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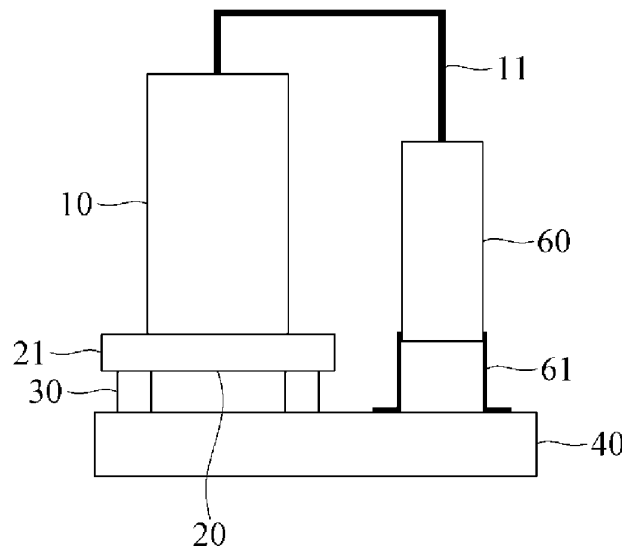
(54) **OUTDOOR UNIT FOR AIR CONDITIONING SYSTEM**

(57) An outdoor unit for an air conditioning system according to an embodiment of the present disclosure may include a case forming an exterior of the outdoor unit; a base installed on a lower plate of the case; a vibration-proof member supporting the base between the lower plate and the base; and a machine room part including a compressor and accumulator connected to each other by a refrigerant suction pipe, and installed on

the base, wherein the compressor and the accumulator each may be coupled to the base with a rigid coupling structure.

Accordingly, when the compressor is driven, the compressor, the accumulator, and the base behave with the same behavior pattern, so that vibration and stress acting on the suction pipe and discharge pipe of the compressor can be effectively reduced.

FIG. 1



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Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present disclosure relates to an outdoor unit for an air conditioning system, and more specifically, to an outdoor unit for an air conditioning system that can reduce stress and vibration of suction/discharge pipes due to relative movement between machine room parts installed in a machine room provided inside a case of the outdoor unit.

Description of the Related Art

[0002] Typically, an air conditioning system consists of an indoor unit that is installed indoors to cool the room, and an outdoor unit that is connected to the indoor unit through a refrigerant pipe and is installed outdoors to exchange heat with the refrigerant.

[0003] The case of the outdoor unit for the air conditioning system may include a front casing, a back casing, and an upper plate, and one of the front casing or the back casing may include a lower plate.

[0004] However, the lower plate may be provided separately from the front casing or the back casing.

[0005] A condenser (heat exchanger) may be installed on the lower plate of the outdoor unit, and a number of machine room parts such as a compressor, accumulator, and oil separator may be installed on the lower plate in the empty space (hereinafter referred to as "machine room") provided next to the condenser.

[0006] Here, "machine room parts" refer to parts responsible for part of the refrigeration cycle using refrigerant.

[0007] And, the discharge part of the accumulator and the suction part of the compressor are connected to each other by the suction pipe of the compressor, and the suction part of the oil separator and the discharge part of the compressor are connected to the discharge pipe side of the compressor.

[0008] However, the compressor generates constant vibration when driven. Therefore, in order to reduce noise caused by vibration generated when the compressor is driven and stress generated in the suction/discharge pipes of the compressor, the compressor is typically installed using anti-vibration rubber such as a grommet.

[0009] Hereinafter, the installation structure of machine room parts according to the prior art will be described with reference to FIGS. 1 to 3.

[0010] FIG. 1 is a schematic diagram illustrating an example of an installation structure of machine room parts according to the prior art (hereinafter, referred to as "Comparative Example 1"), and FIG. 2 is a cross-sectional view of a main part of FIG. 1.

[0011] Referring to FIGS. 1 and 2, a fixing plate 20 fixed to the bottom of the compressor 10 is provided with a

plurality of fixing ends 21, and the plurality of fixing ends 21 are provided with grommet insertion holes 23 into which the upper end of the grommet 30 is inserted.

[0012] And the grommet 30 is coupled to the lower plate 40 of the outdoor unit case by a fastening member 50 including a caulking bolt 51 and a nut 53, the upper end of the grommet 30 is inserted into the grommet insertion hole 23 provided at the fixing end 21 of the fixing plate 20, and the grommet 30 and the fixing plate 20 are coupled to the lower plate 40 by bolts 51 and nuts 53.

[0013] And a bracket 61 is fixed to the accumulator 60 arranged adjacent to the compressor 10, and the bracket 61 fixed to the accumulator 60 is coupled to the lower plate 40 in a rigid coupling structure by a fastening member (not shown).

[0014] Here, "rigid body coupling structure" refers to a structure in which two fastened elements formed of a rigid body are joined by fastening members (e.g. bolts and nuts) formed of a rigid body.

[0015] Although not shown in FIG. 1, the oil separator (not shown) arranged adjacent to the compressor 10 is coupled to the lower plate 40 in the same manner as the accumulator 60, that is, with a rigid coupling structure.

[0016] And the suction part of the compressor 10 and the discharge part of the accumulator 60 are connected to each other by the suction pipe 11 of the compressor 10, and the discharge part of the compressor 10 and the suction part of the oil separator (not shown) are connected to each other by a discharge pipe (not shown) of the compressor 10.

[0017] Therefore, the refrigerant discharged from the discharge part of the accumulator 60 is supplied to the suction part of the compressor 10 through the suction pipe 11 of the compressor 10, and the refrigerant discharged from the discharge part of the compressor 10 is supplied to the suction part of the oil separator (not shown) through the discharge pipe (not shown) of the compressor 10.

[0018] However, according to the above configuration, since the compressor 10 is coupled to the grommet 30 made of a flexible material, while the accumulator 60 and the oil separator (not shown) are coupled to the lower plate 40 in a rigid coupling structure, when the compressor 10 is driven, the compressor 10 behaves in a behavior pattern different from that of the accumulator 60 and the oil separator (not shown).

[0019] That is, since the accumulator 60 and the oil separator (not shown) are coupled to the lower plate 40 by a rigid coupling structure, when the compressor 10 is driven, the accumulator 60 and the oil separator (not shown) remain in fixed positions.

[0020] However, since the fixing plate 20 of the compressor 10 is coupled to the grommet 30, the position of the compressor changes in the up and down and/or left and right directions due to the vibration that occurs when the compressor 10 is driven.

[0021] Therefore, when the compressor 10 is driven, relative motion occurs between the compressor 10 and

the accumulator 60 and between the compressor 10 and the oil separator (not shown), and due to the relative motion, vibration and stress act on the suction pipe 11 and the discharge pipe (not shown) of the compressor 10.

[0022] In order to solve this problem, in the past, the length of the suction pipe 11 and the discharge pipe (not shown) was made long to reduce vibration and stress acting on the suction pipe 11 and the discharge pipe (not shown) of the compressor 10.

[0023] However, if the length of the suction pipe 11 and the discharge pipe (not shown) is increased, the machine room space must be expanded, so there is a problem in that the size of the outdoor unit increases.

[0024] In addition, according to the installation structure of Comparative Example 1, the nut 53 is in contact with the grommet 30, but is spaced apart from the fixing end 21 of the fixing plate 20 by a certain distance D1. Accordingly, the supporting force of the nut 53 acting on the fixing end 21 is weak, and as a result, there is a problem in that the displacement of the compressor 10 due to deformation of the grommet 30 is larger.

[0025] FIG. 3 is a schematic diagram illustrating another example of an installation structure of machine room parts according to the prior art (hereinafter, referred to as "Comparative Example 2").

[0026] The installation structure of FIG. 3 is also disclosed in Japanese Patent Publication No. 6935834 and Chinese Utility Model Patent No. 211116608Y.

[0027] Referring to FIG. 3, in Comparative Example 2, the first grommet 30 is fastened to the lower plate 40 using a fastening member (not shown), the base 70 is fastened to the first grommet 30, the compressor 10 is fastened to the base 70 using the second grommet 35, the accumulator 60 and the oil separator (not shown) are fastened to the base 70 in a rigid coupling structure.

[0028] However, according to the above configuration, since the compressor 10 is fastened to the second grommet 35, while the accumulator 60 and the oil separator (not shown) are fastened to the base 70 in a rigid body coupling structure, when the compressor 10 is driven, the compressor 10 behaves in a different behavior pattern from the accumulator 60 and the oil separator (not shown).

[0029] That is, since the accumulator 60 and the oil separator (not shown) are coupled to the base 70 in a rigid coupling structure, when the compressor 10 is driven, the accumulator 60, oil separator (not shown), and base 70 behave according to the same behavior pattern.

[0030] However, since the compressor 10 is coupled to the second grommet 35 made of flexible material, when the compressor 10 is driven, the compressor 10 behaves according to a behavior pattern different from that of the accumulator 60, the oil separator (not shown), and the base 70.

[0031] Therefore, the outdoor unit of Comparative Example 2, which includes the first and second grommets, can further reduce the vibration of the compressor 10 compared to the outdoor unit of Comparative Example 1,

but similar to Comparative Example 1, since relative motion occurs between the compressor 10 and the accumulator 60 and between the compressor 10 and the oil separator (not shown), it contains the same problems that occur in the outdoor unit of Comparative Example 1 described above.

SUMMARY OF THE INVENTION

[0032] A technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can solve at least one of the above-mentioned problems.

[0033] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system in which machine room parts such as an accumulator and oil separator installed in the machine room together with the compressor behave in the same behavior pattern as the compressor when the compressor is driven.

[0034] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can reduce vibration and stress acting on the suction pipe and discharge pipe of the compressor.

[0035] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can reduce the length of the suction pipe and discharge pipe of the compressor.

[0036] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can compact the internal space of the machine room.

[0037] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can easily secure a space for sound absorption and sound insulation in the internal space of the machine room.

[0038] Another technical problem to be solved by the present disclosure is to provide an outdoor unit for an air conditioning system that can increase the tightening force of the nut applied to the fixing end provided on the fixing plate fixed to the bottom of the compressor.

[0039] The technical problems to be achieved from the present disclosure are not limited to the technical problems mentioned above, and other technical problem which are not mentioned above can be clearly understood from the following description by those skilled in the art to which the present disclosure pertains.

[0040] An outdoor unit for an air conditioning system according to an embodiment of the present disclosure may comprise a case forming an exterior of the outdoor unit; a base installed on a lower plate of the case; a vibration-proof member supporting the base between the lower plate and the base; and a machine room part including a compressor and accumulator connected to each other by a refrigerant suction pipe, and installed on the base, wherein the compressor and the accumulator

each may be rigidly coupled or fixed to the base with one or more rigid coupling members.

[0041] Accordingly, when the compressor is driven, the compressor, the accumulator, and the base behave with the same behavior pattern, so that vibration and stress acting on the suction pipe and discharge pipe of the compressor can be effectively reduced.

[0042] Additionally, as vibration and stress acting on the suction pipe and discharge pipe are reduced, the length of the pipe can be reduced.

[0043] Therefore, the internal space of the machine room can be compacted, and a space for sound absorption and sound insulation can be easily secured in the internal space of the machine room.

[0044] The compressor may be coupled to the base by a first rigid coupling member.

[0045] The outdoor unit may further comprise a fixing plate fixed to a bottom of the compressor, wherein the fixing plate may have a plurality of fixing ends having screw insertion holes, and the first rigid coupling member may couple the fixing end of the fixing plate to the base.

[0046] According to one embodiment of the present disclosure, the base may include a main body and a plurality of auxiliary bodies extending radially from the main body, and the plurality of auxiliary bodies each may have a bolt insertion hole.

[0047] The first rigid coupling member may include a caulking bolt coupled to the bolt insertion hole of the auxiliary body and a nut coupled to a screw portion of the caulking bolt, and the caulking bolt may include a head portion, a body portion protruding from the head portion, the screw portion protruding from the body portion, and a caulking portion spaced apart from the head portion.

[0048] The first rigid coupling member, i.e. the caulking bolt, may include a vibration-proof member insertion groove into which a portion of the vibration-proof member is inserted.

[0049] Accordingly, the base can be installed by a simple operation of inserting the vibration-proof member into the vibration-proof member insertion groove while positioning the base in which the machine room parts are coupled by a rigid body coupling structure on the lower plate of the outdoor unit.

[0050] A front end of the body portion of the caulking bolt may be in close contact with a bottom surface of the fixing end, and a bottom surface of the nut may be in close contact with a top surface of the fixing end.

[0051] Therefore, the tightening force of the nut applied to the fixing end of the fixing plate can be increased.

[0052] The plurality of auxiliary bodies each may include a caulking portion seating groove in which the head portion of the caulking bolt is seated.

[0053] Therefore, assembly of the caulking bolt can be easily performed.

[0054] The base may be provided with reinforcing ribs that form a portion of the main body and a portion of the auxiliary body to be curved.

[0055] Therefore, the strength required for the base can be maintained while reducing the thickness of the base.

[0056] According to another embodiment of the present disclosure, the base may be formed in a flat shape with a plurality of bolt insertion holes.

[0057] When the base is formed in a flat shape, the first rigid coupling member may include a caulking bolt inserted into the bolt insertion hole of the base and a nut coupled to a screw portion of the caulking bolt, and the caulking bolt may include a head portion, a body portion protruding from the head portion, and the screw portion protruding from the body portion.

[0058] A front end of the body portion of the caulking bolt may be in close contact with a bottom surface of the fixing end, and a bottom surface of the nut may be in close contact with a top surface of the fixing end.

[0059] Therefore, the tightening force of the nut applied to the fixing end of the fixing plate can be increased.

[0060] The base may be provided with reinforcing ribs that form a portion of the base to be curved.

[0061] Therefore, the strength required for the base can be maintained while reducing the thickness of the base.

[0062] As another example, the first rigid coupling member may further include a first bracket positioned between the nut and the fixing end, and one end of the first bracket may be coupled to the body portion of the caulking bolt.

[0063] Therefore, the tightening force of the nut applied to the fixing end of the fixing plate can be further increased.

[0064] As another example, the first rigid coupling member may include a bolt, and the base may include a bolt coupling portion to which the bolt is coupled.

[0065] In the outdoor unit of the present disclosure, the machine room part may further include an oil separator connected to the compressor by a refrigerant discharge pipe.

[0066] The accumulator may be fixed to the base by a second rigid coupling member. The oil separator may be fixed to the base with a third rigid coupling member, and when the compressor is driven, the oil separator may behave in the same behavior pattern as the compressor, the accumulator, and the base.

[0067] Accordingly, when the compressor is driven, the compressor, the accumulator, the oil separator, and the base behave with the same behavior pattern, so that vibration and stress acting on the suction pipe and discharge pipe of the compressor can be effectively reduced.

[0068] The accumulator may have a second bracket, and the second bracket may be fixed to the base by the second rigid coupling member. The oil separator may have a third bracket, and the third bracket may be fixed to the base by the third rigid coupling member.

[0069] According to the outdoor unit for an air conditioning system of the present disclosure, machine room

parts such as an accumulator and an oil separator installed in the machine room together with the compressor behave in the same behavior pattern as the compressor when the compressor is driven.

[0070] Accordingly, at least one of the problems occurring in the conventional outdoor unit for an air conditioning system can be solved.

[0071] According to the outdoor unit for an air conditioning system of the present disclosure, vibration and stress acting on the suction pipe and discharge pipe of the compressor can be reduced.

[0072] According to the outdoor unit for an air conditioning system of the present disclosure, the length of the suction pipe and discharge pipe of the compressor can be reduced.

[0073] According to the outdoor unit for an air conditioning system of the present disclosure, the internal space of the machine room can be compacted.

[0074] According to the outdoor unit for an air conditioning system of the present disclosure, a space for sound absorption and sound insulation can be easily secured in the internal space of the machine room.

[0075] According to the outdoor unit for an air conditioning system of the present disclosure, the tightening force of the nut applied to the fixing end provided on the fixing plate fixed to the bottom of the compressor can be increased.

[0076] Effects obtainable from the present disclosure are not limited by the effects mentioned above, and other effects which are not mentioned above can be clearly understood from the following description by those skilled in the art to which the present disclosure pertains.

BRIEF DESCRIPTION OF THE DRAWINGS

[0077] The accompanying drawings, which are included as a part of the detailed description to help the understanding of the present disclosure, provide embodiments of the present disclosure, and together with the detailed description, describe the technical features of the present disclosure.

FIG. 1 is a schematic diagram illustrating an example of an installation structure of machine room parts according to the prior art.

FIG. 2 is a cross-sectional view of a main part of FIG. 1.

FIG. 3 is a schematic diagram illustrating another example of an installation structure of machine room parts according to the prior art.

FIG. 4 is an exploded perspective view illustrating an installation structure of machine room parts according to a first embodiment of the present disclosure.

FIG. 5 is a perspective view illustrating an assembled state of the machine room parts according to a first embodiment.

FIG. 6 is a perspective view of a fixing plate used in a first embodiment.

FIG. 7 is a perspective view of a base used in a first embodiment.

FIG. 8 is a cross-sectional view of a caulking bolt used in a first embodiment.

FIG. 9 is a cross-sectional view of a grommet used in a first embodiment.

FIG. 10 is a cross-sectional view of main parts illustrating an assembled state of machine room parts according to a first embodiment.

FIG. 11 is a diagram illustrating magnitude of stress acting on suction and discharge pipes of Comparative Example 1, Comparative Example 2, and a first embodiment.

FIG. 12 is a plan view illustrating machine room parts and pipes of an outdoor unit according to a first embodiment.

FIG. 13 is a perspective view of a base used in a second embodiment of the present disclosure.

FIG. 14 is a side view of main parts illustrating an assembled state of machine room parts using a base used in a second embodiment.

FIG. 15 is a cross-sectional view of a main part of one embodiment illustrating an assembled state of machine room parts using a base used in a second embodiment.

FIG. 16 is a cross-sectional view of a main part of another embodiment illustrating an assembled state of machine room parts using a base used in a second embodiment.

FIG. 17 is a perspective view of a bracket used in another embodiment of FIG. 16.

FIG. 18 is a cross-sectional view of a main part of another embodiment illustrating an assembled state of machine room parts using a base used in a second embodiment.

FIG. 19 is a graph illustrating results of measuring radiated noise of a base used in a first embodiment and a base used in a second embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0078] Hereinafter, embodiments disclosed in the present disclosure will be described in detail with reference to the accompanying drawings, however, regardless of the reference numerals, the same or similar elements will be given the same reference numerals and redundant description thereof will be omitted.

[0079] The suffixes "assembly" and "unit" for elements used in the following description are given or mixed in consideration of only the ease of writing the specification, and do not have distinct meanings or roles by themselves.

[0080] In addition, in describing the embodiments disclosed in the present disclosure, when it is determined that the detailed description of the related known technology may obscure the subject matter of the embodiments disclosed in the present disclosure, the detailed description thereof will be omitted.

[0081] In addition, the accompanying drawings are only for easily understanding the embodiments disclosed in the present disclosure, the technical spirit disclosed in the present disclosure is not limited by the accompanying drawings, and it should be understood that the accompanying drawings include all changes, equivalents, and substitutes included in the spirit and scope of the present disclosure.

[0082] While terms, such as "first", "second", etc., may be used to describe various elements, such elements must not be limited by the above terms. The above terms are used only to distinguish one element from another.

[0083] When an element is referred to as being "coupled" or "connected" to another element, it may be directly coupled to or connected to the other element, however, it should be understood that other elements may exist in the middle.

[0084] On the other hand, when an element is referred to as being "directly coupled" or "directly connected" to another element, it should be understood that there are no other elements in the middle.

[0085] The singular forms are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0086] In addition, in the present disclosure, it should be understood that the terms "comprise" and "have" specify the presence of stated features, integers, steps, operations, elements, parts, or combinations thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, parts, or combinations thereof.

[0087] Hereinafter, a preferred embodiment according to the present disclosure will be described in detail with reference to the accompanying drawings, however, regardless of the reference numerals, the same or similar elements will be given the same reference numerals and redundant description thereof will be omitted.

[0088] Before describing the embodiments according to the present disclosure, the characteristic parts of the present disclosure will be described first, and an outdoor unit for an air conditioning system according to the present disclosure is characterized in that machine room parts each are coupled to the base through a rigid coupling structure.

[0089] Here, "rigid body coupling structure" refers to a structure in which two fastened elements formed of a rigid body are coupled by fastening members (e.g. bolts and nuts) formed of a rigid body.

[0090] Additionally, "machine room parts" refer to parts responsible for part of a refrigeration cycle using a refrigerant, and may include a compressor and an accumulator, and may further include an oil separator.

[0091] Accordingly, when the compressor is driven, the machine room parts behave in the same behavior pattern as the base, so vibration and stress acting on the suction pipe and discharge pipe of the compressor can be effectively reduced.

[0092] Hereinafter, it will be described as an example

that the machine room parts include a compressor, an accumulator, and an oil separator, but this is not essential to the present disclosure.

[0093] For example, the machine room parts may further include other elements in addition to the compressor, accumulator, and oil separator.

[0094] Hereinafter, an outdoor unit for an air conditioning system according to a first embodiment of the disclosure will be described with reference to FIGS. 4 to 12.

[0095] FIG. 4 is an exploded perspective view illustrating an installation structure of machine room parts according to a first embodiment of the present disclosure, and FIG. 5 is a perspective view illustrating an assembled state of machine room parts according to a first embodiment.

[0096] The outdoor unit for an air conditioning system according to the present embodiment includes a case that forms the exterior of the outdoor unit.

[0097] The case may include a front casing, a back casing, and a top plate, and one of the front casing or the back casing may include a lower plate 110.

[0098] However, the lower plate 110 may be provided separately from the front casing or the back casing.

[0099] A condenser (heat exchanger) may be installed on the lower plate 110 of the outdoor unit, and a number of the machine room parts may be installed on the lower plate 110 in the empty space (hereinafter, referred to as "machine room") provided next to the condenser.

[0100] Here, "machine room parts" refer to parts responsible for part of the refrigeration cycle using refrigerant.

[0101] In the following description, it will be described as an example that the machine room parts include a compressor 120, an accumulator 130, and an oil separator 140, but this is not essential.

[0102] In addition, the outdoor unit of the present embodiment may include a member for installing the machine room parts on the lower plate 110, for example, a fixing plate 150, a base 160, a vibration-proof member 170, a first rigid coupling member 180, a second rigid coupling member 191, and a third rigid coupling member 193.

[0103] Referring to FIG. 6, the fixing plate 150 is fixed to the bottom of the compressor 120.

[0104] The fixing plate 150 is for fixing the compressor 120 to the base 160, and a bolt insertion hole 153 into which a caulking bolt 181 of the first rigid coupling member 180 are inserted are respectively formed at the plurality of fixing ends 151 provided on the fixing plate 150.

[0105] The plurality of fixing ends 151 extend in a radial direction and may be three or more.

[0106] Instead of using the fixing plate 150, it is also possible to form an element corresponding to the fixing end 151 integrally with the housing of the compressor 120.

[0107] And, referring to FIG. 7, the base 160 to which the fixing plate 150 is coupled may include a main body 161 and a plurality of auxiliary bodies 163 extending

radially from the main body 161, and the plurality of auxiliary bodies 163 each may include a bolt insertion hole 163a into which the caulking bolt 181 of the first rigid coupling member 180 is inserted.

[0108] In addition, some of the plurality of auxiliary bodies 163, for example, two auxiliary bodies 163, are each provided with a bolt insertion hole 163b at a position adjacent to the bolt insertion hole 163a, and the bolt of the second rigid coupling member 191 and the bolt of the third rigid coupling member 193 may be respectively inserted into the bolt insertion hole 163b.

[0109] The base 160 may be provided with reinforcing ribs 165 that form a portion of the main body 161 and a portion of the auxiliary body 163 to be curved.

[0110] Accordingly, the strength required for the base 160 can be maintained while reducing the thickness of the base 160.

[0111] The fixing plate 150 and the base 160 may be aligned so that the bolt insertion hole 163a of the auxiliary body 163 and the bolt insertion hole 153 of the fixing end 151 communicate with each other.

[0112] The fixing plate 150 and the base 160 may be coupled in a rigid coupling structure by the first rigid coupling member 180.

[0113] The base 160 may not be fastened to the vibration-proof member 170 by a fastening member, but may be coupled to the vibration-proof member 170 while simply being seated on the vibration-proof member 170.

[0114] The first rigid coupling member 180 that couples the fixing plate 150 to the base 160 in a rigid coupling structure may include the bolt insertion hole 153 provided at the fixing end 151 of the fixing plate 150, the caulking bolt 181 coupled to the bolt insertion hole 163a of the auxiliary body 163, and a nut 183 coupled to a screw portion 181a of the caulking bolt 181.

[0115] In the present disclosure, the bolt of the first rigid coupling member 180 is described as an example of a caulking bolt, but it is also possible to use a conventional bolt in addition to the caulking bolt.

[0116] The caulking bolt 181 may include a head portion 181b, a body portion 181c protruding from the head portion 181b, a caulking portion 181d spaced apart from the head portion 181b, and the screw portion 181a protruding from the body portion 181c.

[0117] And the caulking portion 181d, the head portion 181b, and the body portion 181c of the caulking bolt 181 may include a vibration-proof member insertion groove 181e into which a part of the vibration-proof member 170 is inserted.

[0118] Referring to FIG. 9, the vibration-proof member 170 supporting the base 150 may be formed of a grommet made of a flexible material.

[0119] The vibration-proof member 170 may be provided with a bolt insertion hole 173 into which the bolt 171 is inserted, and may be fixed to the lower plate 110 by the bolt 171.

[0120] The bolt 171 may be made of a caulking bolt.

[0121] Hereinafter, with reference to FIGS. 4, 5, and

10, the rigid body installation structure of the machine room parts will be described.

[0122] The vibration-proof member 170 is coupled to the lower plate 110 by bolts 171 and nuts (not shown), and the base 160 is seated on a front end of the vibration-proof member 170.

[0123] The vibration-proof member 170 may be made of a grommet of a flexible material and may support the base 160.

[0124] The caulking bolt 181 of the first rigid coupling member 180 is inserted into the bolt insertion hole 163a of the auxiliary body 163 and coupled to the auxiliary body 163.

[0125] At this time, the caulking portion 181d of the caulking bolt 181 may be in contact with the bottom surface of the auxiliary body 163, and the head portion 181b of the caulking bolt 181 may be in contact with the upper surface of the auxiliary body 163.

[0126] Accordingly, the body portion 181c and the screw portion 181a of the caulking bolt 181 protrude toward the front side of the auxiliary body 163.

[0127] The fixing end 151 of the fixing plate 150 fixed to the bottom of the compressor 120 may be coupled to the body portion 181c of the caulking bolt 181, and the nut 183 may be coupled to the screw portion 181a of the caulking bolt 181 protruding toward the front of the fixing end 151.

[0128] Accordingly, the compressor 120 fixed to the fixing plate 150 may be coupled to the base 160 in a rigid coupling structure by the first rigid coupling member 180.

[0129] The vibration-proof member 170 and the first rigid coupling member 180 may be positioned in a straight line in the vertical direction.

[0130] The front end of the body portion 181c of the caulking bolt 181 may be in close contact with the bottom surface of the fixing end 151, and the bottom surface of the nut 183 may be in close contact with the upper surface of the fixing end 151.

[0131] Accordingly, the tightening force of the nut 183 applied to the fixing end 151 of the fixing plate 150 can be increased.

[0132] The plurality of auxiliary bodies 163 provided on the base 160 may each include a caulking portion seating groove 167 in which the caulking portion 181d of the caulking bolt 181 is seated.

[0133] Therefore, the caulking bolt 181 can be easily assembled.

[0134] The accumulator 130 is located on the side of the compressor 120, and the refrigerant suction portion of the compressor 120 and the refrigerant discharge portion of the accumulator 130 are connected to each other by the suction pipe 121 of the compressor 120.

[0135] The suction pipe 131 of the accumulator 130 is connected to the 4-way valve 133, and the oil separator 140 and the condenser are further connected to the 4-way valve 133 by a pipe.

[0136] A second bracket 135 is fixed to the accumulator 130, and the second bracket 135 is coupled to the

auxiliary body 163 of the base 160 in a rigid coupling structure by a second rigid coupling member 191.

[0137] The second rigid coupling member 191 may be made of bolts and nuts.

[0138] And the oil separator 140 is located on another side of the compressor 120, and the refrigerant discharge portion of the compressor 120 and the refrigerant suction portion of the oil separator 140 are connected to each other by the discharge pipe 123 of the compressor 120.

[0139] A third bracket 141 is fixed to the oil separator 140, and the third bracket 141 is coupled to the auxiliary body 163 of the base 160 in a rigid coupling structure by the third rigid coupling member 193.

[0140] The third rigid coupling member 193 may be made of bolts and nuts.

[0141] In the outdoor unit for an air conditioning system of this configuration, since the machine room parts 120, 130, and 140, including the compressor 120, the accumulator 130, and the oil separator 140, are each coupled to the base 160 in a rigid coupling structure, when the compressor 120 is driven, the machine room parts 120, 130, and 140 behave in the same behavior pattern as the base 160.

[0142] Accordingly, vibration and stress acting on the suction pipe 121 and the discharge pipe 123 are reduced.

[0143] FIG. 11 is a diagram illustrating magnitude of stress acting on suction and discharge pipes of Comparative Example 1, Comparative Example 2, and a first embodiment.

[0144] Referring to FIG. 11, it can be seen that in the outdoor unit of the first embodiment, the stress acting on the suction pipe 121 and the discharge pipe 123 is greatly reduced compared to Comparative Examples 1 and 2.

[0145] In this way, in the outdoor unit of this embodiment, the magnitude of the stress acting on the suction pipe 121 and the discharge pipe 123 is greatly reduced compared to Comparative Examples 1 and 2, so the lengths of the suction pipe and the discharge pipe can be reduced.

[0146] As an example, in the outdoor unit of this embodiment, the length of the suction pipe and the discharge pipe can be reduced by forming the curvature of the curved pipe portion of the suction pipe and the discharge pipe to be larger than that of Comparative Examples 1 and 2.

[0147] According to the present inventor's experiments, it was found that the length of the suction pipe could be reduced by approximately 5 to 10% compared to Comparative Example 1 and Comparative Example 2, and the length of the discharge pipe could be reduced by approximately 30 to 40% compared to Comparative Example 1 and Comparative Example 2.

[0148] In addition, according to the present inventor's experiments, it was found that the maximum stress acting on the suction pipe could be reduced by approximately 50% compared to Comparative Examples 1 and Comparative Example 2, and the maximum stress acting on the discharge pipe was approximately the same as Com-

parative Examples 1 and Comparative Example 2.

[0149] In addition, according to the present inventor's experiments, it was found that the length of various pipes connected to the 4-way valve could be reduced by about 10 to 30% compared to Comparative Example 1 and Comparative Example 2, and the maximum stress acting on the various pipes connected to the 4-way valve could be reduced by 20 to 30% compared to Comparative Examples 1 and Comparative Example 2.

[0150] As described above, in the outdoor unit of this embodiment, the lengths of the suction pipe and discharge pipe can be reduced, so as shown in FIG. 12, the machine room parts of the first embodiment can be installed in the first area A1.

[0151] In the outdoor units of Comparative Examples 1 and 2, a second area A2 is required to install machine room parts. Accordingly, the first area A1 can be reduced by the third area A3 compared to the second area A2.

[0152] According to the present inventor's experiment, it was found that the area of the first area A1 was formed to be approximately 15% smaller than the area of the second area A2.

[0153] Accordingly, the internal space of the machine room can be compacted by the third area A3, and the third area A3 can be used as a space for sound absorption and sound insulation.

[0154] Hereinafter, a second embodiment of the present disclosure will be described with reference to FIGS. 13 to 18.

[0155] In describing the second embodiment, the same reference numerals are assigned to the same components as those of the above-described first embodiment, and detailed description thereof is omitted.

[0156] Referring to FIG. 13, the base 260 of this embodiment may be formed in a flat shape.

[0157] The base 260 may include a plurality of bolt insertion holes 260a to which the first rigid coupling member is coupled, and two bolt insertion holes 260b to which the second rigid coupling member and the third rigid coupling member are coupled.

[0158] The first to third rigid coupling members may be configured in the same manner as the first embodiment described above.

[0159] The base 260 may be provided with a reinforcing rib 260c that forms a portion of the base 260 to be curved.

[0160] Accordingly, the strength required for the base 260 can be maintained while reducing the thickness of the base 260.

[0161] Meanwhile, in the first embodiment, the vibration-proof member 170 and the first rigid coupling member 180 are arranged in a straight line in the vertical direction, but in this embodiment, as shown in FIG. 14, the vibration-proof member 170 and the first rigid coupling member 180' are not arranged in a straight line in the vertical direction. That is, the vibration-proof member 170 is arranged at a position spaced apart from the first rigid coupling member 180' by a certain distance D2.

[0162] According to this configuration, the flat base 260 can be effectively supported by appropriately designing the position of the vibration-proof member 170.

[0163] Referring to FIG. 15, the front end of the body portion 181'c of the caulking bolt 181' provided in the first rigid coupling member 180' may be in close contact with the bottom surface of the fixing end 151 provided in the fixed plate, and the bottom surface of the nut 183' provided on the first rigid coupling member 180' may be in close contact with the upper surface of the fixing end 151.

[0164] FIGS. 16 to 18 illustrate modified examples of a second embodiment.

[0165] Referring to FIGS. 16 and 17, the first rigid coupling member 180' may further include a first bracket 185 positioned between the nut 183' and the fixing end 150, and one end of the first bracket 185 may be coupled to the body portion 181'c of the caulking bolt 181'.

[0166] Accordingly, the tightening force of the nut 183' applied to the fixing end 151 of the fixing plate can be further increased.

[0167] Referring to FIG. 18, the first rigid coupling member 180" may include a bolt 181"a, and the base 260a may be provided with a bolt coupling portion 183"a to which the bolt 181"a is coupled.

[0168] As described above, the first rigid coupling member can be modified in various ways, and the second and third rigid coupling members can also be modified in various ways.

[0169] Although the structure in which one base is used has been described above, it is also possible to apply a combination of the base of the outdoor unit according to the first embodiment and the base of the outdoor unit according to the second embodiment.

[0170] For example, it is also possible to install the base according to the second embodiment on the lower plate using the first vibration-proof member, and install the base according to the first embodiment on the base according to the second embodiment using the second vibration-proof member.

[0171] FIG. 19 is a graph illustrating results of measuring radiated noise of a base used in a first embodiment and a base used in a second embodiment.

[0172] Referring to FIG. 19, it can be seen that a noise peak of the base used in the outdoor unit of the first embodiment is lower than a noise peak of the base used in the outdoor unit of the second embodiment.

[0173] In addition, since the base used in the outdoor unit of the first embodiment is formed in a smaller size than the base used in the outdoor unit of the second embodiment, material costs can be reduced.

[0174] It is apparent to those skilled in the art that the present disclosure may be embodied in other specific forms without departing from the essential characteristics of the present disclosure. Accordingly, the above detailed description should not be construed as restrictive in all respects but should be considered as illustrative. The scope of the present disclosure should be determined by reasonable interpretation of the appended claims, and all

changes within the equivalent scope of the present disclosure are included in the scope of the present disclosure.

Claims

1. An outdoor unit for an air conditioning system comprising:

a case forming an exterior of the outdoor unit; a base (160) installed on a lower plate of the case;

a vibration-proof member (170) disposed between the lower plate and the base (160) to support the base (160); and

a compressor (120) and an accumulator (130) connected to the compressor (120) by a refrigerant suction pipe, and installed on the base (160), wherein the compressor (120) and the accumulator (130) each are fixed to the same base by one or more rigid coupling members (180, 180', 180", 185, 135, 141).

2. The outdoor unit of claim 1, further comprising:

a fixing plate (150) fixed to a bottom of the compressor (120),

wherein the fixing plate (150) has a plurality of fixing ends (151) having screw insertion holes, and the compressor (120) is rigidly coupled to the base (160) by a first rigid coupling member (180) that fixes the fixing end (151) of the fixing plate (150) to the base (160).

3. The outdoor unit of claim 2, wherein the base (160) includes a main body (161) and a plurality of auxiliary bodies (163) extending radially from the main body (161), and

the plurality of auxiliary bodies (163) each have a bolt insertion hole (163a).

4. The outdoor unit of claim 3, wherein the first rigid coupling member (180) includes a caulking bolt (181) coupled to the bolt insertion hole (163a) of the auxiliary body (163) and a nut (183) coupled to a screw portion of the caulking bolt (181), and the caulking bolt (181) includes a head portion (181b), a body portion (181c) protruding from the head portion (181b), the screw portion (181a) protruding from the body portion (181c), and a caulking portion (181d) spaced apart from the head portion (181b).

5. The outdoor unit of any one of claims 2 to 4, wherein the first rigid coupling member (180) includes a vibration-proof member insertion groove (181e) into which a portion of the vibration-proof member (170)

is inserted.

6. The outdoor unit of claim 4, wherein a front end of the body portion (181c) of the caulking bolt (181) is in close contact with a bottom surface of the fixing end (151), and a bottom surface of the nut (183) is in close contact with a top surface of the fixing end (151). 5
7. The outdoor unit of claim 4, wherein the plurality of auxiliary bodies (163) each include a caulking portion seating groove (167) in which the caulking portion of the caulking bolt (181) is seated. 10
8. The outdoor unit of claim 2, wherein the base (260) is formed in a flat shape with a plurality of bolt insertion holes (260a). 15
9. The outdoor unit of claim 8, wherein the first rigid coupling member (180') includes a caulking bolt (181') inserted into the bolt insertion hole (260a) of the base (260) and a nut (183) coupled to a screw portion of the caulking bolt (181'), and the caulking bolt (181') includes a head portion, a body portion (181'c) protruding from the head portion, the screw portion protruding from the body portion (181'c), and a caulking portion spaced apart from the head portion. 20
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10. The outdoor unit of claim 9, wherein a front end of the body portion (181'c) of the caulking bolt (181') is in close contact with a bottom surface of the fixing end (151), and a bottom surface of the nut (183) is in close contact with a top surface of the fixing end (151). 30
11. The outdoor unit of claim 9, wherein the first rigid coupling member (180') further includes a first bracket (185) positioned between the nut (183') and the fixing end (151), and one end of the first bracket is coupled to the body portion of the caulking bolt (181'). 35
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12. The outdoor unit of claim 8, wherein the first rigid coupling member (180") includes a bolt (181"a), and the base (260a) includes a bolt coupling portion (183"a) to which the bolt (181"a) is coupled. 45
13. The outdoor unit of any one of claims 1 to 12, wherein the accumulator (130) is fixed to the base (160, 260) by a second rigid coupling member (191), and wherein, preferably, the accumulator (130) comprises a second bracket (135) which is fixed to the base (160, 260) by the second rigid coupling member (191). 50
14. The outdoor unit of any one of claims 1 to 13, further comprising an oil separator (140) connected to the compressor (120) by a refrigerant discharge pipe. 55
15. The outdoor unit of claim 14, wherein the oil separator (140) is fixed to the base (160, 260) by a third rigid coupling member (193), and wherein, preferably, the oil separator (140) comprises a third bracket (141) which is fixed to the base (160, 260) by the third rigid coupling member (193).

FIG. 1

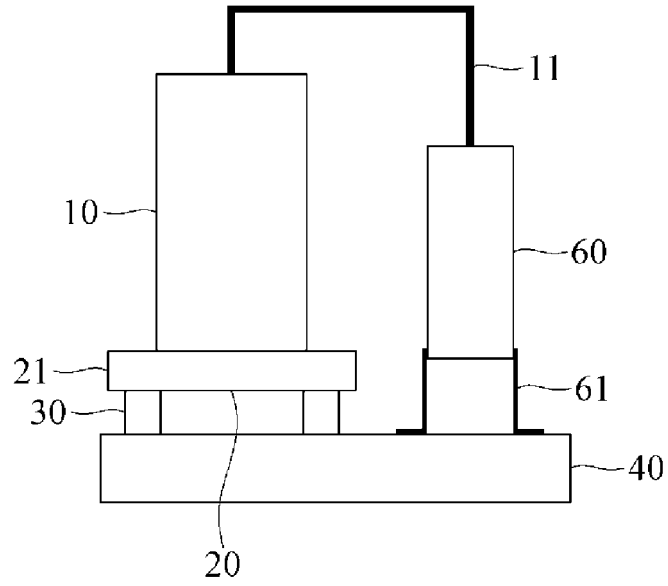


FIG. 2

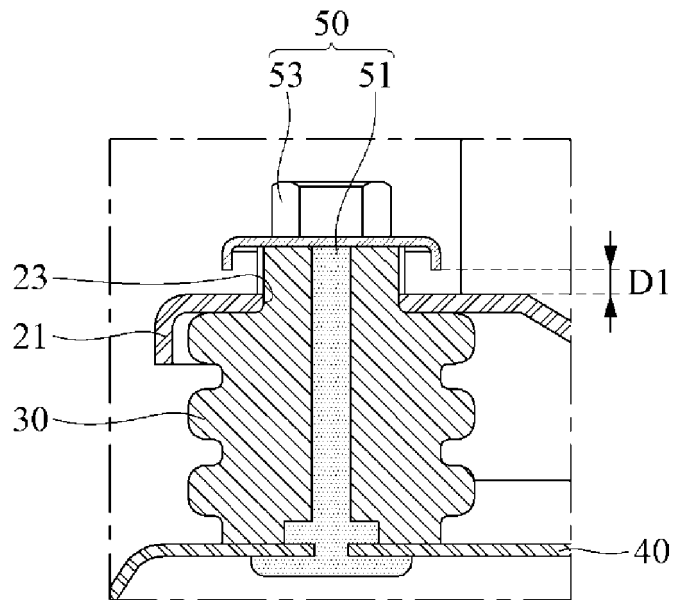


FIG. 3

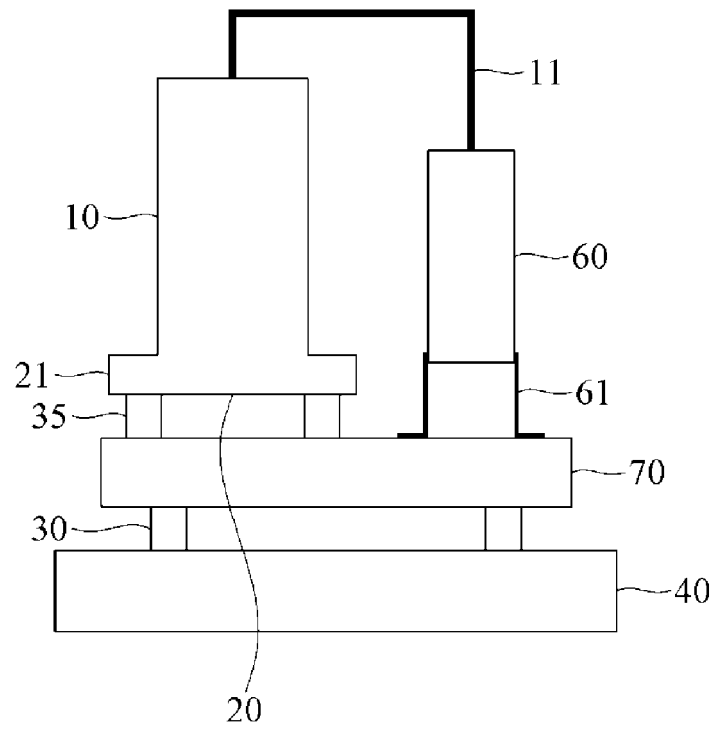


FIG. 4

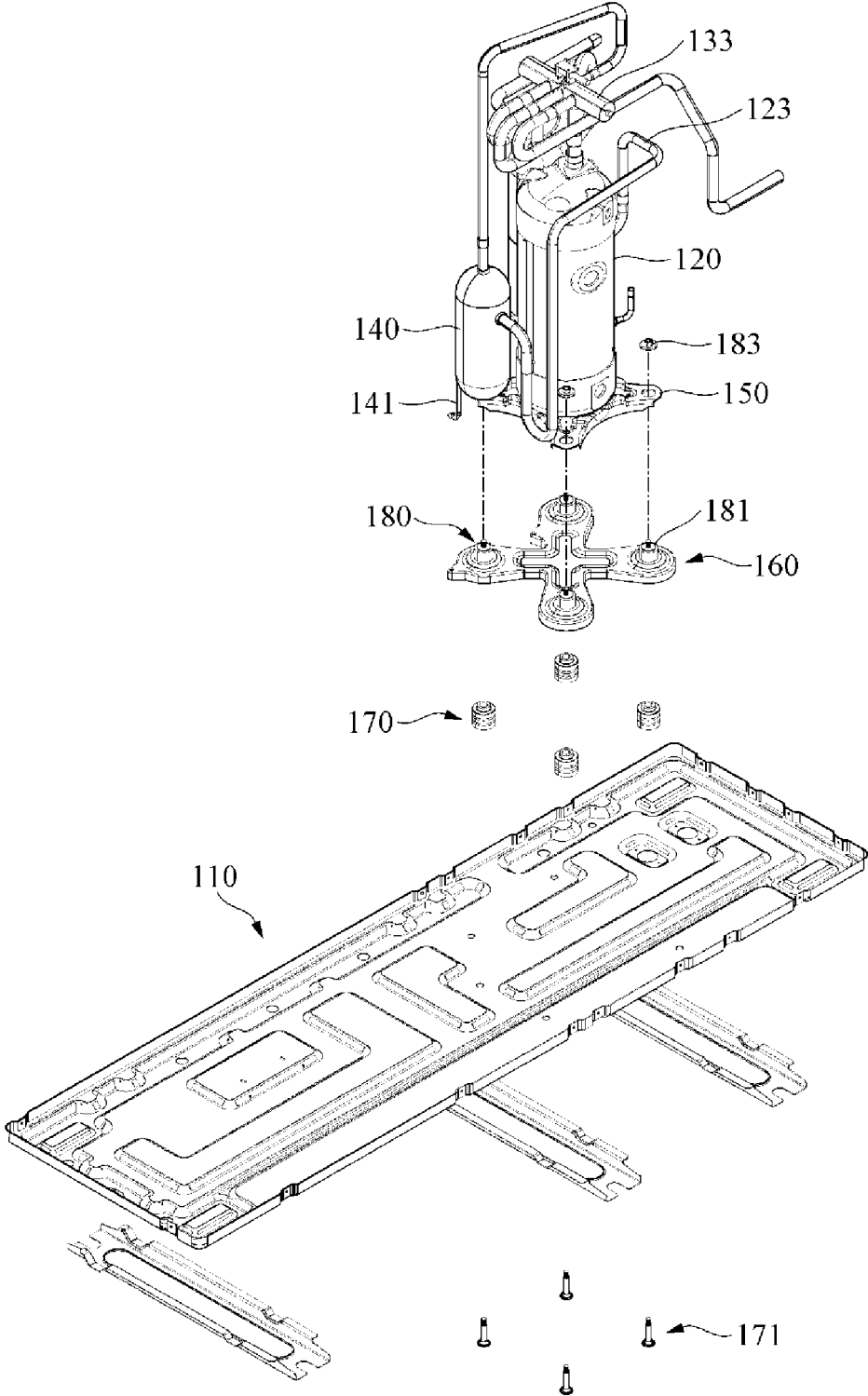


FIG. 5

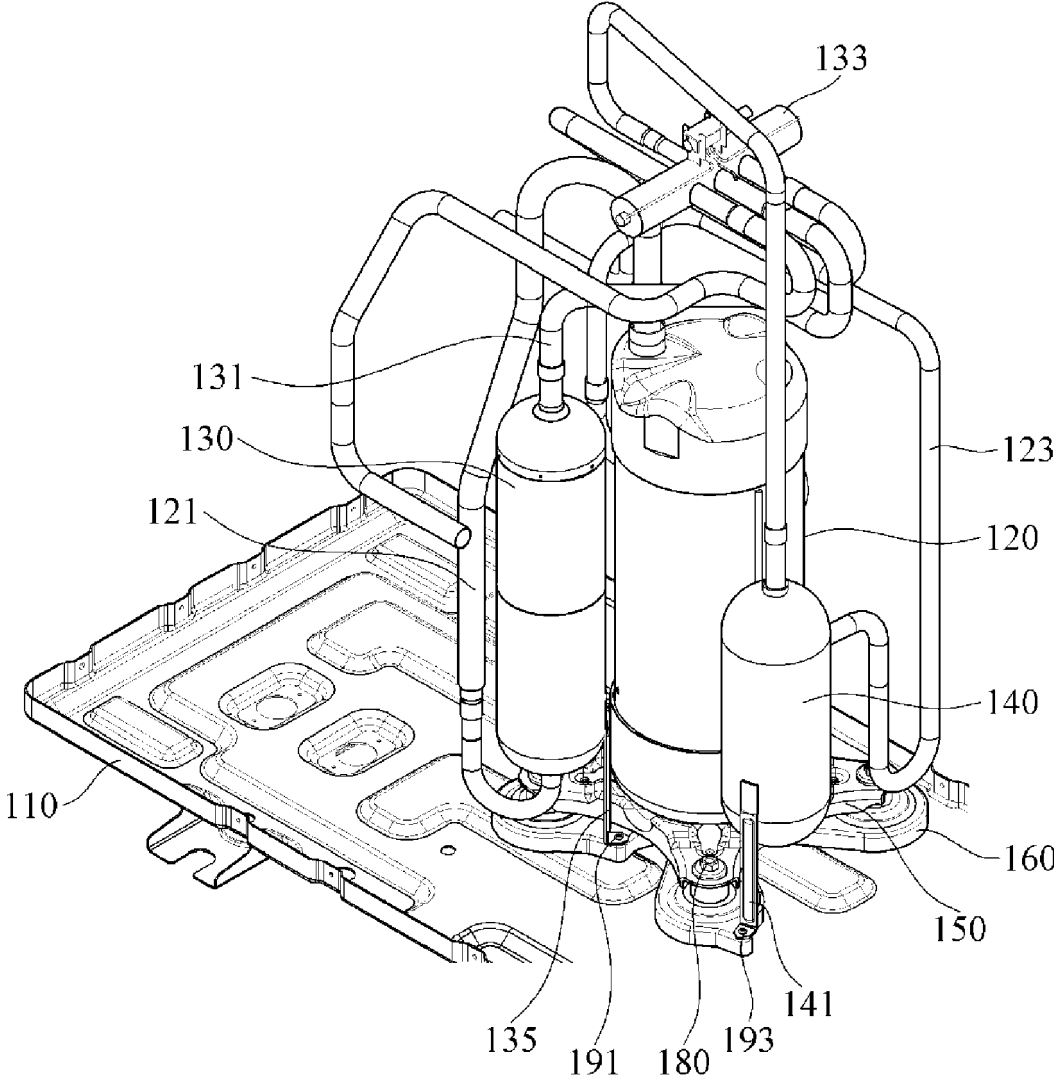


FIG. 6

150

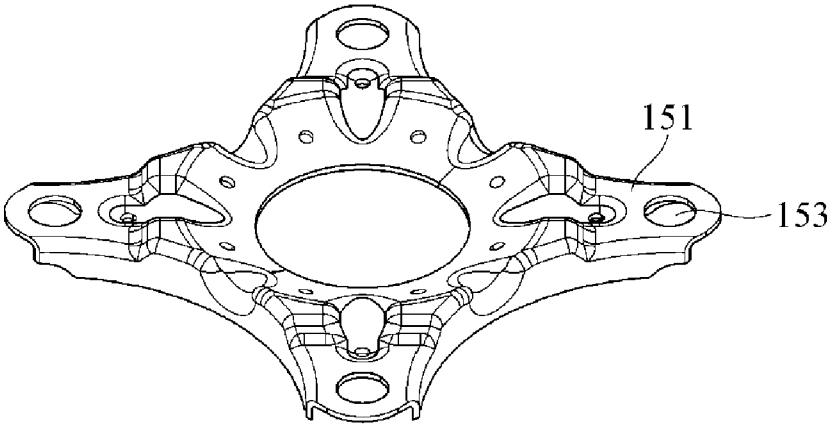


FIG. 7

160

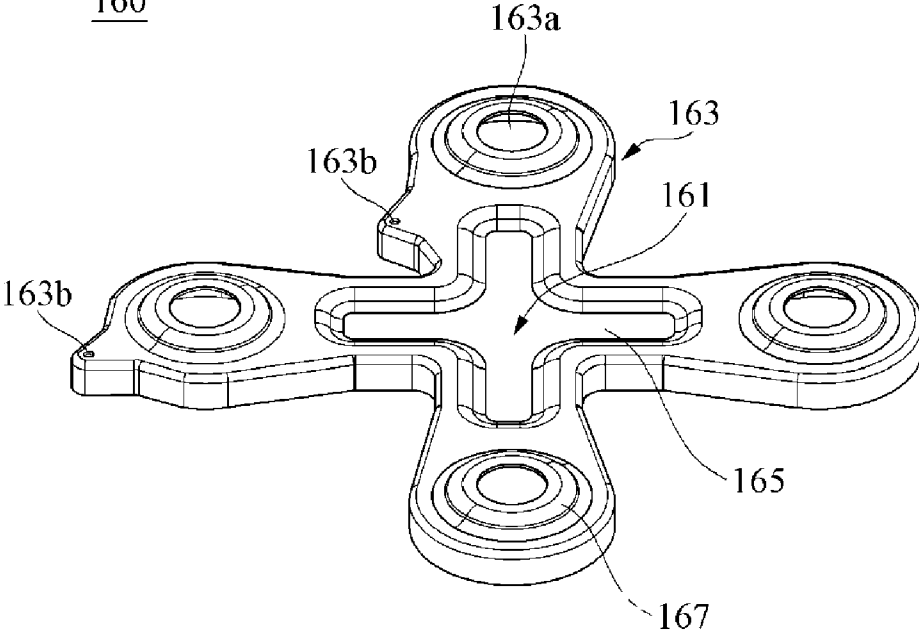


FIG. 8

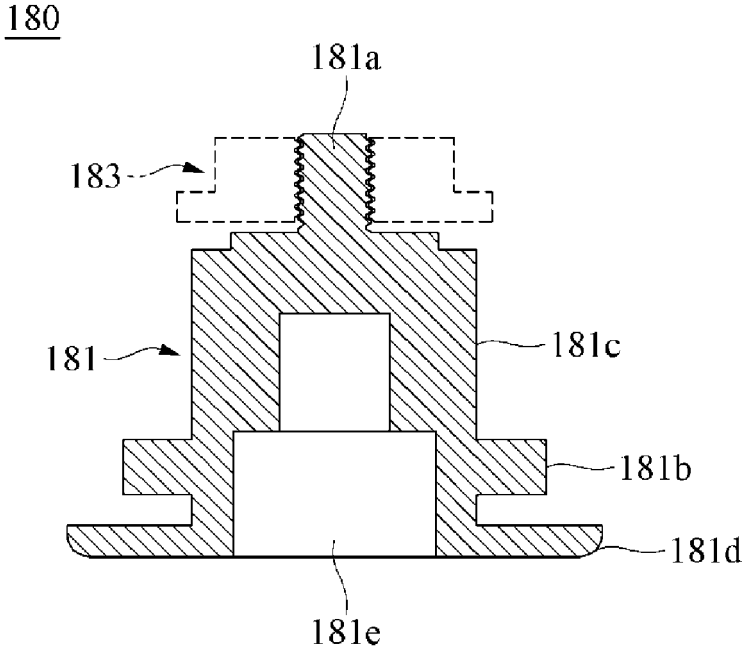


FIG. 9

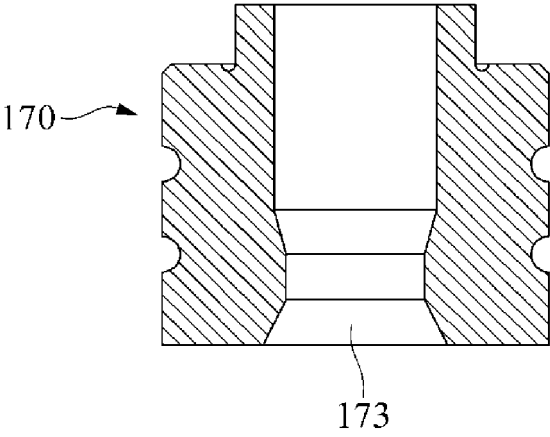


FIG. 10

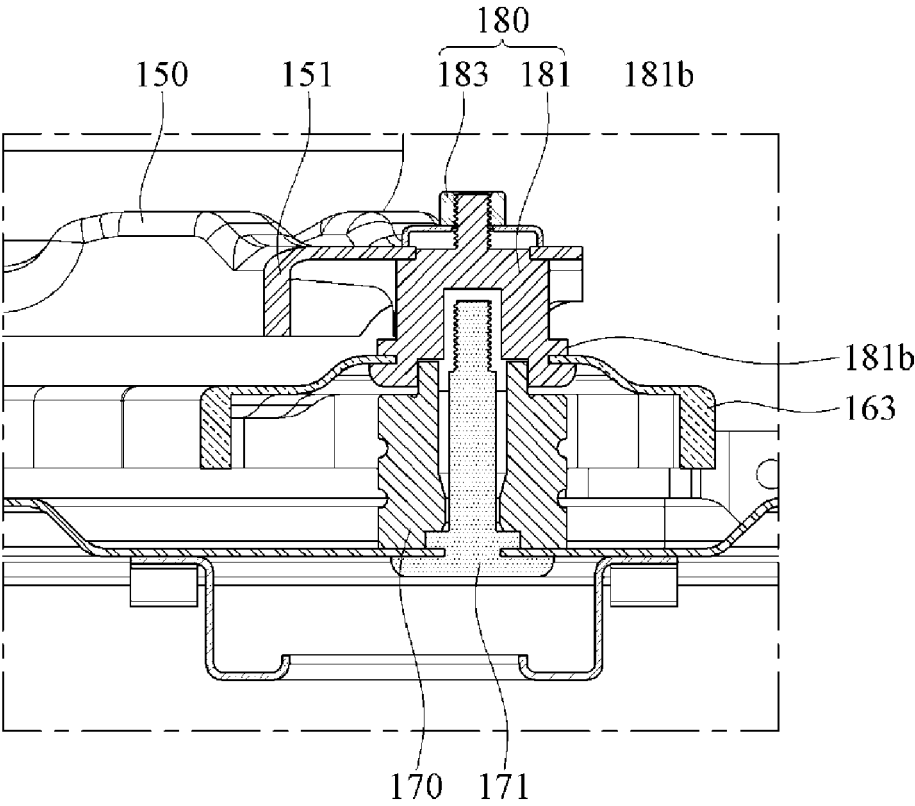
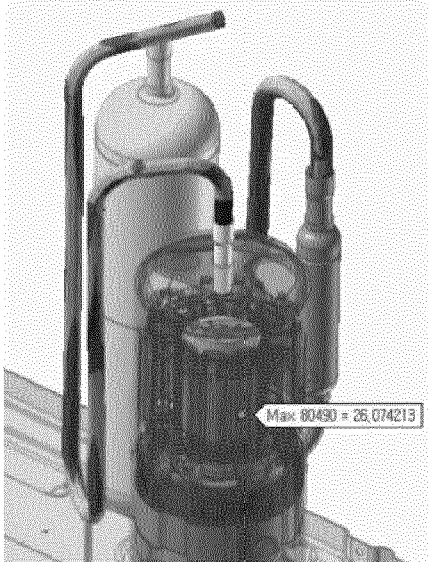


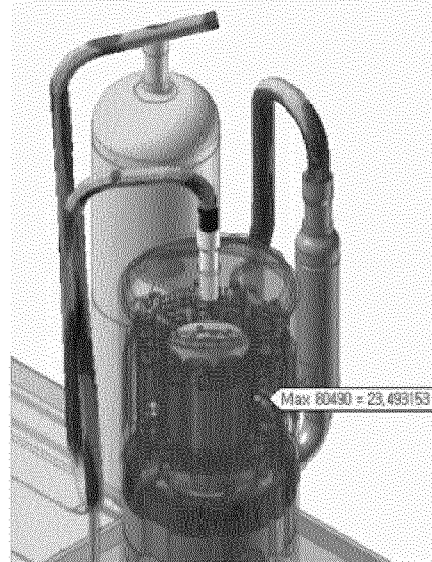
FIG. 11

[Comparative Example 1]



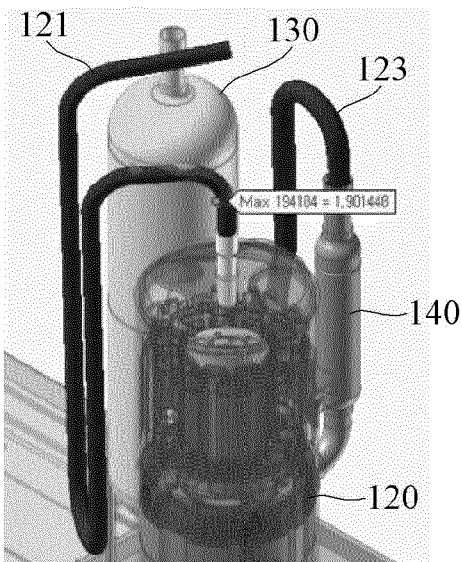
Von Mises stress
Max at Node 90989 time:0.063300
Min at Node 95932 time:0.000000

[Comparative Example 2]



Von Mises stress
Max at Node 90989 time:0.095000
Min at Node 95932 time:0.000000

[First embodiment]



Von Mises stress
Max at Node 90989 time:0.063300
Min at Node 95932 time:0.000000

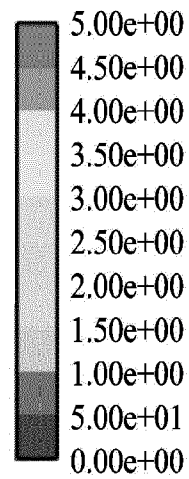


FIG. 12

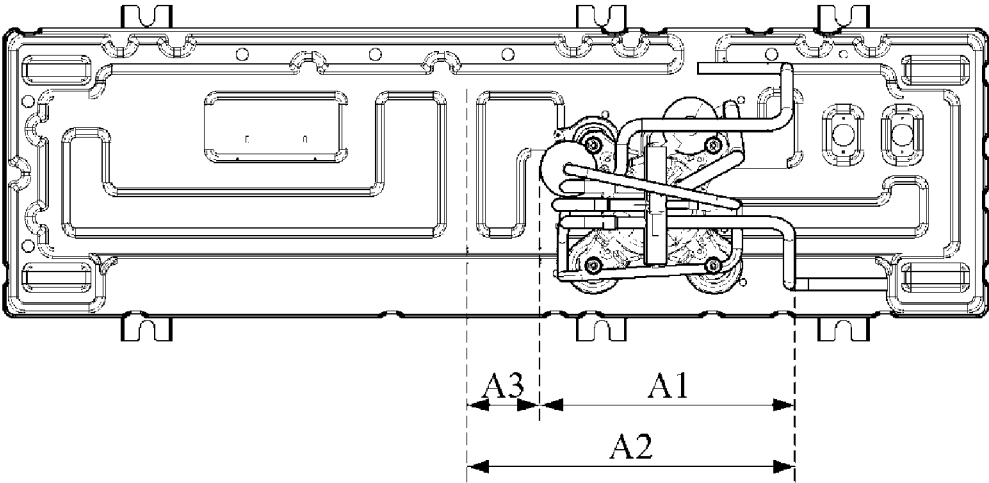


FIG. 13

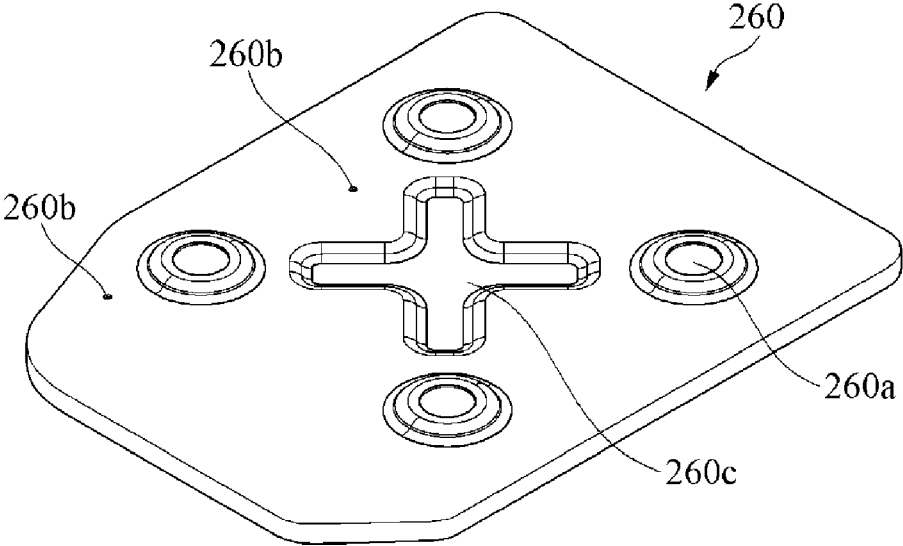


FIG. 14

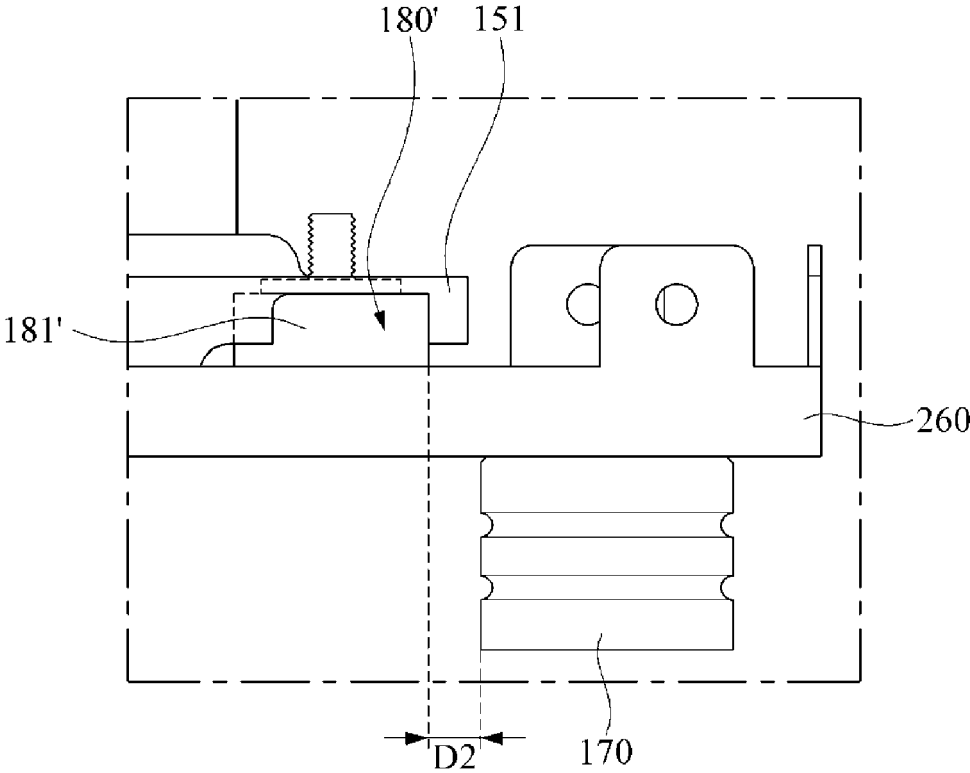
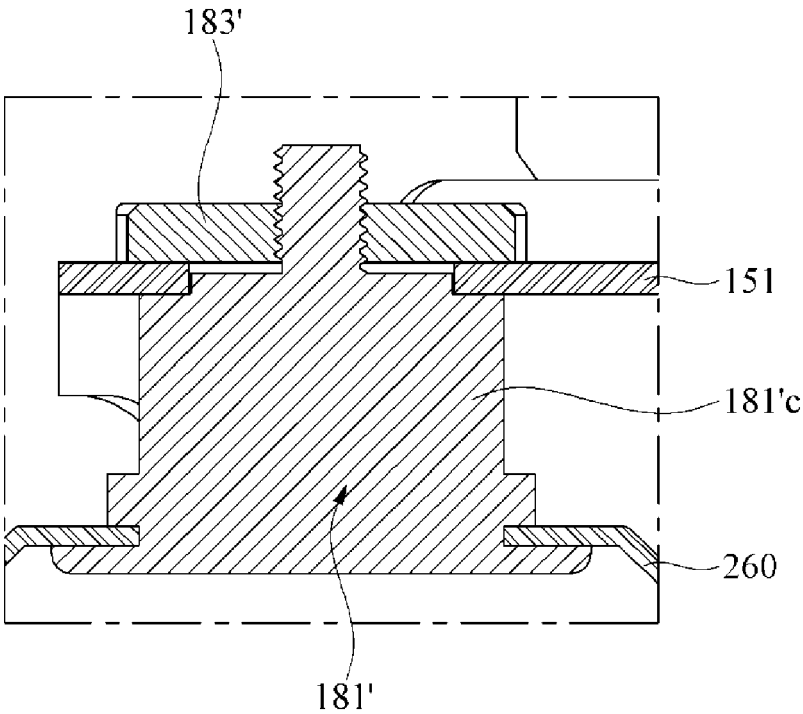
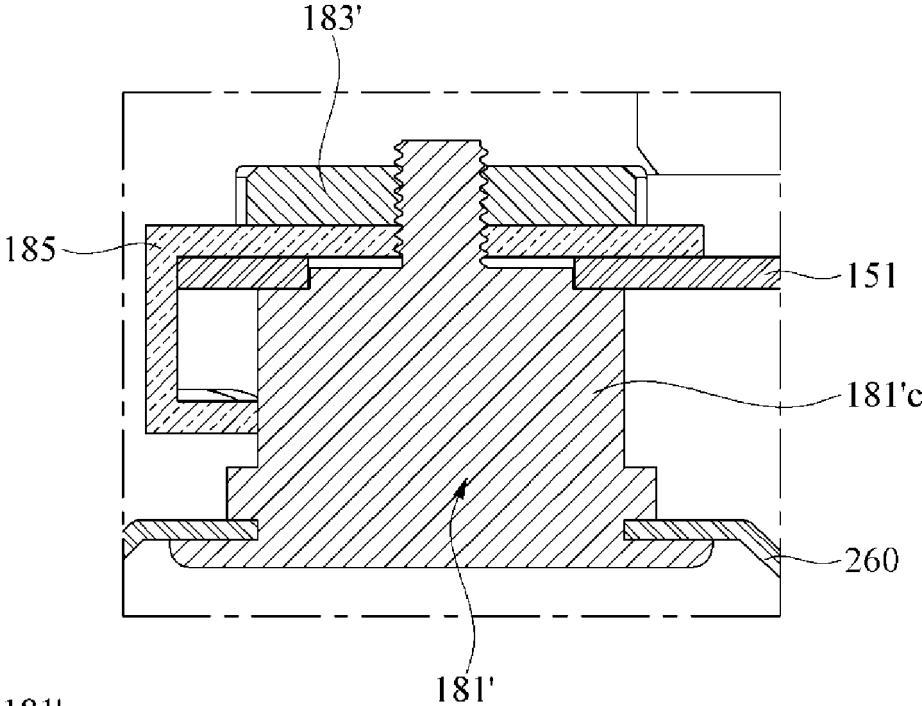


FIG. 15



180' { 181'
183'

FIG. 16



180' { 181'
183'

FIG. 17

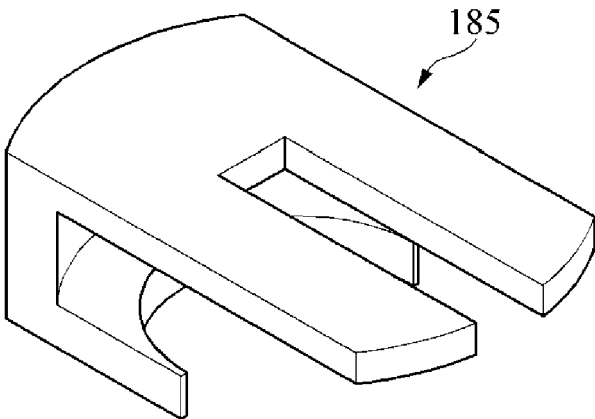


FIG. 18

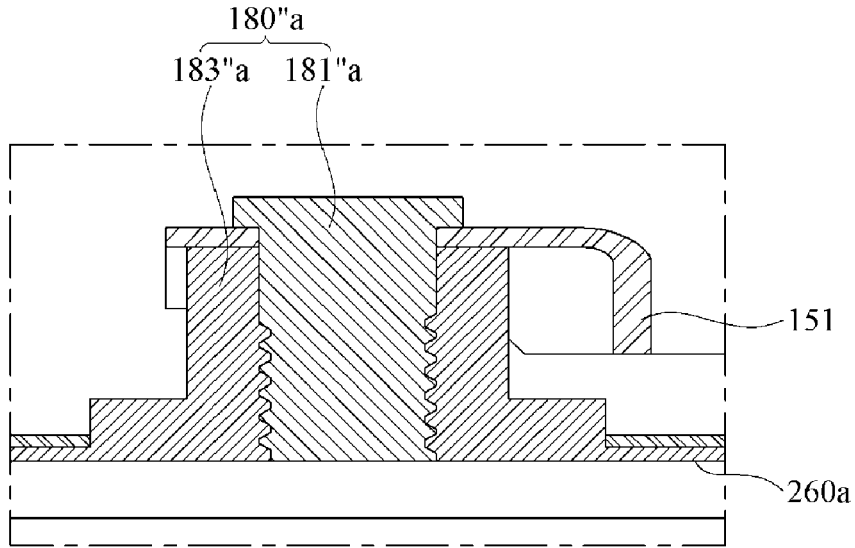
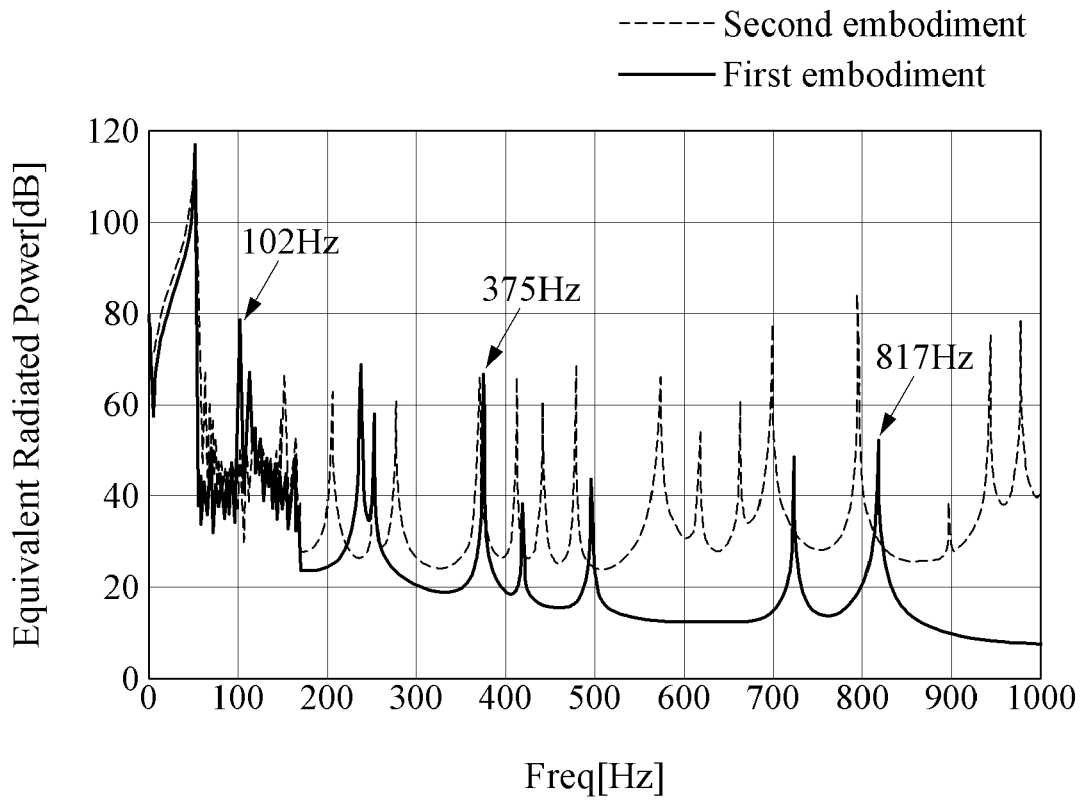


FIG. 19





EUROPEAN SEARCH REPORT

Application Number
EP 24 17 8460

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Y	* paragraphs [0011], [0015]; figures 2,3,8 *	5	F24F1/12

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	* Description of fig. 3 and 8; figures 3,8 *		

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	* claim 1; figures 3,7 *		

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	* paragraph [0018]; figures 1,2 *		

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 31 October 2024	Examiner Degen, Marcello
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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EP 24 17 8460

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31-10-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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