front surface (91 d) of the receiving part (91a) is brought into contact with the limiter (101) to limit the movement of the

first header collection pipe (51) with the externally contacting part (91c) of the receiving part (91a) sandwiched between the first header collection pipe (51) and the limiter (101). This can insulate the first header collection pipe (51) from the limiter (101) by the externally contacting part (91c), and can prevent corrosion (electrolytic corrosion) of the aluminum first header collection pipe (51).

[0075] In the present embodiment, a contacting part of the receiving part (91 a) (the front surface (91d)) and a contacting part of the limiter (101) (the cushion sheet (103)) face substantially parallel to each other so that the receiving part (91a) and the limiter (101) can be brought into surface contact. Thus, the limiter (101) can stably limit the movement of the first header collection pipe (51) with the receiving part (91a) interposed therebetween, the misalignment of the first header collection pipe (51) can surely be reduced, and the generation of noise can be prevented with high reliability.

[0076] In the present embodiment, the support (91b) for supporting the first header collection pipe (51) from below and the externally contacting part (91c) which externally contacts the first header collection pipe (51) are integrally formed as the insulating first rubber member (91). This can insulate the first header collection pipe (51) from the bottom plate (41), can insulate the first header collection pipe (51) from the limiter (101), and can surely prevent the corrosion (electrolytic corrosion) of the first header collection pipe (51) with high reliability. Further, parts count can be reduced to reduce the cost and size of the parts.

[0077] In the present embodiment, the movement of the first header collection pipe (51) in the direction in which the outdoor heat exchanger (23) is easily tilted and the first header collection pipe (51) is easily misaligned (a forward direction of the first header collection pipe (51) in the present embodiment) is limited. This can surely reduce the misalignment of the frequently used first header collection pipe (51), and the generation of noise can be prevented with high reliability.

[Other Embodiments]

[0078] The above-described embodiment may be modified in the following manner.

[0079] In the embodiment described above, the movement of the first header collection pipe (51) is limited with the externally contacting part (91c) sandwiched between the first header collection pipe (51) and the limiter (101). However, the limitation of the movement of the first header collection pipe (51) by the limiter (101) is not limited thereto. For example, the movement of the first header collection pipe (51) may be limited with the first header collection pipe (51) brought in direct contact with the limiter (101). In this case, nothing is interposed between the first header collection pipe (51) and the limiter (101). This can increase positional accuracy of the header collection pipe (51, 52) whose movement is limited by the limiter (101).

[0080] In the embodiment described above, the cushion sheet (103) is adhered to the limiting plate (102) of the limiter (101). However, the configuration of the limiter (101) is not limited thereto, and the limiter (101) may be constituted of the limiting plate (102) only without adhering the cushion sheet (103) to the limiting plate (102) as shown in FIG. 11.

[0081] In the embodiment described above, a gap is provided between the limiter (101) and the receiving part (91 a). The gap is provided to increase a distance between the limiter (101) and the standing wall (41a) of the bottom plate (41) to allow easy insertion of the first header collection pipe (51) in the gap. However, as shown in FIGS. 12(a) and 12(b), the gap between the limiter (101) and the receiving part (91a) may be omitted so that the first header collection pipe (51) is not misaligned at all.

[0082] In the embodiment described above, the support (91b) for supporting the first header collection pipe (51) from below and the externally contacting part (91c) which externally contacts the header collection pipe (51) are integrally formed as the first rubber member (91). However, as shown in FIGS. 13(a) and 13(b), the support (91b) and the externally contacting part (91c) may independently be formed, and the movement of the first header collection pipe (51) may be limited with the externally contacting part (91c) sandwiched between the first header collection pipe (51) and the limiter (101).

[0083] In the embodiment described above, a contact surface of the receiving part (91a) (the front surface (91 d)) and a contact surface of the limiter (101) (the cushion sheet (103)) are flat (linear when viewed in plan). However, the shapes of the contact surfaces are not limited thereto, and the contact surfaces may be curved when viewed in plan along a circumferential surface of the first header collection pipe (51) as shown in FIG. 14. Even in this case, the receiving part (91 a) and the limiter (101) can be brought into surface contact.

[0084] In the embodiment described above, the limiter (101) is connected to the accumulator leg (26a). However, the limiter (101) may be connected and supported by a part except for the accumulator leg (26a).

[0085] In the embodiment described above, the misalignment reduction structure (100) is provided on the first header collection pipe (51). However, the misalignment reduction structure may also be provided on the second header collection pipe (52) to reduce the misalignment of the second header collection pipe (52).

INDUSTRIAL APPLICABILITY

[0086] As described above, the present disclosure relates to the outdoor unit of the air conditioner, and is particularly useful for an outdoor unit including an outdoor heat exchanger having header collection tubes standing upright.

DESCRIPTION OF REFERENCE CHARACTERS

[0087]

10	Air conditioner
11	Outdoor unit
23	Outdoor heat exchanger (heat exchanger)
40	Casing
41	Bottom plate
51	First header collection pipe (header collection pipe)
52	Second header collection pipe (header collection pipe)
53	Flat pipe
55	Fin
91b	Support
91c	Externally contacting part
101	Limiter

Claims

1. An outdoor unit of an air conditioner, the outdoor unit comprising:

a casing (40);
a heat exchanger (23) including two header collection pipes (51, 52) standing in the casing (40), a plurality of flat pipes (53) arranged in a vertical direction between the two header collection pipes (51, 52), each of which is inserted in one of the header collection pipes (51, 52) at one end, and is inserted in the other header collection pipe (51, 52) at the other end, and a plurality of fins (55) joined to the flat pipes (53);
a support (91b) provided on a bottom plate (41) of the casing (40) to support one of the header collection pipes (51, 52) from below; and
a limiter (101) extending from a part near the one of the header collection pipes (51, 52) toward the one of the header collection pipes (51, 52) to limit movement of the one of the header collection pipes (51, 52).

2. The outdoor unit of the air conditioner of claim 1, wherein
an insulating externally contacting part (91c) is provided to externally contacts the one of the header collection pipes (51, 52), and
the limiter (101) limits the movement of the one of the header collection pipes (51, 52) through the externally contacting part (91c).

3. The outdoor unit of the air conditioner of claim 2, wherein
the limiter (101) is in surface contact with the externally contacting part (91c) to limit the movement of the one of the header collection pipes (51, 52).

4. The outdoor unit of the air conditioner of claim 2 or 3, wherein
the support (91b) is insulative, and supports the one of the header collection pipes (51, 52) from below with a top surface of the support (91b) in contact with a lower surface of the one of the header collection pipes (51, 52), and
the externally contacting part (91c) is formed continuously with the support (91b), and protrudes upward from the top surface of the support (91b) to externally contact the one of the header collection pipes (51, 52).

5. The outdoor unit of the air conditioner of claim 1, wherein
the limiter (101) directly contacts the one of the header collection pipes (51, 52) to limit the movement of the one of the header collection pipes (51, 52).

6. The outdoor unit of the air conditioner of any one of claims 1-5, wherein the limiter (101) limits the movement of the one of the header collection pipes (51, 52) in a direction substantially horizontal and substantially vertical to a direction of extension of the flat pipes (53).

FIG.1

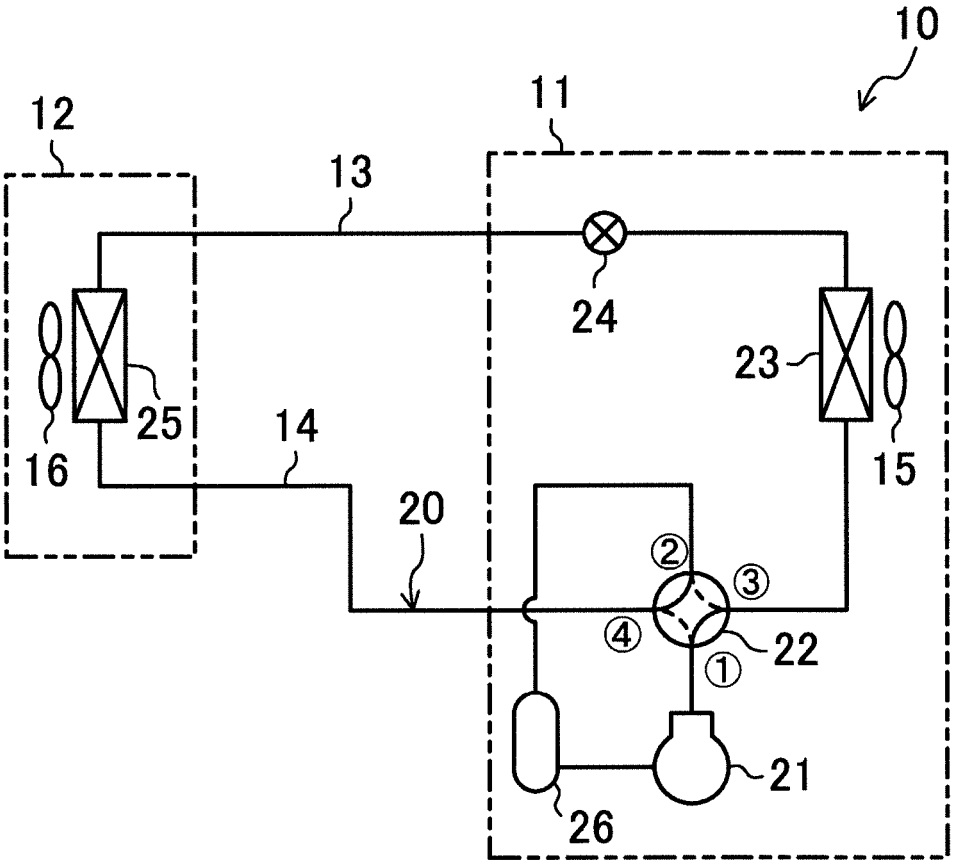


FIG.2

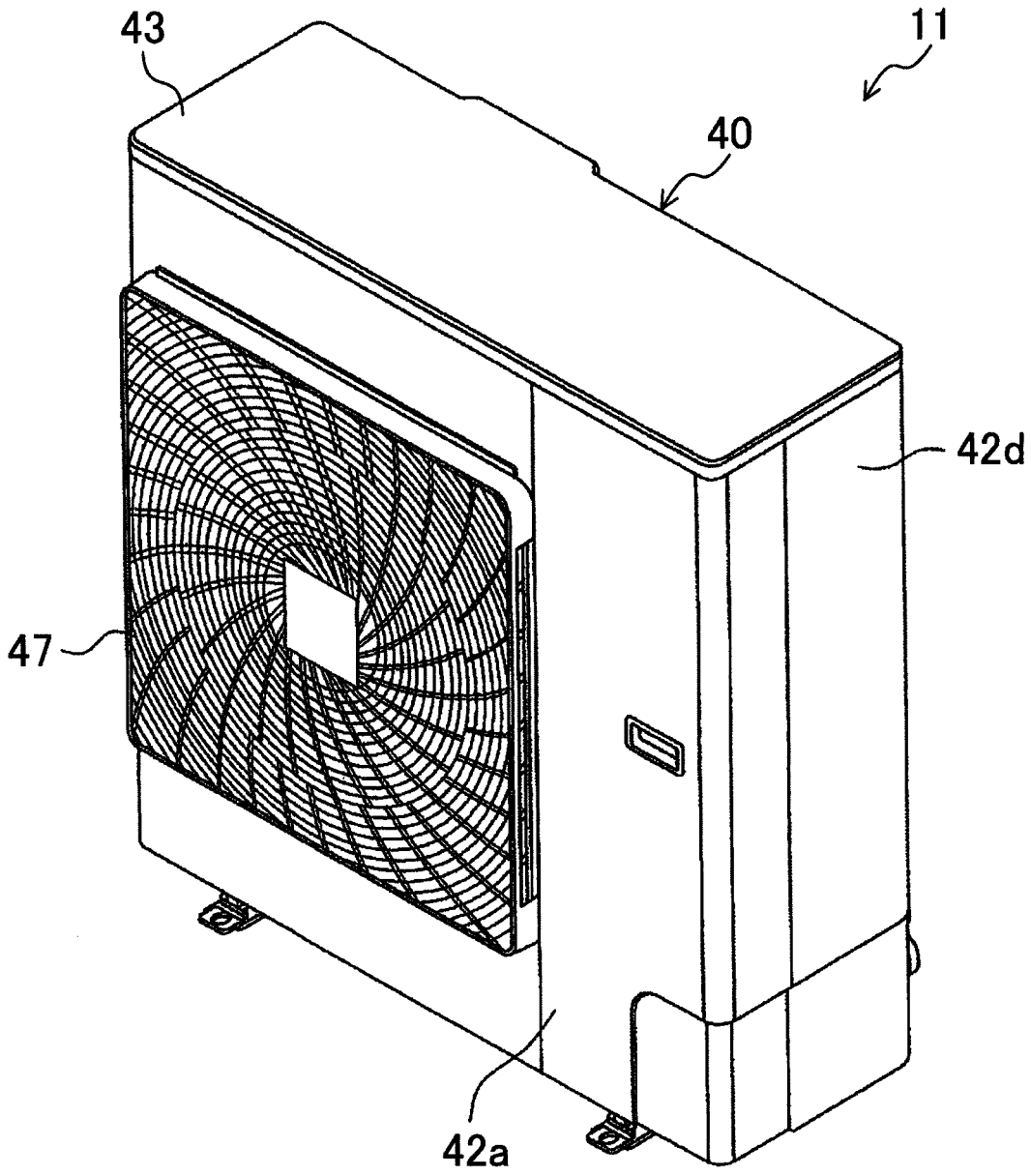
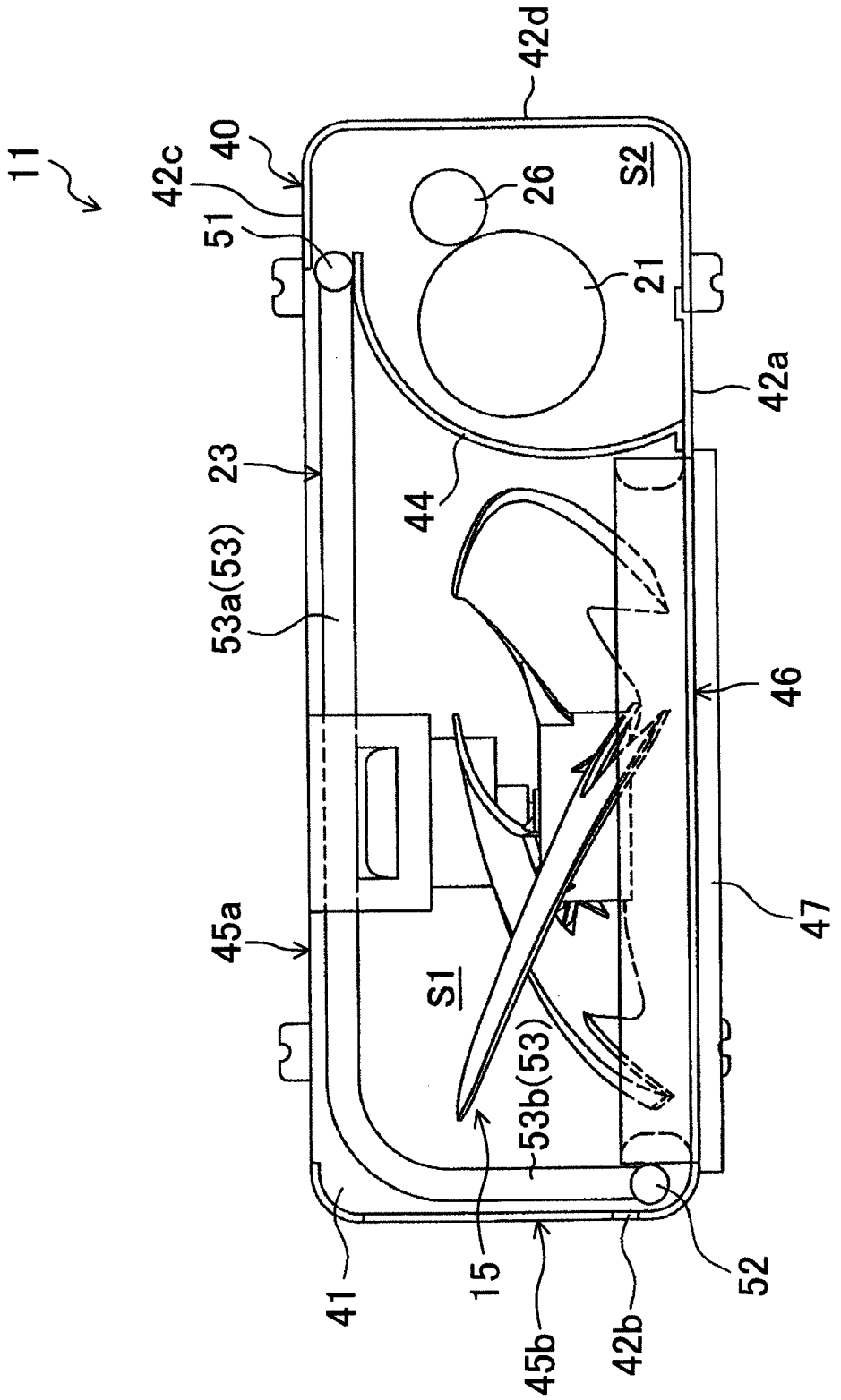


FIG.3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42c
40
51
26
S2
21
42a
23
44
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46
45a
S1
53b(53)
47
41
15
45b
42b
52

FIG.4

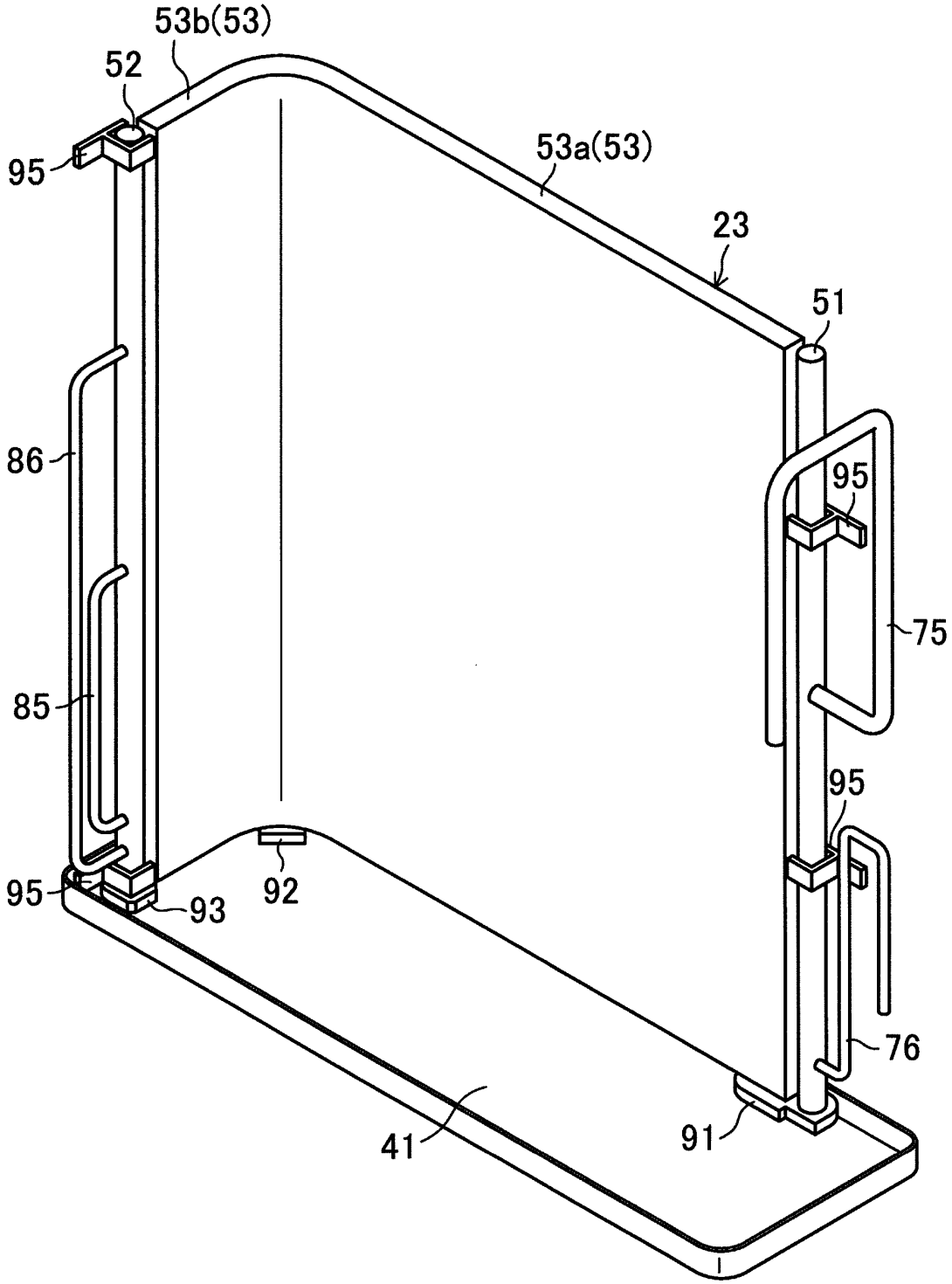
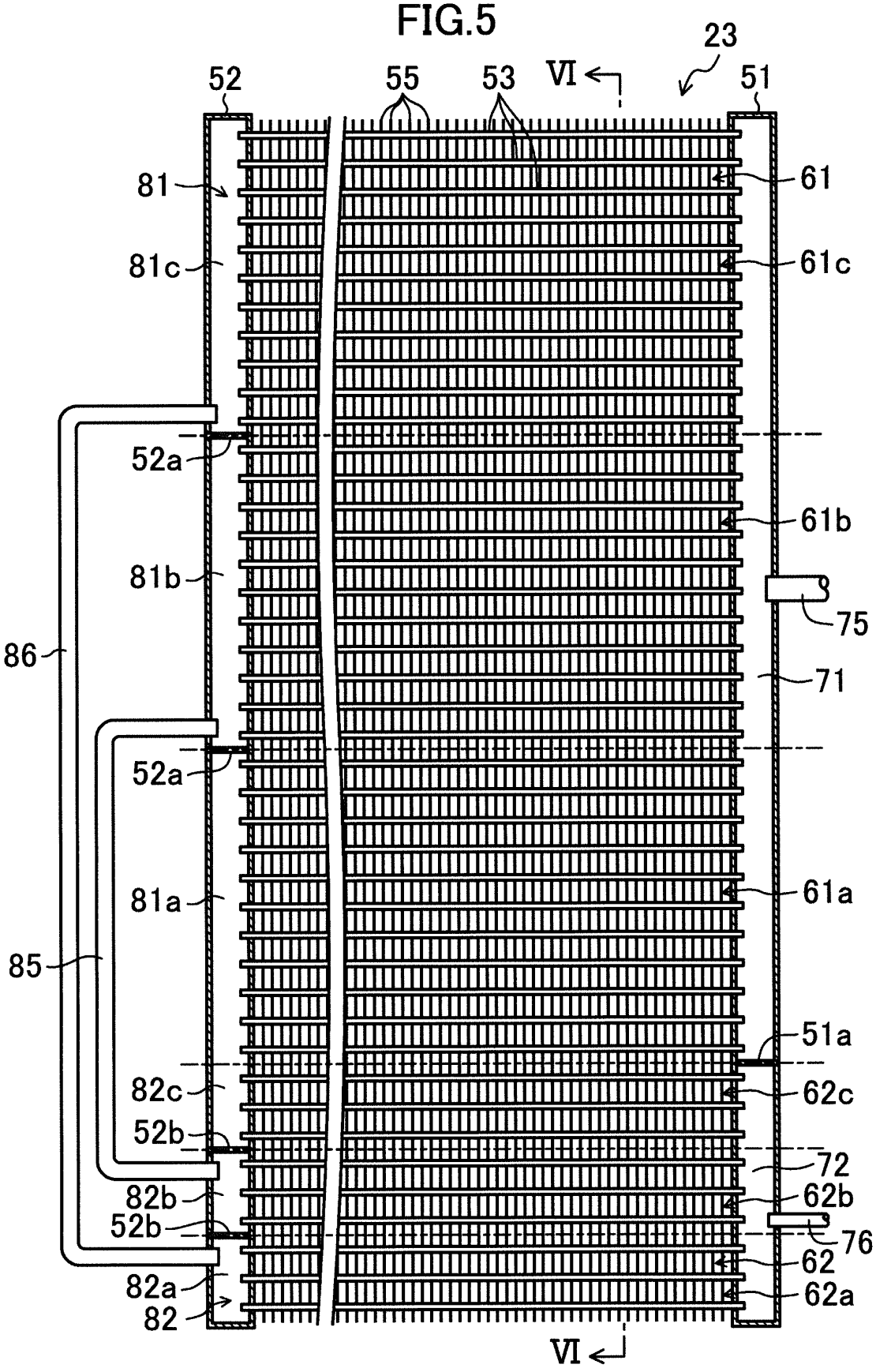


FIG.5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52
55
53
VI
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81b
75
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52a
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62a
82
VI

FIG.6

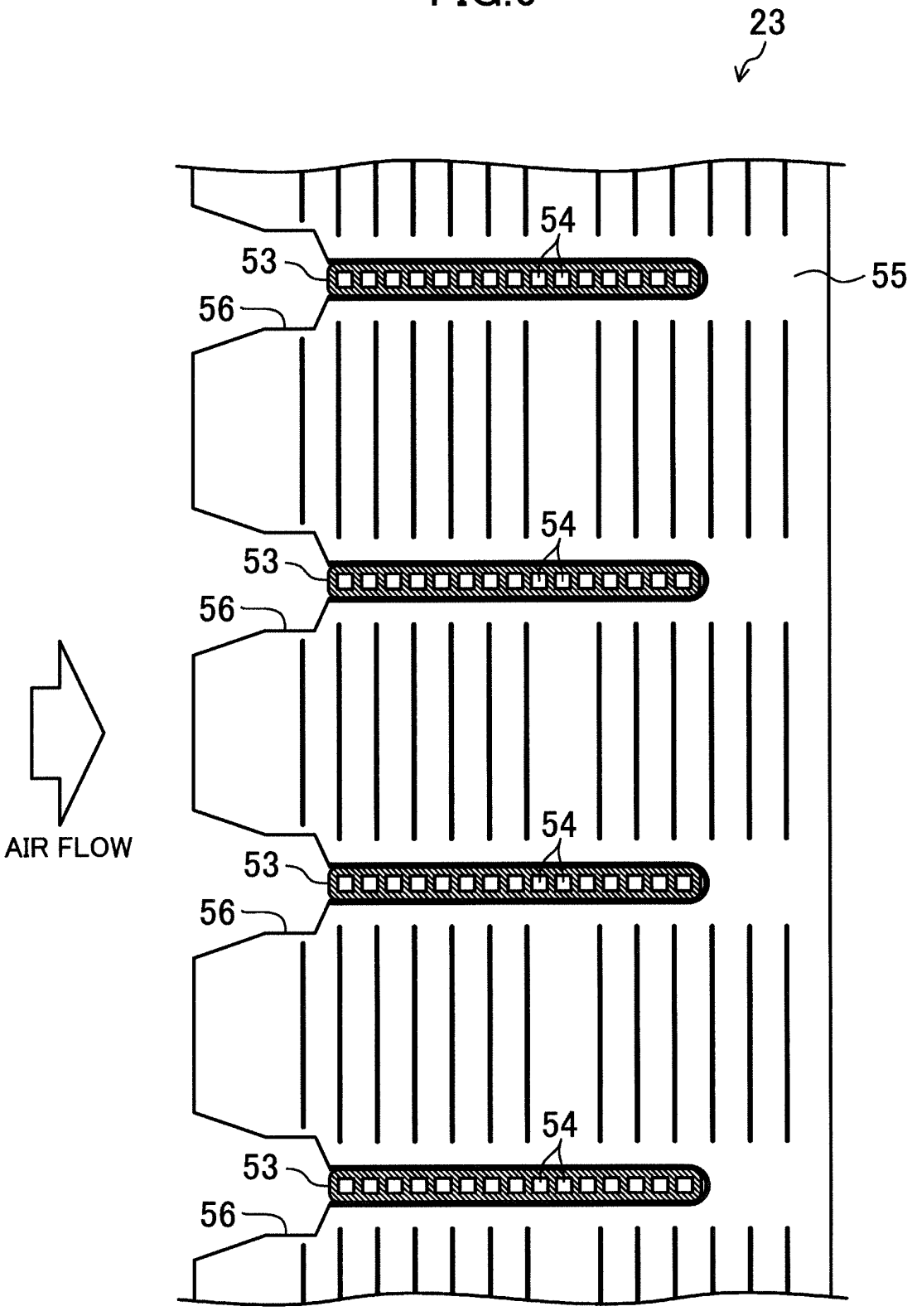
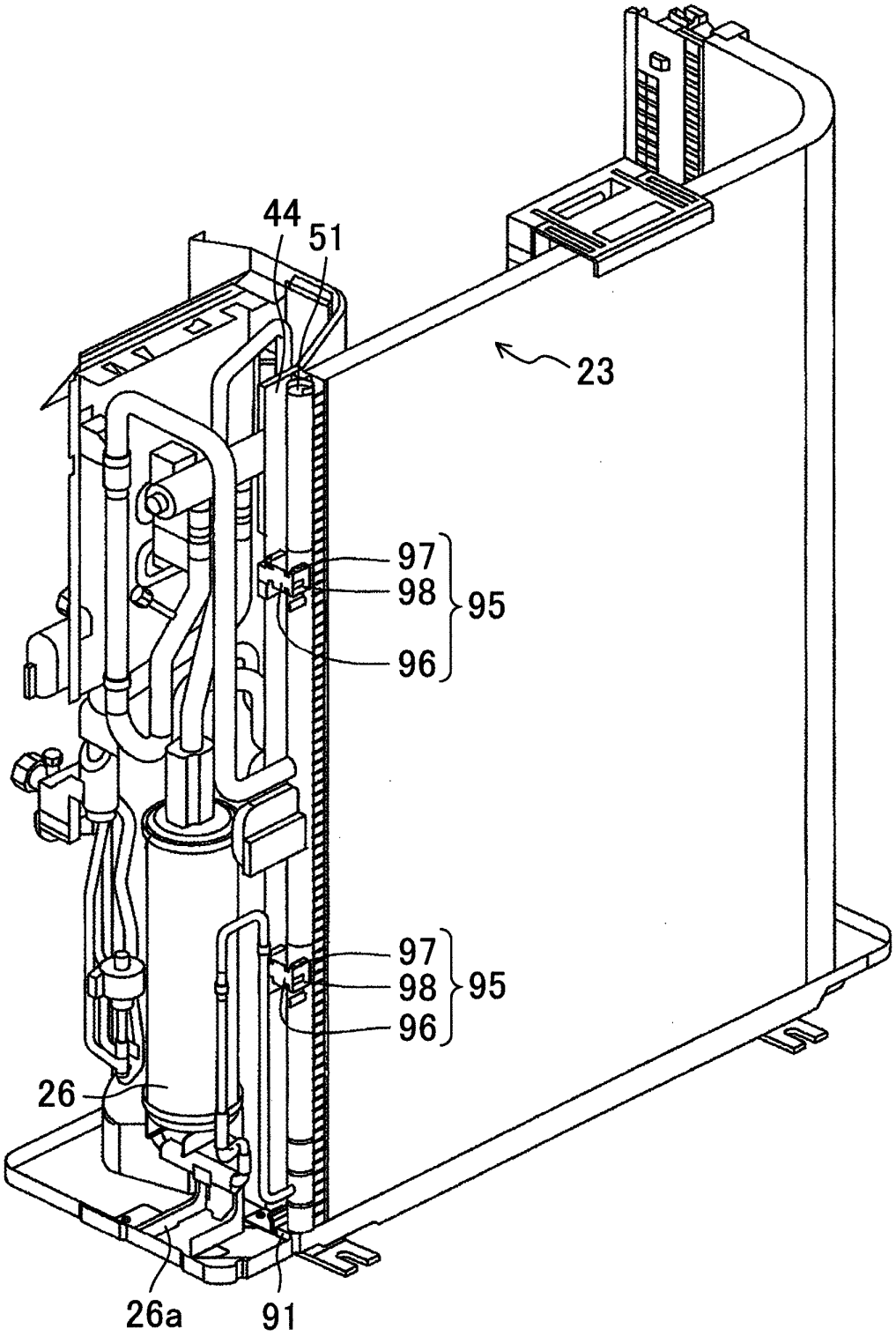


FIG.7



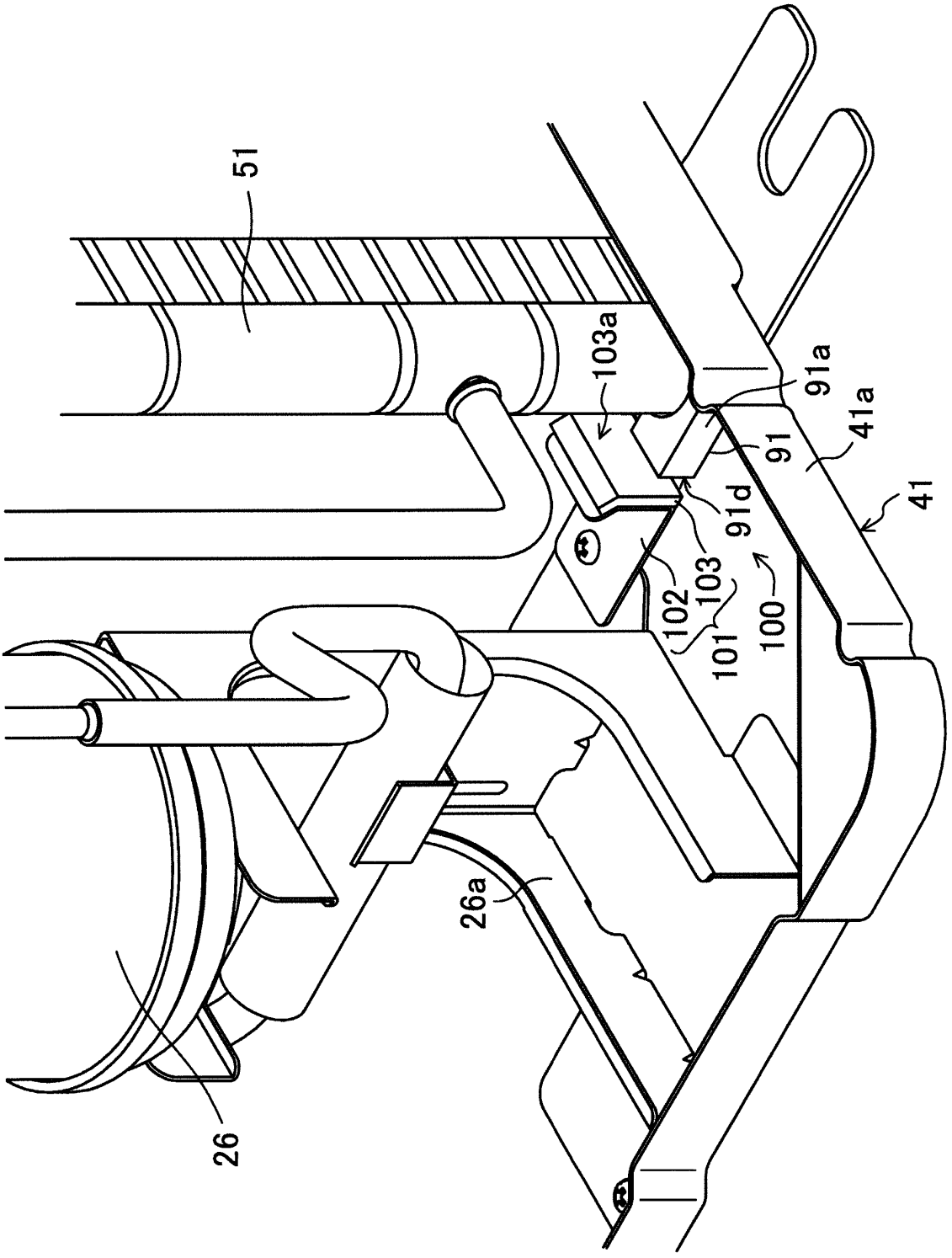
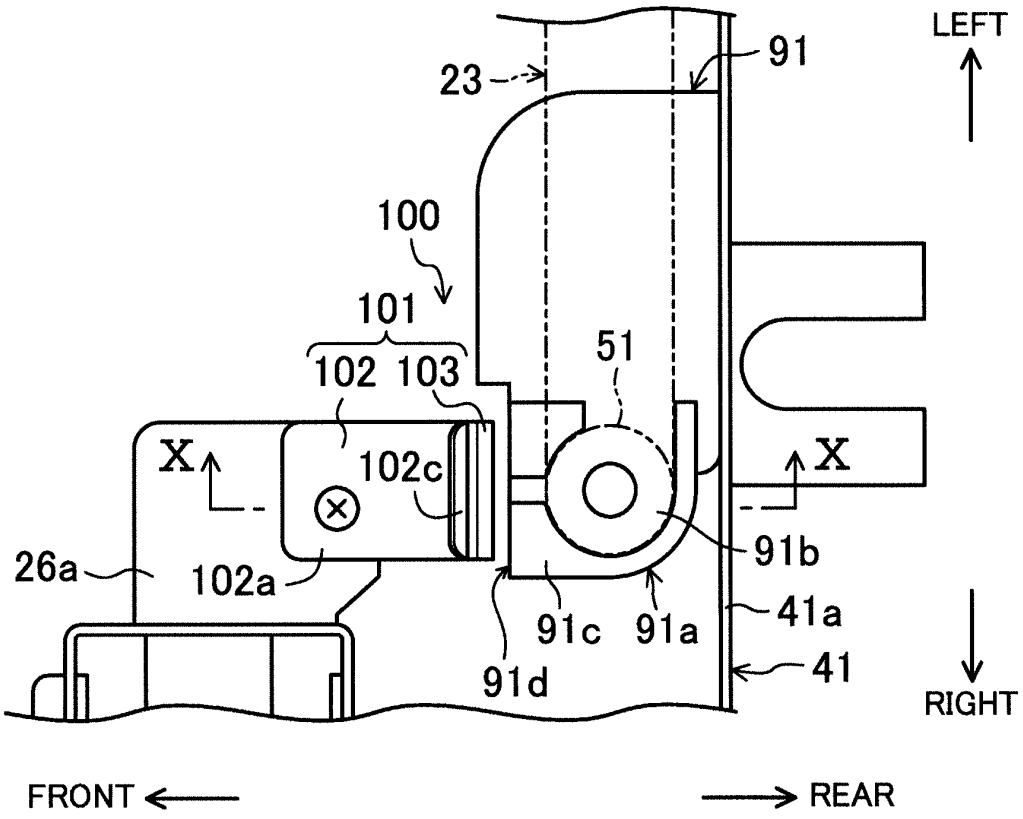


FIG.8

FIG.9


LEFT
91
23
100
101
102 103
51
X
X
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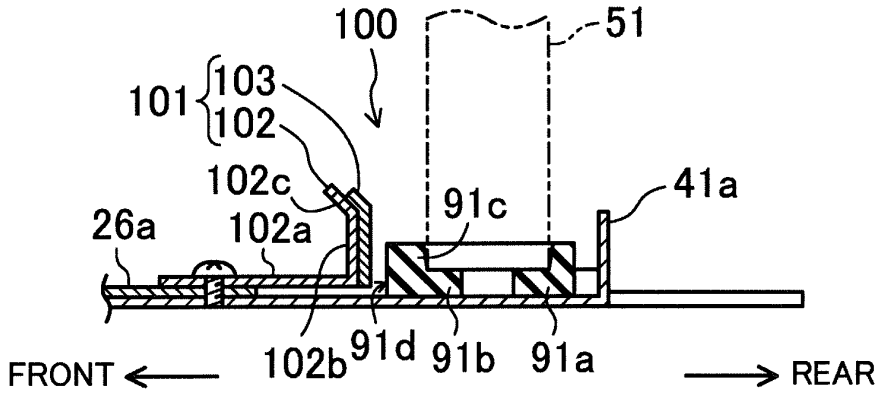
26a
102a
91b
41a
91c
91a
91d
41
RIGHT
FRONT
REAR

FIG.10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26a
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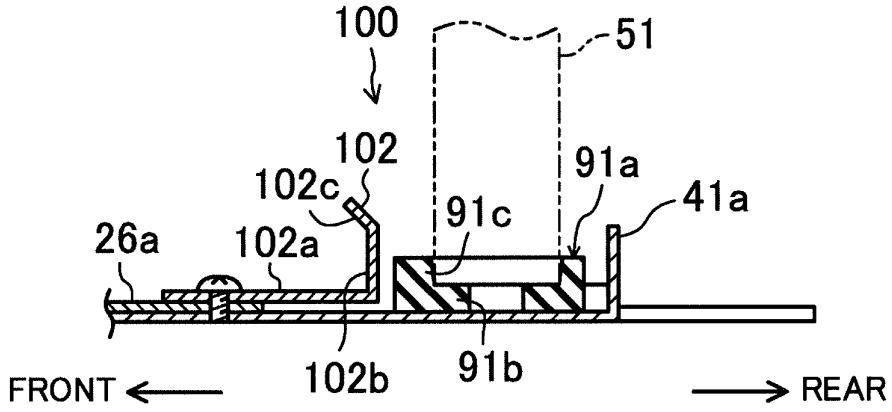
91d
91b
91a
REAR

FIG.11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41a
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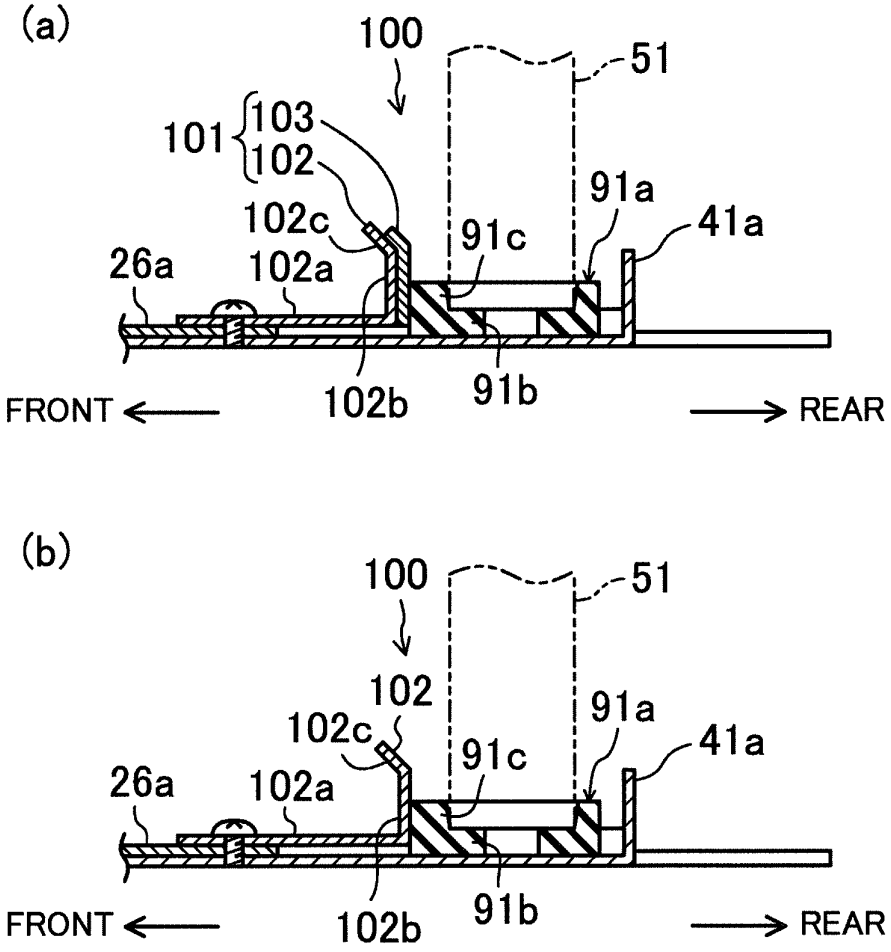
102b
91b
FRONT
REAR

FIG.12


(a)
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101
103
102
91a
102c
91c
41a
26a
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102b
91b
FRONT
REAR
(b)
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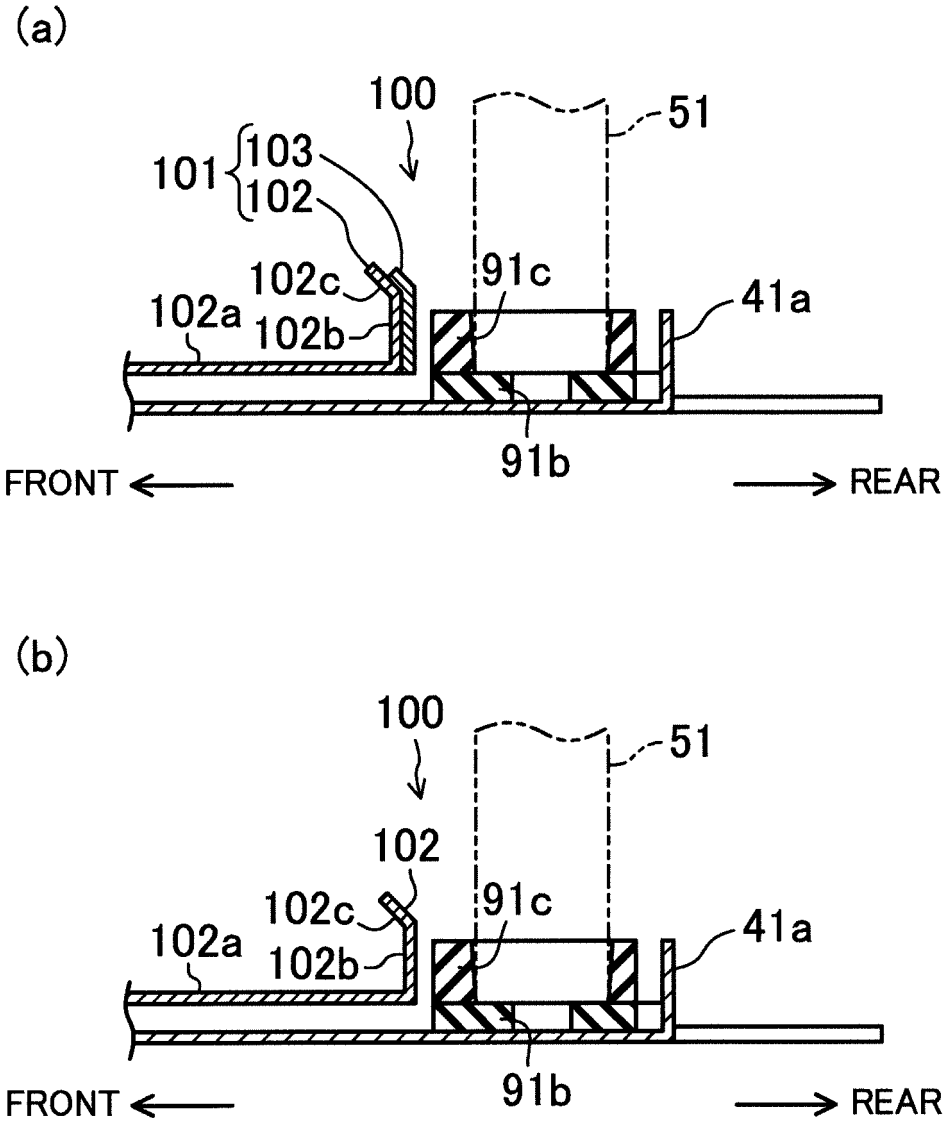
102c
91c
41a
26a
102a
102b
91b
FRONT
REAR

FIG.13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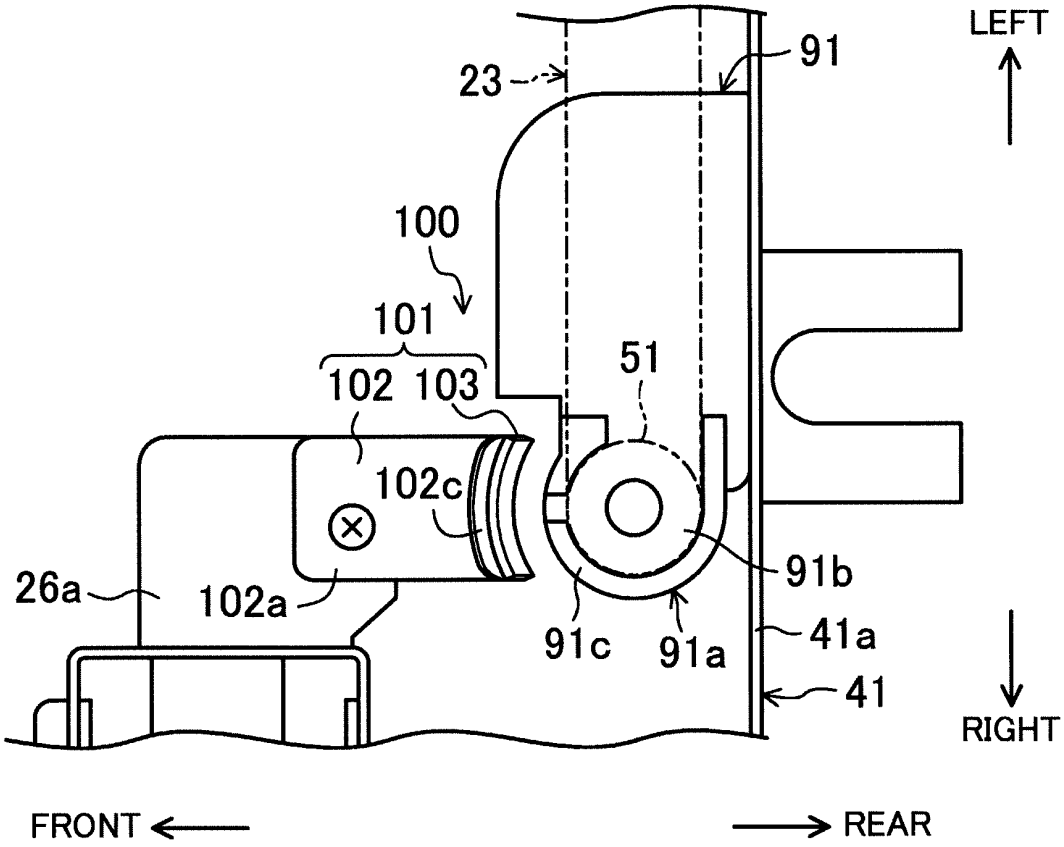
102c
91c
41a
102a
102b
91b
FRONT
REAR

FIG.14


LEFT
91
23
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41a
41
RIGHT
FRONT
REAR

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/002727

A. CLASSIFICATION OF SUBJECT MATTER
F24F1/16(2011.01)i, *F28D1/053*(2006.01)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)
F24F1/16, F28D1/053

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	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

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. 115081/1990(Laid-open No. 073773/1992) (Showa Aluminum Corp.), 29 June 1992 (29.06.1992), page 10, line 6 to page 13, line 3; fig. 1 to 6 (Family: none)	1-6
Y	JP 2011-145029 A (Sharp Corp.), 28 July 2011 (28.07.2011), paragraphs [0023] to [0051]; fig. 1 to 7 (Family: none)	1-6

☒ 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 04 July, 2013 (04.07.13)	Date of mailing of the international search report 16 July, 2013 (16.07.13)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/002727

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 2010-151375 A (Sharp Corp.), 08 July 2010 (08.07.2010), paragraphs [0020] to [0045]; fig. 1 to 9 & US 2011/0226454 A1 & EP 2372282 A1 & WO 2010/073767 A1 & AU 2009332193 A & CN 102216715 A & KR 10-2011-0089366 A & SG 171717 A	1-6
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 058147/1992(Laid-open No. 018012/1994) (Sanden Corp.), 08 March 1994 (08.03.1994), fig. 1 to 4 (Family: none)	4,6
Y	JP 05-332694 A (Nippondenso Co., Ltd.), 14 December 1993 (14.12.1993), fig. 1, 2 (Family: none)	6
Y	JP 04-336397 A (The High Pressuer Gas Safety Institute of Japan), 24 November 1992 (24.11.1992), fig. 1, 2 (Family: none)	6

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Patent documents cited in the description

- JP 2010249388 A **[0004]**