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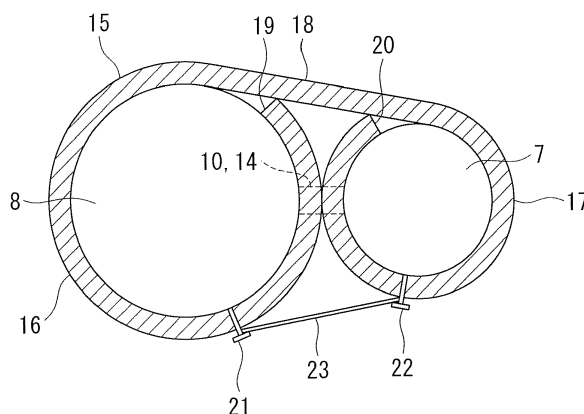
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(54) **COMPRESSOR SYSTEM AND AIR CONDITIONER INCLUDING THE SAME**

(57) Provided is a compressor system including an accumulator (7) configured to accumulate a refrigerant, a compressor (8) configured to compress the refrigerant, and a sheet material (15) formed in one sheet. The sheet material (15) includes a compressor insulating portion (16) wound around the compressor (8), an accumulator insulating portion (17) wound around the accumulator (7), and an isolating portion arranged between the com-

pressor (8) and the accumulator (7) so as to isolate a region in which the compressor (8) is arranged and a region in which the accumulator (7) is arranged. The compressor system can reduce heat transfer from the compressor (8) to the accumulator (7). Also, since the number of components of the compressor system is small, the sheet material (15) can be easily attached.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to a compressor system including an accumulator.

2. DESCRIPTION OF RELATED ART

[0002] A compressor system including an accumulator is used for an air conditioner which is, for example, a refrigerating device (see JP 2004-360476 A). Recently, from the viewpoint of protection of the ozone layer, a refrigerant used in such an air conditioner has been switching to R32 refrigerant with low global warming potential in comparison with R410A refrigerant. However, the R32 refrigerant increases a discharge temperature in a compressor due to physical properties of the refrigerant in comparison with the R410A refrigerant. Therefore, a compressor system capable of reducing loss of cooling capacity is required even in the case where the R32 refrigerant is used.

[0003] JP 4124146 B2 discloses that R32 refrigerant, which increases discharge temperature in a compressor in comparison with R410A refrigerant, can reduce loss of cooling capacity by covering a piping with a heat insulating material. Specifically, in a refrigerant circuit using the R32 refrigerant, a refrigeration air conditioner is illustrated in which a compressor and a low temperature side/high temperature side of a piping for a refrigerant circuit stored in a case and a container forming the refrigerant circuit are covered with a heat insulating material.

BRIEF SUMMARY OF THE INVENTION

[0004] Simple assembly is further required in a compressor system. However, JP 4124146 B2 does not describe simplifying the work for providing a heat insulating material for reducing loss of cooling capacity of a refrigerant circuit using R32 refrigerant.

[0005] An object of the present invention is, in view of the above circumstances, to provide a compressor system in which a sheet material can be simply attached to reduce loss of cooling capacity in the case where a refrigerant increasing discharge temperature from a compressor is used.

[0006] A compressor system according to a first aspect of the present invention includes an accumulator configured to accumulate a refrigerant, a compressor configured to compress the refrigerant, and a sheet material formed in one sheet. The sheet material includes a compressor insulating portion to be wound around the compressor, an accumulator insulating portion to be wound around the accumulator, and an isolating portion arranged between the compressor and the accumulator so

as to separate a region in which the compressor is arranged and a region in which the accumulator is arranged.

[0007] The compressor system can reduce heat transfer from a compressor to an accumulator by arranging a part of a sheet material between the compressor and the accumulator. The compressor system can reduce heat transfer between a low temperature refrigerant and a high temperature refrigerant even in the case where a refrigerant increasing discharge temperature from a compressor (for example, R32 refrigerant) is used. Furthermore, by using one sheet material, the compressor system can insulate the compressor from the environment, insulate the accumulator from the environment, and also insulate between the compressor and the accumulator. Also, the compressor system has a small number of components and can be easily manufactured in comparison with other compressor system in which a heat insulating material for reducing heat transfer from a compressor to an accumulator is separately provided from the sheet material.

[0008] In the sheet material, the compressor insulating portion may be wound around the compressor so as to surround the compressor, and the accumulator insulating portion may be wound around the accumulator so as to surround the accumulator.

[0009] The sheet material is doubly arranged between the compressor and the accumulator, and heat transfer from the compressor to the accumulator can be highly efficiently reduced in comparison with a case in which the sheet material is not wound all around side surfaces of the compressor or the accumulator.

[0010] In the sheet material, the accumulator insulating portion may be wound around the accumulator so as to surround the accumulator, and the sheet material may be wound around the compressor such that a gap which is not covered by the compressor insulating portion is formed in a region on the accumulator side around the compressor.

[0011] The sheet material can be formed in a small size and inexpensively formed in comparison with a case in which the sheet material is wound all around the compressor. Therefore, the compressor system can be inexpensively manufactured by providing the sheet material.

[0012] In the sheet material, the compressor insulating portion may be wound around the compressor so as to surround the compressor, and the sheet material may be wound around the accumulator such that a gap which is not covered by the accumulator insulating portion is formed in a region on the compressor side around the compressor.

[0013] The sheet material can be formed in a small size and inexpensively formed in comparison with a case in which a sheet material is wound all around an accumulator. Therefore, the compressor system can be inexpensively manufactured by providing the sheet material.

[0014] The compressor system according to the first aspect may further include a fixed member configured to fix the sheet material with the compressor and the accu-

mulator by fastening the sheet material so as to draw a part of the compressor insulating portion and a part of the accumulator insulating portion.

[0015] In the compressor system, the sheet material can be appropriately attached to the compressor and the accumulator by drawing a part of the compressor insulating portion and a part of the accumulator insulating portion so that the sheet material does not come off from the compressor and the accumulator. Further, in the compressor system, the sheet material can be appropriately attached to the compressor and the accumulator by fastening one place of the sheet material. Furthermore, the sheet material can be easily attached to the compressor and the accumulator in comparison with other compressor system separately providing a fixed member for fixing the compressor insulating portion to the compressor and a fixed member for fixing the accumulator insulating portion to the accumulator.

[0016] The sheet material may be wound around the compressor and the accumulator such that a part of the accumulator insulating portion comes into contact with a part of the compressor insulating portion.

[0017] Even in the case where the sheet material is not wound all around side surfaces of the compressor, the compressor system can isolate a region, in which the compressor is arranged, from the outside and reduce noise transferring from the compressor to the outside.

[0018] An air conditioner according to a second aspect of the present invention includes the compressor system according to the present invention, an indoor heat exchanger, and an outdoor heat exchanger.

[0019] In the air conditioner, the compressor system can reduce heat transfer from the compressor to the accumulator. Therefore, even in the case where a refrigerant increasing discharge temperature from a compressor (for example, R32 refrigerant) is used, the compressor system can reduce heat transfer between a low temperature refrigerant and a high temperature refrigerant and improve efficiency of the air conditioner.

[0020] A compressor system according to the present invention can reduce heat transfer from a compressor to an accumulator. Therefore, even in the case where a refrigerant increasing discharge temperature from a compressor is used, the compressor system can reduce heat transfer between a low temperature refrigerant and a high temperature refrigerant and improve efficiency of an air conditioner. Also, by using one sheet material, the compressor system according to the present invention can insulate the compressor from the environment, insulate the accumulator from the environment, and also insulate between the compressor and the accumulator. Accordingly, the number of components is reduced, and the compressor system can be easily assembled.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0021]

Fig. 1 is a refrigerant circuit diagram illustrating an air conditioner applying a compressor system according to the present invention;

Fig. 2 is a longitudinal sectional view illustrating the compressor system of the refrigerant circuit illustrated in Fig. 1;

Fig. 3 is a cross-sectional view illustrating a heat insulating member used in a compressor system according to a first embodiment;

Fig. 4 is a side view illustrating the heat insulating member used in the compressor system according to the first embodiment;

Fig. 5 is a cross-sectional view illustrating a heat insulating member used in a compressor system according to a second embodiment; and

Fig. 6 is a cross-sectional view illustrating a heat insulating member used in a compressor system according to a third embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0022] A compressor system according to a first embodiment of the present invention will be described below with reference to drawings.

[0023] An air conditioner 1 applying the compressor system includes a refrigerant circuit in which a refrigerant is circulated as illustrated in Fig. 1. As the refrigerant, R32 refrigerant is exemplified. The refrigerant circuit includes a four-way valve 2, an outdoor heat exchanger 3, an expansion valve 5, an indoor heat exchanger 6, an accumulator 7 (compressor system), and a compressor 8 (compressor system). The compressor system includes the compressor 8 and the accumulator 7.

[0024] The four-way valve 2 switches a flow direction of a refrigerant between cooling operation and heating operation. During cooling operation, the four-way valve 2 supplies a refrigerant compressed by the compressor 8 to the outdoor heat exchanger 3 and supplies a refrigerant heated by the indoor heat exchanger 6 to the compressor 8 via the accumulator 7. During heating operation, the four-way valve 2 supplies a refrigerant compressed by the compressor 8 to the indoor heat exchanger 6 and supplies a refrigerant heated by the outdoor heat exchanger 3 to the compressor 8 via the accumulator 7.

[0025] The outdoor heat exchanger 3 is provided in an outdoor unit placed outdoors. The outdoor heat exchanger 3 heat-exchanges outdoor air with a refrigerant supplied from the four-way valve 2 or the expansion valve 5. The expansion valve 5 expands and cools a refrigerant supplied from the outdoor heat exchanger 3 or the indoor heat exchanger 6. The indoor heat exchanger 6 is provided in an indoor unit placed indoors. The indoor heat exchanger 6 heat-exchanges indoor air with a refrigerant supplied from the four-way valve 2 or the expansion valve 5.

[0026] The accumulator 7 is provided in the outdoor unit and arranged on the way of an inlet side piping 10 supplying a refrigerant from the four-way valve 2 to the

compressor 8. The accumulator 7 is configured so that oil is drawn in the compressor 8 via the inlet side piping 10 by separating oil included in refrigerant gas and liquid such as a liquid refrigerant.

[0027] The compressor 8 is provided in the outdoor unit and formed by a rotary compressor. The compressor 8 compresses a refrigerant accumulated by the accumulator 7.

[0028] The air conditioner 1 operates as described below.

[0029] During cooling operation, the air conditioner 1 switches the four-way valve 2 so that the refrigerant compressed by the compressor 8 is supplied to the outdoor heat exchanger 3, and the refrigerant heated by the indoor heat exchanger 6 is supplied to the compressor 8 via the accumulator 7. The refrigerant compressed by the compressor 8 is supplied to the outdoor heat exchanger 3 via the four-way valve 2 and heat-exchanged with outdoor air in the outdoor heat exchanger 3, and the refrigerant heats outdoor air and is cooled. The refrigerant cooled in the outdoor heat exchanger 3 is expanded and cooled at the expansion valve 5. The refrigerant cooled at the expansion valve 5 is heat-exchanged with indoor air in the indoor heat exchanger 6, and the refrigerant cools the indoor air and is heated. The refrigerant heated in the indoor heat exchanger 6 is supplied to the compressor 8 via the four-way valve 2 and the inlet side piping 10. A refrigerant flowing in the inlet side piping 10 is accumulated by the accumulator 7 so that a pressure of the refrigerant supplied to the compressor 8 becomes a predetermined pressure. The refrigerant supplied to the compressor 8 is compressed and becomes high temperature.

[0030] During heating operation, the air conditioner 1 switches the four-way valve 2 so that the refrigerant compressed by the compressor 8 is supplied to the indoor heat exchanger 6, and the refrigerant heated by the outside heat exchanger 3 is supplied to the compressor 8 via the accumulator 7. The refrigerant compressed by the compressor 8 is supplied to the indoor heat exchanger 6 via the four-way valve 2 and heat-exchanged with indoor air in the indoor heat exchanger 6, and then the refrigerant heats the indoor air and is cooled. The refrigerant cooled in the indoor heat exchanger 6 is expanded and cooled at the expansion valve 5. The refrigerant cooled at the expansion valve 5 is heat-exchanged with outdoor air in the outdoor heat exchanger 3, and the refrigerant cools the outdoor air and is heated. The refrigerant heated in the outdoor heat exchanger 3 is supplied to the compressor 8 via the four-way valve 2 and the inlet side piping 10. The refrigerant supplied to the compressor 8 is compressed by the compressor 8 and becomes high temperature.

First Embodiment

[0031] Fig. 2 illustrates a first embodiment of a compressor system including the compressor 8 and the ac-

cumulator 7. The compressor 8 includes a sealed container formed in a nearly cylindrical shape. A motor is arranged at an upper portion in the sealed container. A rotary compression mechanism is arranged at a lower portion in the sealed container. The rotary compression mechanism is a multiple cylinder type in the present embodiment, and includes multiple cylinder chambers, blades for separating an inlet side and a discharge side in each cylinder chamber, and rotors rotating in each cylinder chamber by the motor. The compressor 8 is configured so that a low-pressure refrigerant gas sucked in each cylinder chamber from the inlet side piping 10 is compressed by rotation of the rotor, discharged in the sealed container, and sent to the four-way valve 2. The compressor 8 is arranged so that an axis 11 of a cylinder formed by the sealed container is parallel to a vertical direction.

[0032] The accumulator 7 is formed in a nearly cylindrical shape and arranged so that an axis 12 of the cylinder is parallel to the axis 11 of the compressor 8 and also in line with the compressor 8 along a direction (horizontal direction) vertical to the axis 11 of the compressor 8. The compressor system further includes a support member 14. One end of the support member 14 is joined to the compressor 8 and another end is joined to the accumulator 7. Both ends of the support member 14 are joined to the compressor 8 and the accumulator 7, and accordingly the support member 14 fixes the accumulator 7 to the compressor 8.

[0033] The compressor system further includes a sheet material 15 as illustrated in Fig. 3. The sheet material 15 is formed in a continuous long strip-like sheet and formed in a multi-layer structure in which multiple layers including a felt layer and a rubber layer are laminated in a thickness direction. The felt layer is formed of a felt-like heat insulating material. The rubber layer is formed of rubber and laminated on the felt layer. Since the sheet material 15 is formed in this manner, the sheet material 15 is flexible and is formed so as to be easily bended by hand. When sound enters from one side, the sheet material 15 absorbs a part of the sound and reduces sound transmitting from the one side to another side. Also, when heat enters from one side, the sheet material 15 reduces heat transfer from the one side to another side.

[0034] The sheet material 15 includes a compressor insulating portion 16, an accumulator insulating portion 17, and a connected portion 18. The compressor insulating portion 16 is a portion coming into contact with a side surface of a cylinder formed by the compressor 8 in the sheet material 15. The compressor insulating portion 16 is wound around a side surface of the cylinder formed by the compressor 8 and cylindrically formed so as to face an outer peripheral surface of the compressor 8 by arranging a surface on a felt layer side on an inner peripheral side and surround the compressor 8. Specifically, in the compressor insulating portion 16, an end 19 on the compressor insulating portion 16 side of the sheet

material 15 is sandwiched between the compressor insulating portion 16 and the compressor 8. The accumulator insulating portion 17 is a portion coming into contact with a side surface of a cylinder formed by the accumulator 7 in the sheet material 15. The accumulator insulating portion 17 is wound around a side surface of the cylinder formed by the accumulator 7 and cylindrically formed so as to face an outer peripheral surface of the accumulator 7 by arranging a surface on a felt layer side on an inner peripheral side and surround the accumulator 7. Specifically, in the accumulator insulating portion 17, an end 20 on the accumulator insulating portion 17 side of the sheet material 15 is sandwiched between the accumulator insulating portion 17 and the accumulator 7. The connected portion 18 is arranged between the compressor insulating portion 16 and the accumulator insulating portion 17 and connects the compressor insulating portion 16 and the accumulator insulating portion 17.

[0035] A cut is formed at the compressor insulating portion 16. The cut is formed so that the support member 14 penetrates the cut when the compressor insulating portion 16 is winding around the compressor 8. When the compressor insulating portion 16 is winding around the compressor 8, the cut is further formed along a plane perpendicular to the axis 11 and formed so as to connect a portion penetrated by the support member 14 and the end 19 of the sheet material 15.

[0036] Also, another cut is formed at the compressor insulating portion 16. The cut is formed so that a portion connecting the accumulator 7 and the compressor 8 in the inlet side piping 10 penetrates the cut when the compressor insulating portion 16 is winding around the compressor 8. When the compressor insulating portion 16 is winding around the compressor 8, the cut is formed along a plane perpendicular to the axis 11 and formed so as to connect a portion penetrated by the inlet side piping 10 and the end 19 of the sheet material 15.

[0037] A cut is formed at the accumulator insulating portion 17. The cut is formed so that the support member 14 penetrates the cut when the accumulator insulating portion 17 is winding around the accumulator 7. When the accumulator insulating portion 17 is winding around the accumulator 7, the cut is formed along a plane perpendicular to the axis 12 and formed so as to connect a portion penetrated by the support member 14 and the end 20 of the sheet material 15.

[0038] Also, another cut is formed at the accumulator insulating portion 17. The cut is formed so that a portion connecting the accumulator 7 and the compressor 8 in the inlet side piping 10 penetrates the cut when the accumulator insulating portion 17 is winding around the accumulator 7. The cut is formed along a plane perpendicular to the axis 12 and formed so as to connect a portion penetrated by the inlet side piping 10 and the end 20 of the sheet material 15.

[0039] The compressor system further includes a cover which is not illustrated. As with the sheet material 15, the cover is formed in a multi-layer structure in which

multiple layers including a felt layer and a rubber layer are laminated in a thickness direction. When the sheet material 15 is wound around the accumulator 7 and the compressor 8, the cover is joined to an edge other than the ends 19 and 20 of the sheet material 15 and covers an opening formed on an upper side and a lower side of a region in which the accumulator 7 and the compressor 8 are arranged by being surrounded by the sheet material 15.

[0040] By arranging in this manner, the sheet material 15 includes an isolating portion arranged between the compressor 8 and the accumulator 7. At this time, the isolating portion is formed of a part of the compressor insulating portion 16 and a part of the accumulator insulating portion 17. Specifically, the sheet material 15 is doubly arranged between a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged, and separates the region in which the compressor 8 is arranged and the region in which the accumulator 7 is arranged on a surface perpendicular to the axis 11 and crossing the compressor 8 and the accumulator 7.

[0041] Also, the sheet material 15 is attached so that a part of a surface on a rubber layer side of the compressor insulating portion 16 comes into contact with a part of a surface on a rubber layer side of the accumulator insulating portion 17, and a region surrounded by the compressor insulating portion 16, the accumulator insulating portion 17, and the connected portion 18 are isolated from the outside. By attaching the sheet material 15 in this manner, the compressor system can reduce noise of the compressor 8, leaking from a gap between the compressor insulating portion 16 and the accumulator insulating portion 17. When the noise of the compressor 8, leaking from the gap between the compressor insulating portion 16 and the accumulator insulating portion 17, is sufficiently small, the sheet material 15 can be attached so that a part of the compressor insulating portion 16 does not come into contact with a part of the accumulator insulating portion 17.

[0042] The sheet material 15 further includes a fixed member including a compressor side fitting 21, an accumulator side fitting 22, and a binding string 23. The compressor side fitting 21 is connected to a surface on a rubber layer side of the compressor insulating portion 16 and protrusively formed so as to protrude from the surface on the rubber layer side of the compressor insulating portion 16. The accumulator side fitting 22 is connected to a surface on a rubber layer side of the accumulator insulating portion 17 and protrusively formed so as to protrude from the surface on the rubber layer side of the accumulator insulating portion 17. The binding string 23 is arranged so that the compressor 8 and the accumulator 7 are arranged between the binding string 23 and the connected portion 18 as illustrated in Fig. 3 in a state in which the sheet material 15 is wound around the compressor 8 and the accumulator 7. The binding string 23 is entwined with the compressor side fitting 21 and the

accumulator side fitting 22 so as to draw a portion connected with the compressor side fitting 21 in the compressor insulating portion 16 and a portion connected with the accumulator side fitting 22 in the accumulator insulating portion 17.

Method for Attaching Sheet Material 15

[0043] The sheet material 15 is attached as follows.

[0044] First, the compressor insulating portion 16 of the sheet material 15 is wound around a side surface of a cylinder formed by the compressor 8. At this time, so that the support member 14 penetrates a cut formed by the compressor insulating portion 16 of the sheet material 15, the support member 14 is inserted into the cut from the end 19 of the sheet material 15. So that the inlet side piping 10 penetrates another cut formed by the compressor insulating portion 16, the inlet side piping 10 is inserted into the cut. In the compressor insulating portion 16 of the sheet material 15, the end 19 of the sheet material 15 is pushed into between the compressor insulating portion 16 and the compressor 8 so that the end 19 is fixed by being sandwiched between the compressor insulating portion 16 and the compressor 8 after each of the support member 14 and the inlet side piping 10 are inserted into each of the two cuts.

[0045] Also, in the sheet material 15, the accumulator insulating portion 17 is wound around a side surface of a cylinder formed by the accumulator 7, and each of the support member 14 and the inlet side piping 10 is inserted into each of two cuts formed in the accumulator insulating portion 17. In the accumulator insulating portion 17, the end 20 of the sheet material 15 is pushed into between the accumulator insulating portion 17 and the accumulator 7 so that the end 20 is fixed by being sandwiched between the accumulator insulating portion 17 and the accumulator 7 after each of the support member 14 and the inlet side piping 10 is inserted into each of the two cuts.

[0046] The compressor insulating portion 16 is wound around the compressor 8. After the accumulator insulating portion 17 is wound around the accumulator 7, the compressor side fitting 21 and the accumulator side fitting 22 are entwined with the binding string 23, and accordingly the sheet material 15 is fastened to prevent loosening and fixed to the compressor 8 and the accumulator 7. The compressor system is manufactured by connecting a cover to an edge other than the ends 19 and 20 of the sheet material 15 so as to cover an opening formed on an upper side and a lower side of a region, in which the accumulator 7 and the compressor 8 are arranged, by being surrounded by the sheet material 15 after the sheet material 15 is fixed to the compressor 8 and the accumulator 7.

Effect of Compressor System

[0047] According to the present embodiment, the fol-

lowing effect is produced by the above-described configuration.

[0048] In the compressor system, heat transfer from the compressor 8 to the accumulator 7 is reduced by isolating a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged by an isolating portion formed of a part of the sheet material 15. In the compressor system, heat loss of a high temperature refrigerant disposed from the compressor 8 can be reduced by reducing heat transfer from the compressor 8 to the accumulator 7. As this result, by providing the air conditioner 1 as described above, heat loss of a high temperature refrigerant discharged from the compressor 8 can be sufficiently reduced, and energy consumption efficiency can be improved even in the case where a refrigerant such as R32 refrigerant which increases a discharge temperature from the compressor 8 is used.

[0049] In the compressor system, the sheet material 15 and a cover surround the compressor 8 and the accumulator 7 and absorb noise generated from the compressor 8. Accordingly, noise generated from the compressor 8 is reduced. Specifically, the sheet material 15 is a soundproofing material for reducing noise generated from the compressor 8 and also used as a heat insulating material for reducing heat transfer from the compressor 8 to the accumulator 7. Therefore, the compressor system can be easily manufactured without preparing a heat insulating material for reducing heat transfer from the compressor 8 to the accumulator 7 separately from the sheet material 15 for reducing noise generated from the compressor 8.

[0050] By using multiple sheet materials, the compressor system can insulate the compressor 8 and the accumulator 7 from the outside and also reduce heat transfer from the compressor 8 to the accumulator 7.

[0051] On the other hand, the air conditioner 1 according to the present embodiment can realize insulation of the compressor 8 and the accumulator 7 by one sheet material 15 and reduction in heat transfer from the compressor 8 to the accumulator 7. Accordingly, a number of components can be reduced, labor for attaching the sheet material 15 can be reduced, and the sheet material 15 can be simply attached to the compressor 8 and the accumulator 7.

[0052] The sheet material 15 can be relatively easily wound around the compressor 8 and the accumulator 7 since cuts are formed along a plane perpendicular to the axes 11 and 12.

[0053] Specifically, a sheet material as a comparative example, in which a cut penetrated by the support member 14 or the inlet side piping 10 is formed in parallel with the axes 11 and 12, is needed to be widely moved vertically in parallel with the axes 11 and 12 when the support member 14 or the inlet side piping 10 is inserted into the cut.

[0054] On the other hand, in the sheet material 15, the compressor insulating portion 16 can be wound around

the compressor 8 without widely moving the sheet material 15 in parallel with the axes 11 and 12, or the support member 14 or the inlet side piping 10 can be penetrated through the cut by moving the sheet material 15 in a winding direction (direction perpendicular to the axes 11 and 12) in which the accumulator insulating portion 17 is moved when being wound around the accumulator 7. Therefore, in the sheet material 15 in comparison with the sheet material as the comparative example, the support member 14 or the inlet side piping 10 can be more easily penetrated through cuts, and the sheet material 15 can be more easily attached to a compressor system.

[0055] The sheet material 15 can be fixed to the compressor 8 and the accumulator 7 by using a fixed member different from the fixed member including the compressor side fitting 21, the accumulator side fitting 22, and the binding string 23. As the fixed member, a pair of a compressor insulating portion binding string and an accumulator insulating portion binding string is exemplified. The compressor insulating portion binding string fastens the sheet material 15 by bringing the end 20 of the sheet material 15 close to an end on the connected portion 18 side of the compressor insulating portion 16 so that the compressor insulating portion 16 is wound around the compressor 8 without loosening. The accumulator insulating portion binding string fastens the sheet material 15 by bringing the end 19 of the sheet material 15 close to an end on the connected portion 18 side of the accumulator insulating portion 17 so that the accumulator insulating portion 17 is wound around the accumulator 7 without loosening. As with the above-described compressor system according to the first embodiment, a compressor system including the fixed member can reduce heat transfer from the compressor 8 to the accumulator 7, sufficiently reduce heat loss of a high temperature refrigerant discharged from the compressor 8, and improve energy consumption efficiency. Also, in the compressor system according to the first embodiment, the sheet material 15 can be attached to the compressor 8 and the accumulator 7 by fastening one place of the sheet material by using the binding string 23, and the sheet material 15 can be easily attached to the compressor 8 and the accumulator 7 in comparison with a compressor system including the compressor insulating portion binding string and the accumulator insulating portion binding string.

Second Embodiment

[0056] Fig. 5 illustrates a sheet material according to a second embodiment of a compressor system. As with the sheet material 15, a sheet material 31 is formed in a sheet and formed in a multi-layer structure in which multiple layers including a felt layer and a rubber layer are laminated. The felt layer is formed of a felt-like heat insulating material. The rubber layer is formed of rubber and laminated on the felt layer.

[0057] The sheet material 31 includes a compressor

insulating portion 32, an accumulator insulating portion 33, and a connected portion 34. The connected portion 34 is arranged between the compressor insulating portion 32 and the accumulator insulating portion 33 and connects the compressor insulating portion 32 and the accumulator insulating portion 33. The accumulator insulating portion 33 is a portion coming into contact with a side surface of a cylinder formed by the accumulator 7 in the sheet material 31. The accumulator insulating portion 33 is wound around the side surface of the cylinder formed by the accumulator 7 so that a surface on a felt layer side faces the accumulator 7, and an end 36 of the sheet material 31 is sandwiched between the accumulator insulating portion 33 and the accumulator 7.

[0058] A cut is formed at the accumulator insulating portion 33. The cut is formed so that the support member 14 penetrates the cut when the accumulator insulating portion 33 is winding around the accumulator 7. The cut is formed so as to connect a portion penetrated by the support member 14 and the end 36 of the sheet material 31.

[0059] Also, another cut is formed at the accumulator insulating portion 33. The cut is formed so that a portion connecting the accumulator 7 and the compressor 8 in the inlet side piping 10 penetrates the cut when the accumulator insulating portion 33 is winding around the accumulator 7. The cut is formed so as to connect a portion penetrated by the support member 14 and the end 36 of the sheet material 31.

[0060] The compressor insulating portion 32 is a portion coming into contact with a side surface of a cylinder formed by the compressor 8 in the sheet material 31. The compressor insulating portion 32 is wound around the compressor 8 so that a surface on a felt layer side faces the compressor 8, and an end 35 on the compressor insulating portion 32 side of the sheet material 31 (specifically, an end on a side opposing to the connected portion 34 in the compressor insulating portion 32) does not reach to an end on the connected portion 34 side of the compressor insulating portion 32. Specifically, the compressor insulating portion 32 does not surround all side surfaces of the compressor 8, and a gap which is not covered by the compressor insulating portion 32 is formed in a region on the accumulator 7 side around the compressor 8. Also, the compressor insulating portion 32 is wound around the compressor 8 so that the end 35 comes into contact with a back surface opposing to the accumulator 7 in the accumulator insulating portion 33. Also, the sheet material 31 is attached so that a part of a surface on a rubber layer side of the compressor insulating portion 32 (the end 35 on the compressor insulating portion 32 side in the sheet material 31) comes into contact with a part of a surface on a rubber layer side of the accumulator insulating portion 33, and a region in which the compressor 8 is arranged is isolated from the outside.

[0061] The sheet material 31 further includes a compressor side fitting 37, an accumulator side fitting 38, and a binding string 39. The compressor side fitting 37 is con-

nected to a surface on a rubber layer side of the compressor insulating portion 32 and protrusively formed so as to protrude from the surface on the rubber layer side of the compressor insulating portion 32. The accumulator side fitting 38 is connected to a surface on a rubber layer side of the accumulator insulating portion 33 and protrusively formed so as to protrude from the surface on the rubber layer side of the accumulator insulating portion 33. The binding string 39 is arranged so that the compressor 8 and the accumulator 7 are arranged between the binding string 39 and the connected portion 34 when the sheet material 31 is wound around the compressor 8 and the accumulator 7. The binding string 39 is entwined with the compressor side fitting 37 and the accumulator side fitting 38 so as to draw a portion connected with the compressor side fitting 37 in the compressor insulating portion 32 and a portion connected with the accumulator side fitting 38 in the accumulator insulating portion 33. Accordingly, the binding string 39 fixes the sheet material 31 to the compressor 8 and the accumulator 7 to prevent coming off of the sheet material 31 from the compressor 8 and the accumulator 7.

[0062] As with the compressor system according to the first embodiment, a compressor system applying the sheet material 31 reduces heat transfer from the compressor 8 to the accumulator 7 and can reduce heat loss of a high temperature refrigerant discharged from the compressor 8 by arranging an isolating portion, which is a part of the sheet material 31, so as to isolate a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged.

[0063] The compressor system applying the sheet material 31 includes a portion in which the sheet material 31 is not doubly arranged between a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged. Therefore, in the compressor system applying the sheet material 31, efficiency for reducing heat transfer from the compressor 8 to the accumulator 7 is lowered in comparison with the compressor system according to the first embodiment, in which the sheet material 15 is between the compressor 8 and the accumulator 7 is doubly arranged. However, when heat transfer from the compressor 8 to the accumulator 7 can be sufficiently reduced even in the case where a portion in which the sheet material 31 is not doubly arranged is arranged between the compressor 8 and the accumulator 7, the sheet material 31 including a portion in which the sheet material 31 is not doubly arranged may be applied like the compressor system according to the second embodiment.

[0064] Also, as with the compressor system according to the first embodiment, in a compressor system applying the sheet material 31, the compressor 8 and the accumulator 7 are insulated by one sheet material 31, and labor for assembling the sheet material 31 can be reduced. Accordingly, the sheet material 31 can be easily attached to the compressor 8 and the accumulator 7.

[0065] When the compressor insulating portion 32 is

wound around the compressor 8, the sheet material 31 can be formed in a small shape and inexpensively manufactured in comparison with the sheet material 15 according to the first embodiment since the compressor insulating portion 32 does not cover all of side surfaces of the compressor 8. The compressor system applying the sheet material 31 can be inexpensively manufactured in comparison with the compressor system according to the first embodiment since the sheet material 31 can be formed in a small shape.

[0066] The sheet material 31 can isolate a region in which the compressor 8 is arranged from the outside by winding a part of the compressor insulating portion 32 (the end 35 on the compressor insulating portion 32 side of the sheet material 31) around the compressor 8 so as to come into contact with the accumulator insulating portion 33. Therefore, an air conditioner applying the sheet material 31 can isolate a region in which the compressor 8 is arranged from the outside through the sheet material 31 and can reduce noise leaking from the compressor 8 to the outside even in the case where the compressor insulating portion 32 does not surround all side surfaces of the compressor 8.

Third Embodiment

[0067] Fig. 6 illustrates a heat insulating material according to a third embodiment of a compressor system. As with the sheet material 15, a sheet material 41 is formed in a sheet and formed in a multi-layer structure in which multiple layers including a felt layer and a rubber layer are laminated. The felt layer is formed of a felt-like heat insulating material. The rubber layer is formed of rubber and laminated on the felt layer.

[0068] The sheet material 41 includes a compressor insulating portion 42, an accumulator insulating portion 43, and a connected portion 44. The connected portion 44 is arranged between the compressor insulating portion 42 and the accumulator insulating portion 43 and connects the compressor insulating portion 42 and the accumulator insulating portion 43. The accumulator insulating portion 43 is a portion coming into contact with a side surface of a cylinder formed by the accumulator 7 in the sheet material 41. The accumulator insulating portion 43 is wound around the accumulator 7 so that a surface on a felt layer side faces the accumulator 7, and an end 46 on the accumulator insulating portion 43 side of the sheet material 41 (specifically, an end on a side opposing to the connected portion 44 in the accumulator insulating portion 43) does not reach to an end on the connected portion 44 side of the accumulator insulating portion 43. Specifically, the accumulator insulating portion 43 does not surround all side surfaces of the accumulator 7, and a gap which is not covered by the accumulator insulating portion 43 is formed in a region on the compressor 8 side around the accumulator 7.

[0069] The compressor insulating portion 42 is a portion coming into contact with a side surface of a cylinder

formed by the compressor 8 in the sheet material 41. The compressor insulating portion 42 is wound around the compressor 8 so that a surface on a felt layer side faces the compressor 8 and an end 45 of the sheet material 41 is sandwiched between the compressor insulating portion 42 and the compressor 8. A cut is formed at the compressor insulating portion 42. The cut is formed so that the support member 14 penetrates the cut when the compressor insulating portion 42 is winding around the compressor 8. The cut is formed so as to connect a portion penetrated by the support member 14 and the end 45 of the sheet material 41.

[0070] Also, another cut is formed at the compressor insulating portion 42. The cut is formed so that a portion connecting the accumulator 7 and the compressor 8 in the inlet side piping 10 penetrates the cut when the compressor insulating portion 42 is winding around the compressor 8. The cut is formed so as to connect a portion penetrated by the inlet side piping 10 and the end 45 of the sheet material 41.

[0071] Also, the sheet material 41 is attached so that a part of a surface on a rubber layer side of the accumulator insulating portion 43 (the end 46 on the accumulator insulating portion 43 side of the sheet material 41) comes into contact with a part of a surface on a rubber layer side of the compressor insulating portion 42, and a region in which the accumulator 7 is arranged is isolated from the outside.

[0072] The sheet material 41 further includes a compressor side fitting 47, an accumulator side fitting 48, and a binding string 49. The compressor side fitting 47 is connected to a surface on a rubber layer side of the compressor insulating portion 42 and protrusively formed so as to protrude from the surface on the rubber layer side of the compressor insulating portion 42. The accumulator side fitting 48 is connected to a surface on a rubber layer side of the accumulator insulating portion 43 and protrusively formed so as to protrude from the surface on the rubber layer side of the accumulator insulating portion 43. The binding string 49 is arranged so that the compressor 8 and the accumulator 7 are arranged between the binding string 49 and the connected portion 44 when the sheet material 41 is wound around the compressor 8 and the accumulator 7. The binding string 49 is entwined with the compressor side fitting 47 and the accumulator side fitting 48 so as to draw a portion connected with the compressor side fitting 47 in the compressor insulating portion 42 and a portion connected with the accumulator side fitting 48 in the accumulator insulating portion 43. The binding string 49 fixes the sheet material 41 to the compressor 8 and the accumulator 7 to prevent coming off of the sheet material 41 from the compressor 8 and the accumulator 7 by drawing the compressor side fitting 47 and the accumulator side fitting 48.

[0073] As with the compressor system according to the first embodiment, a compressor system applying the sheet material 41 reduces heat transfer from the compressor 8 to the accumulator 7 and can sufficiently reduce

heat loss of a high temperature refrigerant discharged from the compressor 8 by arranging a part of the sheet material 41 so as to isolate a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged.

[0074] The compressor system applying the sheet material 41 includes a portion in which the sheet material 41 is not doubly arranged between a region in which the compressor 8 is arranged and a region in which the accumulator 7 is arranged. Therefore, in the compressor system applying the sheet material 41, efficiency for reducing heat transfer from the compressor 8 to the accumulator 7 is low in comparison with the compressor system according to the first embodiment, in which the sheet material 15 between the compressor 8 and the accumulator 7 is doubly arranged. However, when heat transfer from the compressor 8 to the accumulator 7 can be sufficiently reduced even in the case where a portion in which the sheet material 41 is not doubly arranged is arranged between the compressor 8 and the accumulator 7, the sheet material 41 including a portion in which the sheet material 41 is not doubly arranged can be applied like the compressor system according to the third embodiment.

[0075] Also, as with the air conditioner 1 according to the first embodiment, in an air conditioner applying the sheet material 41, the compressor 8 and the accumulator 7 are insulated by one sheet material 41, and labor for attaching the sheet material 41 can be reduced. Accordingly, the sheet material 41 can be easily attached to the compressor 8 and the accumulator 7.

[0076] When the accumulator insulating portion 43 is wound around the accumulator 7, the sheet material 41 can be formed in a small shape and inexpensively manufactured in comparison with the sheet material 15 according to the first embodiment since the accumulator insulating portion 43 does not entirely cover side surfaces of the accumulator 7. The air conditioner applying the sheet material 41 can be inexpensively manufactured in comparison with the air conditioner 1 according to the first embodiment since the sheet material 41 can be formed in a small shape.

[0077] In the above embodiment, a multiple cylinder rotary compressor including multiple cylinder chambers as the compressor 8 is illustrated as an example. However, a compressor is not limited to the multiple cylinder rotary compressor. A multi-stage rotary compressor capable of obtaining a high compression ratio since a cylinder chamber has a multi-stage structure and a single cylinder rotary compressor including one cylinder chamber can be applied. Also, the compressor 8 can be switched to a compressor different from the rotary compressor. As the compressor, a scroll compressor is exemplified. In this case, a compressor system can insulate the compressor 8 and the accumulator 7 by one sheet material 15, 31, 41 and has a small number of components. Therefore, labor for attaching the sheet materials 15, 31, 41 can be reduced, and the sheet material 15 can

be easily attached to the compressor 8 and the accumulator 7.

[0078] The compressor system can be used in other device different from an air conditioner. As the device, a refrigerator-freezer and a heat pump type hot water supply system are exemplified. In this case, the compressor system can insulate the compressor 8 and the accumulator 7 by one sheet material 15, 31, 41 and has a small number of components. Therefore, labor for attaching the sheet material 15, 31, 41 can be reduced, and the sheet material 15, 31, 41 can be easily attached to the compressor 8 and the accumulator 7.

Claims

1. A compressor system comprising:

an accumulator (7) configured to accumulate a refrigerant;
an compressor (8) configured to compress the refrigerant; and
a sheet material (15; 31; 41) formed in one sheet, **characterized in that** the sheet material (15; 31; 41) comprises:

a compressor insulating portion (16; 32; 42) to be wound around the compressor (8);
an accumulator insulating portion (17; 33; 43) to be wound around the accumulator (7); and
an isolating portion arranged between the compressor (8) and the accumulator (7) so as to isolate a region in which the compressor (8) is arranged and a region in which the accumulator (7) is arranged.

2. The compressor system according to claim 1, **characterized in that** the sheet material (15) is wound around the compressor (8) such that the compressor insulating portion (16) surrounds the compressor (8), and the sheet material (15) is wound around the accumulator (7) such that the accumulator insulating portion (17) surrounds the accumulator (7).

3. The compressor system according to claim 1, **characterized in that** the sheet material (31) is wound around the accumulator (7) such that the accumulator insulating portion (33) surrounds the accumulator (7), and the sheet material (31) is wound around the compressor (8) such that a gap which is not covered by the compressor insulating portion (32) is formed in a region on the accumulator (7) side around the compressor (8).

4. The compressor system according to claim 1, **characterized in that** the sheet material (41) is wound around the compressor (8) such that the compressor

insulating portion (42) surrounds the compressor (8), and the sheet material (41) is wound around the accumulator (7) such that a gap which is not covered by the accumulator insulating portion (43) is formed in a region on the compressor (8) side around the accumulator (7).

5. The compressor system according to any one of claims 1 to 4, further comprising a fixed member configured to fix the sheet material (15; 31; 41) with the compressor (8) and the accumulator (7) by fastening the sheet material (15; 31; 41) so as to draw a part of the compressor insulating portion (16; 32; 42) and a part of the accumulator insulating portion (17; 33; 43).

6. The compressor system according to any one of claims 1 to 5, **characterized in that** the sheet material (15; 31; 41) is wound around the compressor (8) and the accumulator (7) such that a part of the accumulator insulating portion (17; 33; 43) comes into contact with a part of the compressor insulating portion (16; 32; 42).

7. An air conditioner (1), comprising:

the compressor system according to any one of claims 1 to 6;
an indoor heat exchanger (6); and
an outdoor heat exchanger (3).

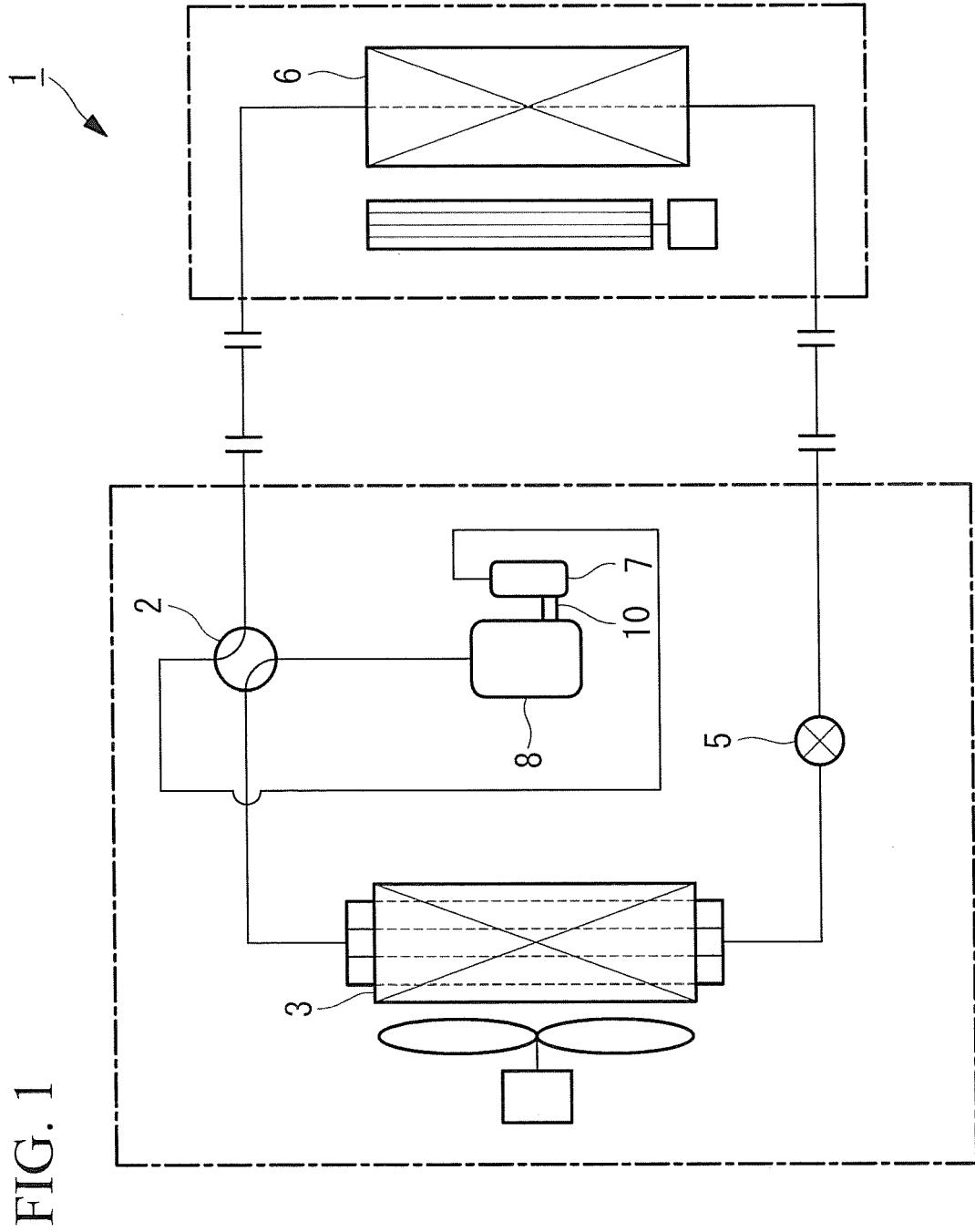


FIG. 1

FIG. 2

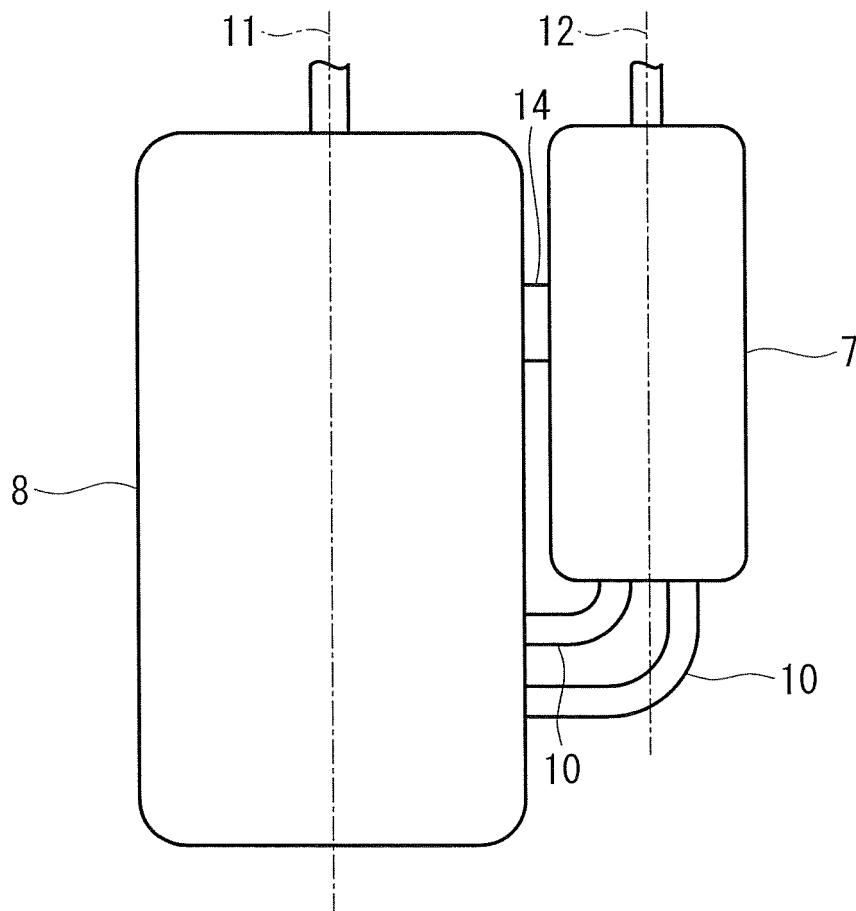


FIG. 3

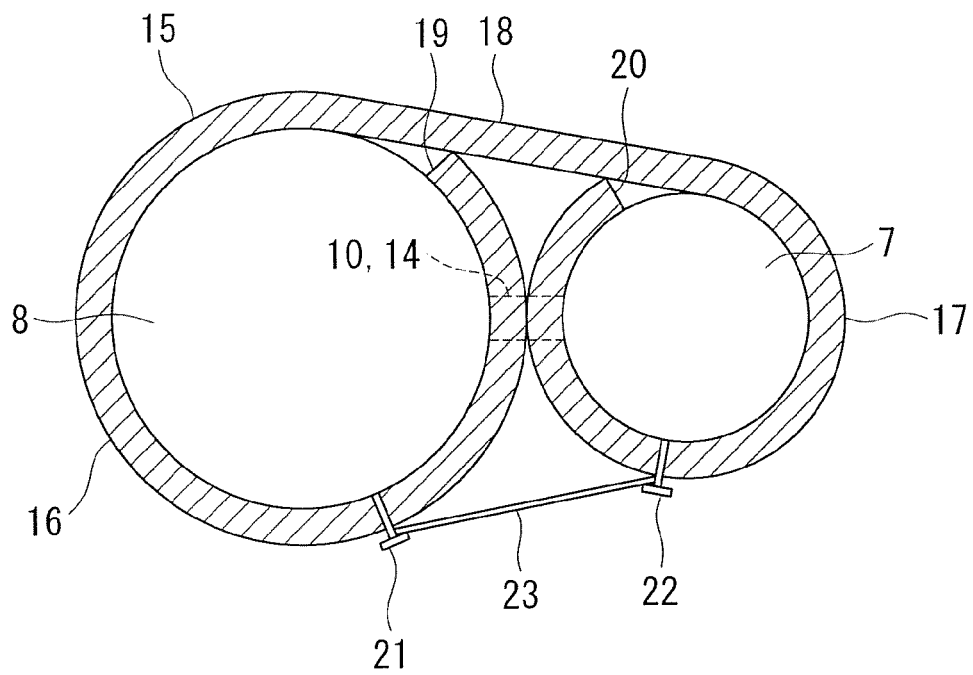


FIG. 4

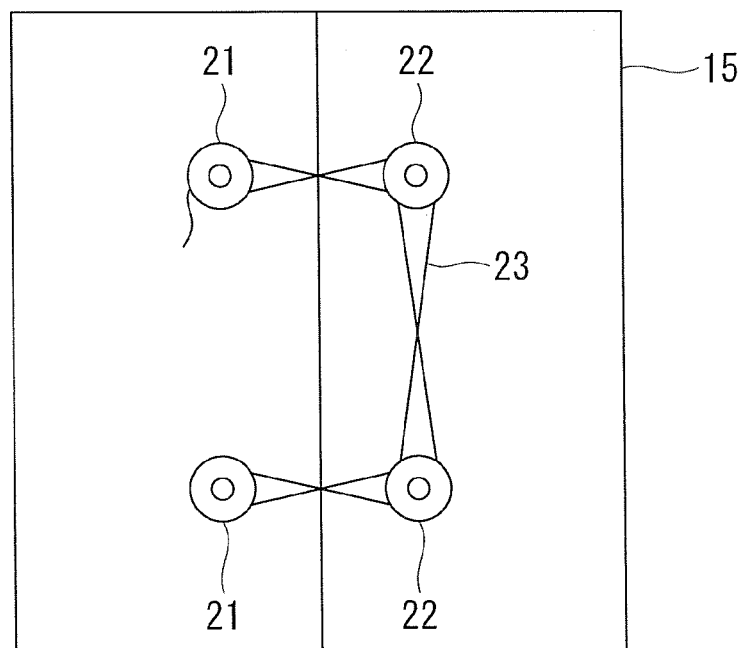


FIG. 5

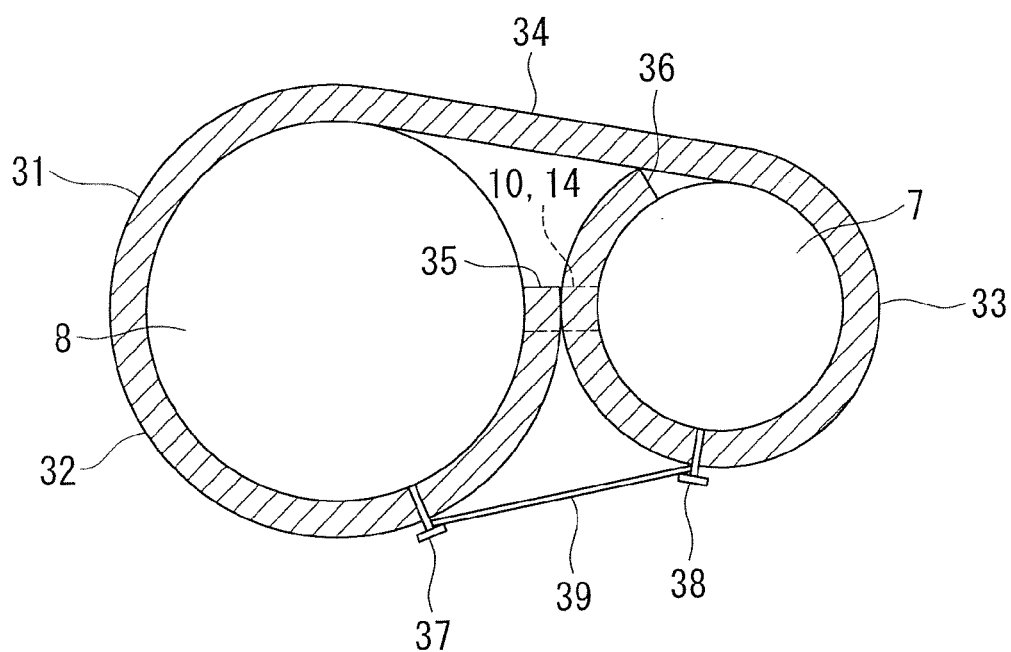
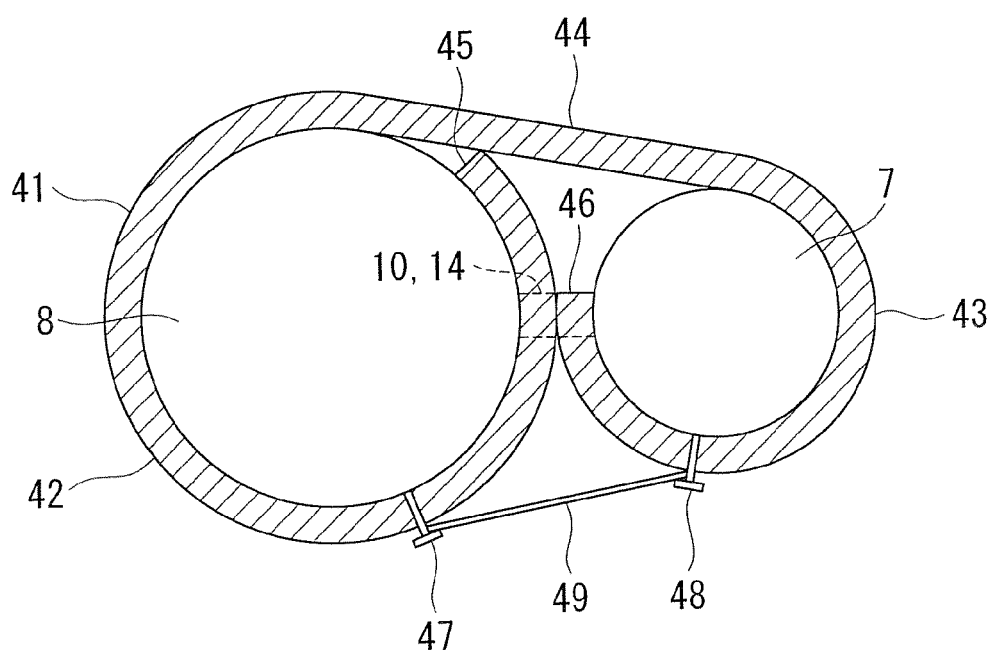


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 15 17 3899

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