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(54) BRACKET FOR COMPRESSOR, AND ROTARY COMPRESSOR

(57) A bracket for a compressor is provided with: a base (31) affixed to the outer peripheral surface of a housing (11); a pair of arms (32A, 32B) provided so as to tilt from both ends of the base (31) toward the outside of the base (31); and contact sections (33) provided on the side of the arms (32A, 32B) opposite the side connected to the base (31). The contact sections (33) have bends (33A, 33B) formed to curve toward the outside where the pair of arms (32A, 32B) separate from each other.

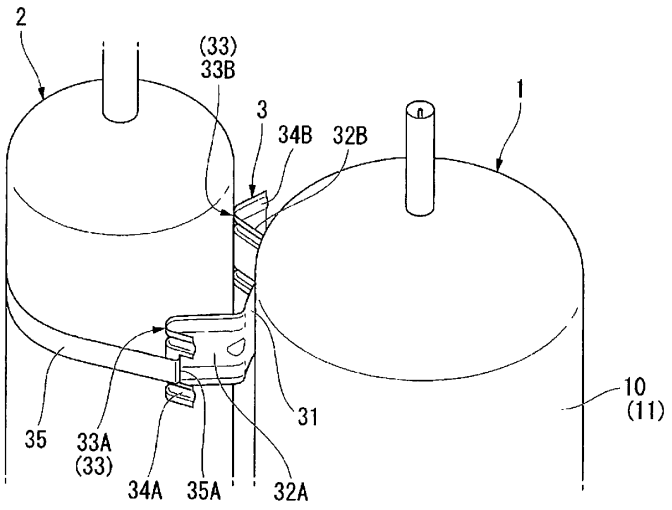

FIG. 2

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Description

Technical Field

[0001] The present invention relates to a bracket for a compressor, and a rotary compressor.

[0002] This application claims priority based on Japanese Patent Application No. 2014-211810 filed on October 16, 2014, of which the contents are incorporated herein.

Background Art

[0003] Conventionally, a structure for a rotary compressor used in air conditioners and refrigerators or the like, as described in patent document 1 for example, which is provided with a cylinder and a piston rotor provided within a cylinder where eccentric rotation is given by the amount of eccentricity of an eccentric shaft portion. A rotary compressor having a structure in which two cylinders are partitioned by a separator is known.

[0004] In such a rotary compressor 100, as illustrated in FIG. 8, there is a structure in which an accumulator 103 is attached via a bracket 102 to the outer peripheral surface of a housing 101 configuring a sealed container. Bracket 102 is provided with a base 106, and a pair of an arm 104 and an arm 104 provided tilting towards the outside of the base 106. A locking surface 104a is provided on each of that arms 104 for aligning with the outer peripheral surface 103a of the accumulator 103. Bracket 102 brings the locking surface 104a of the arm 104 into contact with the outer peripheral surface 103a of the accumulator 103 so that the surfaces contact each other, and locks the end of a belt member 105 wound around the outer peripheral surface 103a of the accumulator 103 to the tips of the pair of arms 104. Thus, the bracket 102 is configured affixing the accumulator 103 to the housing 101.

Citation List

Patent Document

[0005] Patent Document 1: Japanese Unexamined Patent Application Publication No. H9-250477A

Summary of Invention

Technical Problem

[0006] However, in a conventional rotary compressor, when an excitation force is transmitted to the accumulator by operation of the compressor, there is a risk that the accumulator will vibrate and emit noise. This excitation force is estimated to be a motor magnetic excitation force and a pulsating excitation force. Other than an intake pulse, it is an excitation force generated from the compressor main body. Thus, it is necessary to suppress vibration propagation from the compressor main body.

[0007] The binding portion of the accumulator and the compressor main body is only the bracket 102 as illustrated in FIG. 8, and an intake pipe bent in an L-shape, thus, it is difficult to change the structure of the intake pipe.

[0008] The conventional structure as illustrated in FIG. 8 is a configuration wherein the locking surfaces 104a of the arms 104 on the bracket 102 come into contact with the outer peripheral surface 103a of the accumulator 103. Thus, both of the contact surface areas are large, and there is room for improvement in that the vibration transmission rate of the compressor main body becomes large.

[0009] The present invention provides a bracket for a compressor, and a rotary compressor that can effectively suppress the generation of vibration and noise from the accumulator by reducing the contact surface area of the bracket for compressor.

Solution to Problem

[0010] A bracket for compressor according to one embodiment of the present invention is provided with a base, a pair of arms provided tilting from both ends of the base toward the outside of the base, and a contact section provided on a side of the arms opposite the side connected to the base, wherein the contact section is formed with a bend.

[0011] According to such a configuration, it is possible to cause the tip of the bend formed in the contact section of the arm portions to contact and to attach to the other outer peripheral surface in a state where the base portion is affixed to either one of the compressor main body or the accumulator. Thereby, the bend is in line contact with the outer peripheral surface, and the contact surface area can be reduced compared to when in surface contact. Therefore, it is possible to suppress the vibration transmission rate from the compressor main body on the accumulator so as to be small. Thus, it

is possible to reduce the vibration of the accumulator, and to reduce the emitted noise generated from the accumulator.

[0012] The bracket for compressor in a second embodiment of the present invention, according to the first embodiment, wherein the bend is curved toward the outside where the pair of arms are separated from each other.

[0013] In this case, it is possible to connect, for example, a band member wound around the outer peripheral surface of the accumulator to the outwardly bent bend, and it is possible to more reliably attach it to the accumulator.

[0014] The bracket for compressor in a third embodiment of the present invention, according to the first or second embodiment, wherein a convex portion is preferably provided in the contact section.

[0015] In this case, the convex portion provided on the contact section can be attached in contact with any one of the outer peripheral surfaces of the compressor main body and the accumulator. Thereby, the convex portion is in point contact with the outer peripheral surface, and the contact surface area can be reduced compared to when in surface contact. Therefore, it is possible to suppress the vibration transmission rate from the compressor main body to the accumulator so as to be small, it is possible to reduce the vibration of the accumulator, and to reduce the emitted noise generated from the accumulator.

[0016] The bracket for compressor in a fourth embodiment of the present invention, according to the first or second embodiment, wherein a notch is preferably provided in the contact section.

[0017] In this case, the portion remaining due to the notch provided on the contact section can be attached in contact with any one of the outer peripheral surfaces of the compressor main body and the accumulator. Thereby, the contact surface area on the outer peripheral surface can be reduced compared to when in surface contact. Therefore, it is possible to suppress the vibration transmission rate from the compressor main body to the accumulator so as to be small, it is possible to reduce the vibration of the accumulator, and to reduce the emitted noise generated from the accumulator.

[0018] The bracket for compressor in a fifth embodiment of the present invention, according to any one of the first to fourth embodiments, wherein a rib is preferably provided in the arms.

[0019] In this case, the rigidity of the arms can be increased by the rib, and in particular, it can respond to a low frequency excitation force.

[0020] A rotary compressor in a sixth embodiment of the present invention is a rotary compressor using a bracket for compressor according to any one of the first to fourth embodiments, provided with a compressor main body and an accumulator, wherein

the compressor main body and the accumulator are connected using the bracket for compressor, a band member connected to a bend of the bracket for compressor and wound around the outer peripheral surface of the accumulator, and an elastic sheet disposed on the inside of the band member.

[0021] According to such a configuration, the bracket for compressor is affixed to the accumulator by the band member wound around the outer peripheral surface of accumulator being connected to the bend of the bracket for compressor. In this embodiment, since the elastic sheet is disposed inside the band member, the vibration of the accumulator can be reduced by the shearing deformation of the elastic sheet, and the emitted noise generated from the accumulator can be reduced.

[0022] The rotary compressor in a seventh embodiment of the present invention, according to the sixth embodiment, wherein the arms are attached to the base having an incline contacting in a tangential direction of the accumulator.

[0023] In this case, it is possible to attach the outer peripheral portion of the accumulator in contact with the pair of arms on the bracket for compressor so as to be interposed therebetween. Also in this case, the vibration of the accumulator can be reduced by the shear deformation of the elastic sheet as described above. Since the inclined portions of the arms extend in the tangential direction of the accumulator, the inclined portions are perpendicular to the radial direction of the accumulator. Thus, vibration in the radial direction of the accumulator can be effectively suppressed. Thereby, it is possible to exhibit a vibration suppression effect in a concentrated winding motor having a large radial vibration in particular.

Summary of Invention

[0024] According to the bracket for compressor, and rotary compressor of the present invention, it is possible to effectively suppress the generation of vibration and noise from the accumulator by reducing the contact surface area of the bracket for compressor.

Brief Description of Drawings

[0025]

FIG. 1 is a longitudinal section view of a compressor provided with the accumulator according to a first embodiment of the present invention.

FIG. 2 is a perspective view of a main portion of the compressor illustrated in FIG. 1.
FIG. 3 is a top view illustrating a configuration of the compressor.
FIG. 4 is a perspective view illustrating a configuration of the bracket illustrated in FIG. 3.
FIG. 5 is a top surface view illustrating a configuration of a compressor according to a second embodiment, and is a drawing corresponding to FIG. 3.
FIG. 6 is a perspective view illustrating a configuration of a bracket according to a third embodiment, and is a drawing corresponding to FIG. 4.
FIG. 7 is a perspective view illustrating a configuration of a bracket according to a fourth embodiment, and is a drawing corresponding to FIG. 4.
FIG. 8 is a top surface view illustrating a main portion of a conventional compressor.

Description of Embodiments

[0026] Hereinafter, the bracket for a compressor, and the rotary compressor according to an embodiment of the present invention will be described based on the drawings. Related embodiment illustrates one embodiment of the present invention and does not limit the present invention, but can be arbitrarily modified within the scope of the technical idea of the present invention.

First Embodiment

[0027] As illustrated in FIG. 1, the rotary compressor according to the present embodiment (hereinafter simply referred to as the compressor 1) is provided with a compressor main body 10 and an accumulator 2. The compressor main body 10 has a disk-shaped cylinder 20A and a cylinder 20B provided in two stages, upper and lower, inside a cylindrical sealed housing 11 having a central axis in the vertical direction. The compressor main body 10 is what is called a two-cylinder type. The cylindrical cylinder inner wall surfaces 20S having an axes in the vertical direction are formed in the central portion of each of the pair of cylinder 20A and cylinder 20B.

[0028] A cylindrical piston rotors 21A and a piston rotor 21B having an outer diameter that is smaller than the inner diameter of the cylinder internal wall surface 20S are disposed inside cylinder 20A and cylinder 20B. Each of the piston rotor 21A and piston rotor 21B is inserted and affixed to eccentric shaft portion 23A and eccentric shaft portion 23B of the shaft 22 along the center axis of the housing 11. In this way, each space R having a crescent-shaped cross-section is formed between the cylinder internal wall surfaces 20S of the cylinder 20A and the cylinder 20B, and outer peripheral surfaces of the piston rotor 21A and the piston rotor 21B.

[0029] Here, the upper stage side piston rotor 21A and the lower stage side piston rotor 21B are provided so that their phases are different from each other.

[0030] Furthermore, a disc-shaped separator 24 is provided between the upper and lower cylinder 20A and cylinder 20B. Due to the separator 24, the space R inside the upper stage side cylinder 20A and the space R of the lower stage side cylinder 20B do not communicate with each other, and are partitioned into a compression chamber R1 and a compression chamber R2.

[0031] Blades (not illustrated in the drawings) that divide each of the compression chamber R1 and the compression chamber R2 into two sections are provided in the upper and lower cylinder 20A and cylinder 20B. The blades are supported in insertion channels formed extending in the radial direction of the cylinder 20A and the cylinder 20B, so that the blades can be freely move forward or backward in a direction to approach or be separated from the piston rotor 21A and the piston rotor 21B. The rear end portions of the blades are pressed by a coil spring. Thus, the tip end portions of the blades are always pressed against the piston rotor 21A and the piston rotor 21B.

[0032] As illustrated in FIG. 1, the shaft 22 is rotatably supported around its axis by an upper and lower bearing 26A and 26B affixed to the upper and lower cylinder 20A and cylinder 20B using bolts.

[0033] The eccentric shaft 23A and the eccentric shaft 23B offset in a direction perpendicular from the central axis of the shaft 22 to the inside of the piston rotor 21A and the piston rotor 21B are formed in the shaft 22. The eccentric shaft 23A and the eccentric shaft 23B have an outer diameter that is slightly smaller than the inner diameter of the piston rotor 21A and the piston rotor 21B. Thereby, when the shaft 22 rotates, the eccentric shaft 23A and the eccentric shaft 23B revolves around the central axis of shaft 22, and the upper and lower piston rotor 21A and piston rotor 21B rotates eccentrically inside the cylinder 20A and the cylinder 20B. At this time, since the blades are pressed by a coil spring, the tip portion advances following the movement of the piston rotor 21A and the piston rotor 21B, and is always pressed against the piston rotor 21A and the piston rotor 21B.

[0034] The shaft 22 extends protruding upwards from the bearing 26A. A rotor 41 of the motor 40 is provided on the protrusion of the shaft 22 to rotate the shaft 22. A stator 42 is provided affixed to the internal peripheral surface of a housing 11, against the outer peripheral portion of the rotor 41.

[0035] An opening 12A and an opening 12B are each formed on the inside of the housing 11 in positions facing the

outer peripheral surface of the cylinder 20A and the cylinder 20B. The intake port 30A and the intake port 30B that communicate up to a predetermined position of the cylinder internal wall surface 20S are formed in the cylinder 20A and the cylinder 20B, in positions facing the opening 12A and the opening 12B.

[0036] The accumulator 2 for gas-liquid separation of a refrigerant prior to being supplied to the compressor main body 10 is affixed to the housing 11 via a bracket for a compressor (hereinafter simply referred to as the bracket 2) on the outside of the housing 11.

[0037] An intake pipe 2A and an intake pipe 2B are provided in the accumulator 2 for causing the refrigerant inside the accumulator 2 to be taken into the compressor main body 10. The tip portions of the intake pipe 2A and the intake pipe 2B pass through the opening 12A and the opening 12B, and are respectively connected to the intake port 30A and the intake port 30B.

[0038] In such a compressor 1, the refrigerant is taken into the accumulator 2 from an intake opening 2a, and the refrigerant is gas-liquid separated in the accumulator 2. In the compressor 1, the gas phase after gas-liquid separation is introduced from the intake pipe 2A and the intake pipe 2B via the intake port 30A and the intake port 30B of the cylinder 20A and the cylinder 20B, and is supplied to the compression chamber R1 and the compression chamber R2, which are the internal spaces of the cylinder 20A and the cylinder 20B.

[0039] The volume of the compression chamber R1 and the compression chamber R2 is gradually decreased by the eccentric rotation of the piston rotor 21A and the piston rotor 21B, and the refrigerant is compressed. Discharge holes (not illustrated in the drawings) for discharging the refrigerant are formed at predetermined positions of the cylinder 20A and the cylinder 20B. A reed valve (not illustrated in the drawings) is provided in the discharge hole. Thereby, when the pressure of the compressed refrigerant increases, the reed valve is pressed open, and the refrigerant is discharged to the outside of the cylinder 20A and the cylinder 20B. The discharged refrigerant is emitted from a discharge pipe 27 provided on the upper portion of the housing 11 to an external pipe that is not illustrated.

[0040] Next, the structure of the bracket 3 for affixing the accumulator 2 to the outer peripheral surface of the compressor main body 10 (housing 11) will be described in detail based on drawings.

[0041] As illustrated in FIG. 2 to FIG. 4, the bracket 3 is a plate-like member having a substantially hat shape. The bracket 3 is provided with: a base 31 affixed to the outer peripheral surface of the housing 11; a pair of arms 32A and 32B provided so as to extend tilting from both ends of the base 31 toward the outside of the base 31; and contact section provided on the side of the arm 32A and the arm 32B opposite the side connected to the base 31.

[0042] The contact section 33 has a bend 33A and a bend 33B formed to curve toward the outside where the pair of arms 32A and 32B separate from each other. A joint portion (first joint portion) 34A and a joint portion (second joint portion) 34B are provided on the tip end portion further extending from the bend 33A.

[0043] An end portion (first end portion) 35A and an end portion (second end portion) 35B of a bail strap 35 (band member) for winding around the outer peripheral surface of the accumulator 2 in the circumferential direction is connected to the joint portion 34A and the joint portion 34B. The end portion 35A on one side of the bail strap 35 forms a key-shape locking portion. The end portion 35A is formed so that the other end portion 35B can insert a bolt 36 therethrough, and so that the can overlap with each other at the second joint portion 34B.

[0044] For the bend 33A and the bend 33B, the bend 33A on the first joint portion 34A side is larger in bending than the bend 33B on the second joint portion 34B side (the radius of curvature is smaller). The first end portion 35A of the bail strap 35 is locked to the first joint portion 34A, and is affixed by the bolt 36. The second end portion 35B is similarly overlapped and locked to the second joint portion 34B, and is affixed by the bolt 36.

[0045] Each end of the pair of bends 33A and 33B contact the outer peripheral surface of the accumulator 2. That is, as illustrated in FIG. 3, the bracket 3 is attached to the accumulator 2 in a state where the arm 32A and the arm 32B are in line contact with the outer peripheral surface of the accumulator 2.

[0046] As illustrated in FIG. 4, a pair of longitudinal ribs 32a extending along the extending direction of both the arm 32A and the arm 32B, and a corner rib 32b provided across the base 31 from the arm 32A and the arm 32B, are provided on the inside of the arm 32A and the arm 32B. By providing the rib 32a and the rib 32b, the rigidity of the bracket 3 is improved, and in particular, it is possible to support a low frequency excitation force.

[0047] In this case, by operating the compressor main body 10 attached to the accumulator 2, the excitation force is propagated to the accumulator 2 via the bracket 3.

[0048] Next the action of the bracket for a compressor and the rotary compressor having the aforementioned configuration will be specifically described based on drawings.

[0049] As illustrated in FIG. 2 and FIG. 3, according to the present embodiment, in a state in which the base 31 of the bracket 3 is affixed to the compressor main body 10, the tip of the bend 33A and the bend 33B formed on the contact section 33 of the arm 32A and the arm 32B can be in contact with and attached to the outer peripheral surface of the accumulator 2. Thereby, the bend 33A and the bend 33B are in line contact with the outer peripheral surface of the accumulator 2. As a result, the contact surface area can be reduced compared to when in surface contact.

[0050] Therefore, it is possible to suppress the vibration transmission rate from the compressor main body 10 to the accumulator 2 so as to be small. Thus, it is possible to reduce the vibration of the accumulator 2, and to reduce the

emitted noise generated from the accumulator 2.

[0051] In the present embodiment, it is possible to connect the bail strap 35 wound around the outer peripheral surface of the accumulator 2 to the outwardly bent bend 33A and bend 33B, and it can be more reliably attached to the accumulator 2.

[0052] In the bracket for a compressor and the rotary compressor according to the aforementioned embodiment, an effect can be achieved wherein it is possible to effectively suppress the generation of vibration and noise from the accumulator 2 by reducing the contact surface area on the bracket 3.

[0053] Next, another embodiment of the bracket for a compressor and the rotary compressor according to the present invention will be described based on the attached drawings. However, for members and portions that are the same or similar to the aforementioned first embodiment, the same reference numeral will be used and a description will be omitted; the configuration differing from the first embodiment will be described.

Second Embodiment

[0054] As illustrated in FIG. 5, the compressor 1 according to the second embodiment is configured having an elastic sheet 37 disposed on the inside of the bail strap 35 (band member) for connecting the bracket 3A using adhesion.

[0055] In the bracket 3A according to the present embodiment, the arm 32A and the arm 32B are attached to the base 31 having an incline contacting in a tangential direction (the two-dot chain line E illustrated in FIG. 5) of the accumulator 2.

[0056] In the second embodiment, the bracket 3A is affixed to the accumulator 2 by the bail strap 35 wound around the outer peripheral surface of the accumulator 2 contacting the joint portion 34A and the joint portion 35B of the bracket 3A. In this state, the vibration of the accumulator 2 can be reduced by the shearing deformation of the elastic sheet 37 on the inside of the bail strap 35, and the emitted noise generated from the accumulator 2 can be reduced.

[0057] Note that by narrowing the width of the bail strap 35, an effect can be obtained that reduces the contact surface area.

[0058] Furthermore, it is possible to attach the outer peripheral portion of the accumulator 2 so as to be interposed contacting the pair of arms 32A and 32B on the bracket 3A. The inclined portion of the arm 32A and the arm 32B extends in the tangential direction E of the accumulator 2. Thus, the inclined portion is perpendicular to the radial direction of the accumulator 2. Thus, vibration in the radial direction of the accumulator 2 can be effectively suppressed. As a result, it is possible to exhibit suppression effect for vibration in a concentrated winding motor having a large radial vibration in particular.

[0059] While the above has described an embodiment of the bracket for a compressor and the rotary compressor according to the present invention, the present invention is not limited to the aforementioned embodiment, allowing suitable changes without deviation from the spirit and scope of the present invention.

[0060] For example, in the present embodiment, the base 31 of the bracket 3 is in contact with and attached to the compressor main body 10 side, and the contact section 33 (the bend 33A and the bend 33B) is in contact with and attached to the outer peripheral surface of the accumulator 2, but it is also possible to be conversely attached. That is, the contact section 33 can be in contact with and attached to the outer peripheral surface of either the compressor main body 10 or the accumulator 2.

[0061] In bracket 3, as illustrated in FIG. 6, a convex portion 38 can also be provided on a portion (contact section 33) contacting the accumulator 2 on the inside of the arm 32A and the arm 32B. The convex portion 38 illustrated in FIG. 6 is composed of a ridge 38A extending along the length direction of the arm 32A and the arm 32B, and a bulging portion 38B and a bulging portion 38C. Each of the convex portions 38 are provided so as to be in point contact with the outer peripheral portion of the accumulator 2.

[0062] In this case, the convex portions 38 (38A, 38B, 38C) provided on the contact section can be in contact with and attached to the outer peripheral surface of the accumulator 2. Thereby, the convex portion 38 is in point contact with the outer peripheral surface, and the contact surface area can be reduced compared to when in surface contact. Therefore, it is possible to suppress the vibration transmission rate from the compressor main body 10 to the accumulator 2 so as to be small. As a result, it is possible to reduce the vibration of the accumulator 2, and to reduce the emitted noise generated from the accumulator 2.

[0063] As illustrated in FIG. 7, a notch 39 may be provided on the contact section 33 on the bracket 3. In this case, the portion 33a remaining due to the notch 39 is in contact with and attached to the outer peripheral surface of the accumulator 2. Thereby, the contact surface area on the outer peripheral surface can be reduced compared to when in surface contact. Therefore, it is possible to suppress the vibration transmission rate from the compressor main body 10 to the accumulator 2 so as to be small, it is possible to reduce the vibration of the accumulator 2, and to reduce the emitted noise generated from the accumulator 2.

[0064] Note that the configuration such as the length dimensions of the base 31, the arm 32A, and the arm 32B of the bracket 3, the curvature of the bend 33A and the bend 33B, the plate thickness of the bracket 3, material and the like can be appropriately changed according to conditions such as the shape of the compressor main body 10 and the

accumulator 2, the magnitude of the vibration, and the like.

[0065] In addition, the constituent elements in the aforementioned embodiments can be replaced as appropriate with commonly known constituent elements, or the embodiments above may be appropriately combined within a scope that it does not deviate from the intention of the present invention.

Industrial Applicability

[0066] According to the bracket for a compressor and the rotary compressor it is possible to effectively suppress the generation of vibration and noise from the accumulator by reducing the contact surface area of the bracket for compressor.

Reference Signs List

[0067]

1	Compressor (Rotary Compressor)
2	Accumulator
3, 3A	Bracket (Bracket for a Compressor)
10	Compressor Main Body
11	Housing
20A, 20B	Cylinder
31	Base
32A, 32B	Arm
32a, 32b	Rib
33	Contact Section
33A, 33B	Bend
34A, 34B	Joint Portion
35	Bail Strap (Band Member)
37	Elastic Sheet
38, 38A, 38B, 38C	Convex Portion
39	Notch
E	Tangential Direction

Claims

1. A bracket for a compressor, comprising:

a base,
a pair of arms provided tilting from both ends of the base toward the outside of the base, and
a contact section provided on a side of the arms opposite the side connected to the base,
the contact section is formed having a bend.

2. The bracket for a compressor according to claim 1, wherein the bend is curved toward the outside where the pair of arms are separated from each other.

3. The bracket for a compressor according to claim 1 or 2, wherein a convex portion is provided in the contact section.

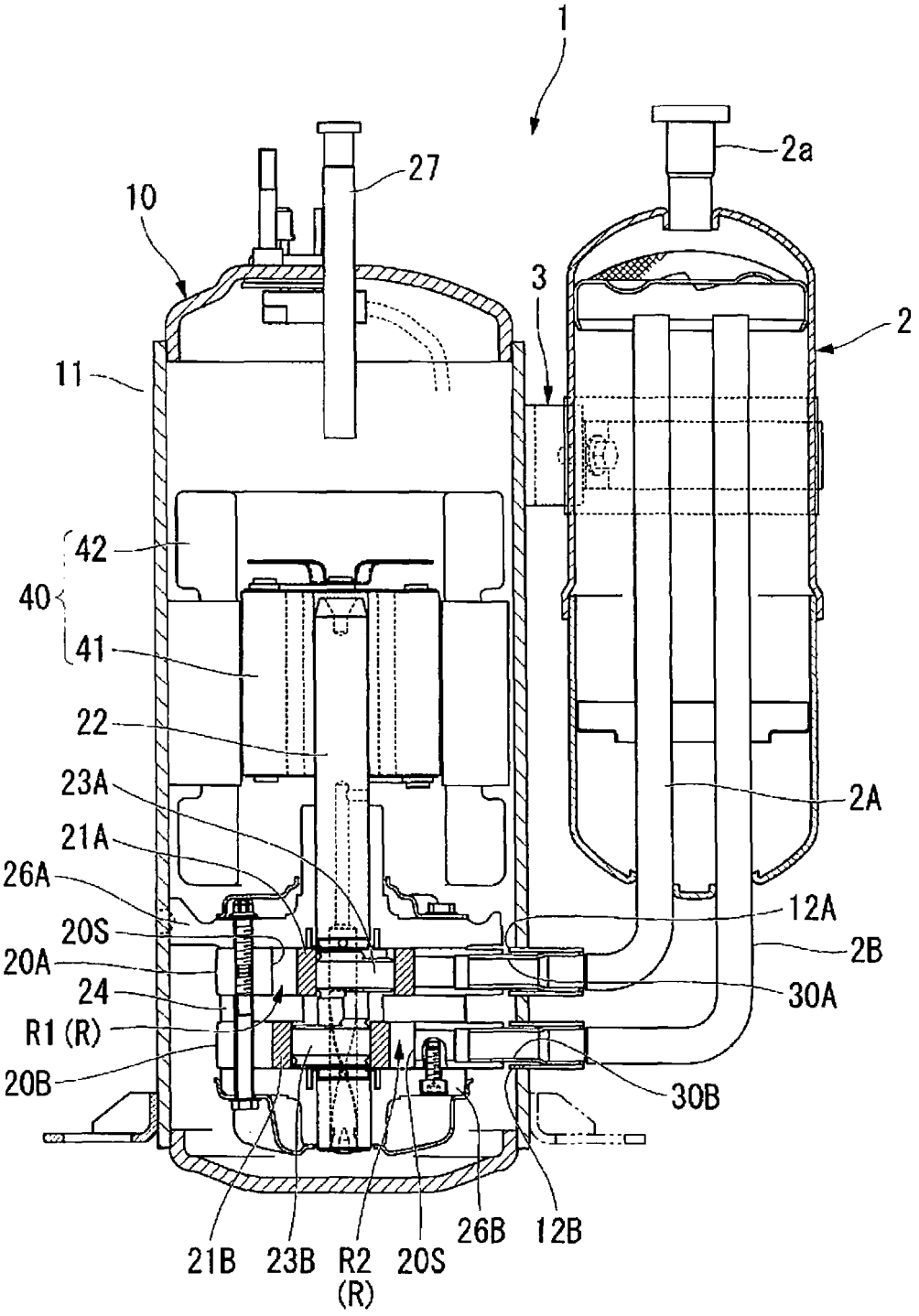
4. The bracket for a compressor according to claim 1 or 2, wherein a notch is provided in the contact section.

5. The bracket for a compressor according to any one of claims 1 to 4, wherein a rib is provided on the arms.

6. A rotary compressor using the bracket for a compressor according to any one of claims 1 to 5, comprising:

a compressor main body and an accumulator, wherein
the compressor main body and the accumulator are connected using the bracket for a compressor, a band member connected to a bend of the bracket for a compressor and wound around the outer peripheral surface of the accumulator, and an elastic sheet disposed on the inside of the band member.

7. The rotary compressor according to claim 6, wherein the arms are attached to the base having an incline contacting in a tangential direction of the accumulator.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41
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23A
2A
21A
26A
12A
20S
2B
20A
24
30A
R1 (R)
20B
30B
21B
23B
R2
(R)
20S
26B
12B

FIG. 1

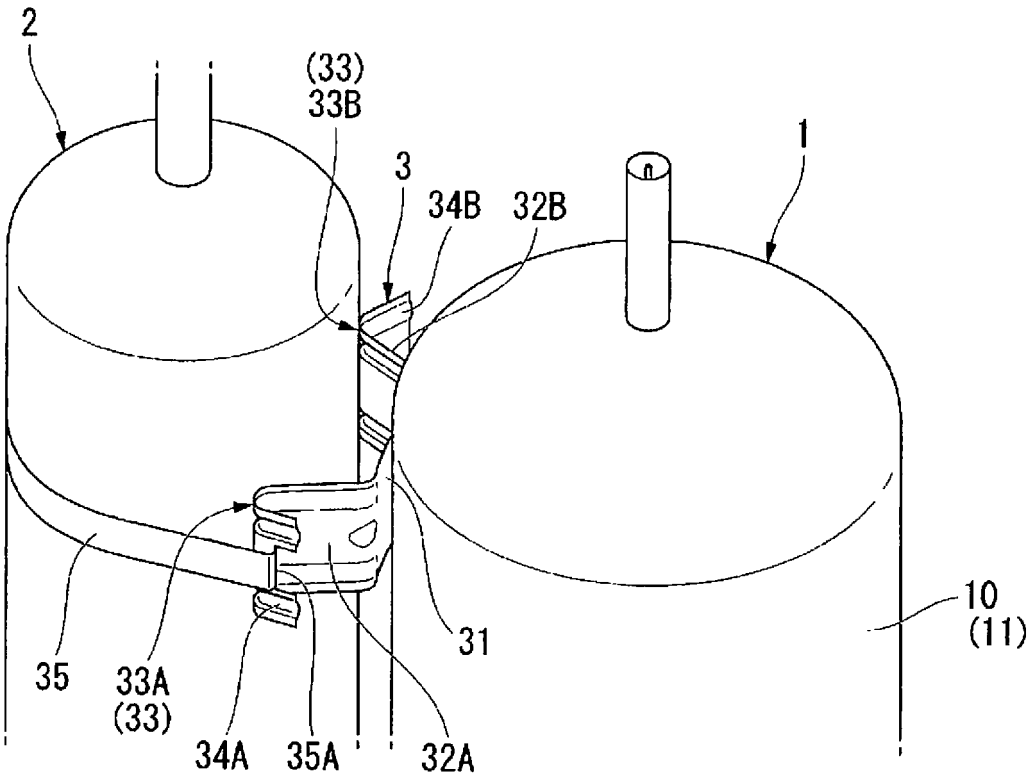
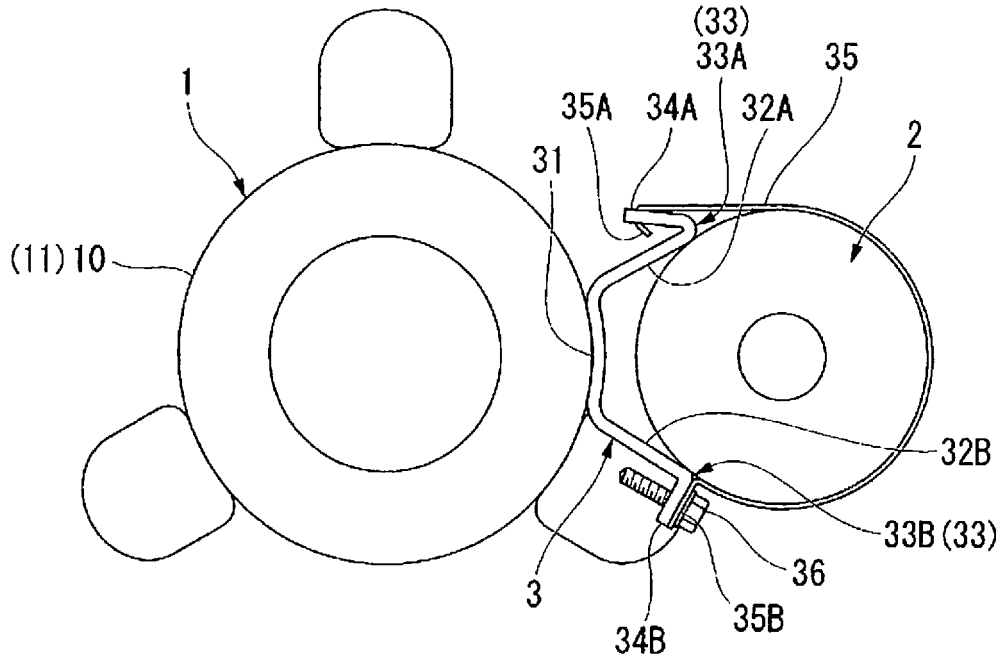


FIG. 2


(33)
33A
35
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35A
34A
32A
2
31
(11) 10
32B
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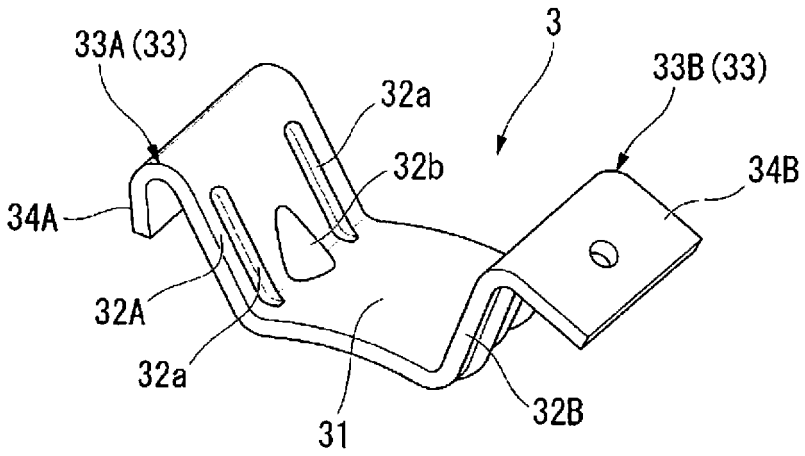
3
35B
34B

FIG. 3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32b
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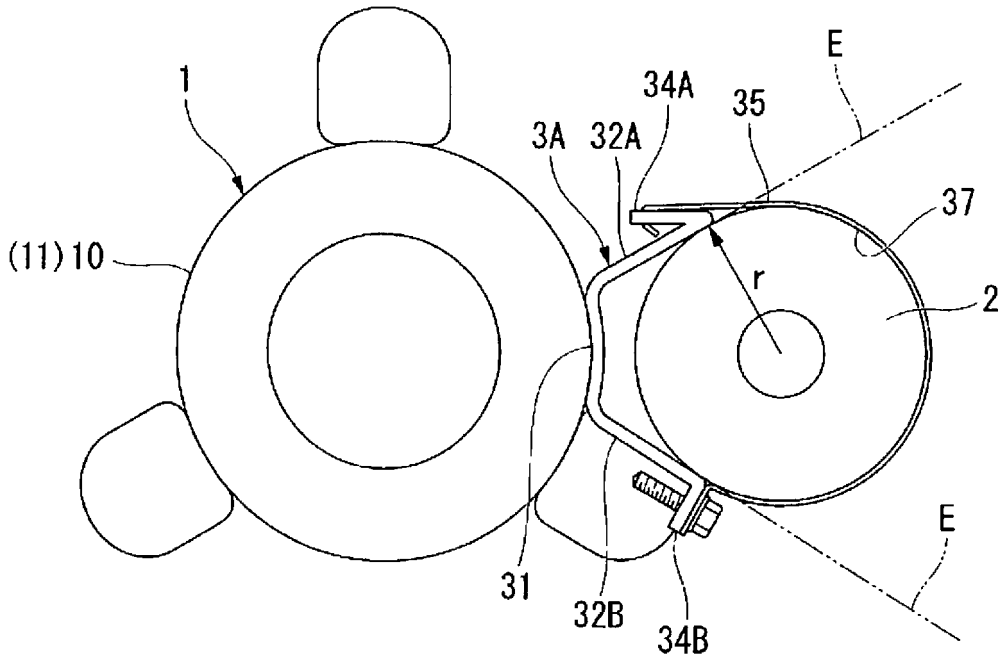
32a
32B
31

FIG. 4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(11) 10
3A
32A
34A
35
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37
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2
E
31
32B
34B

FIG. 5

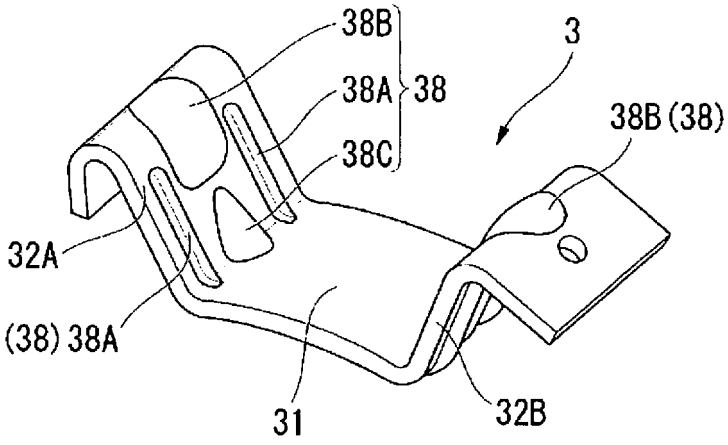
38B
38A
38
38C
3
38B (38)
32A
(38) 38A
31
32B

FIG. 6

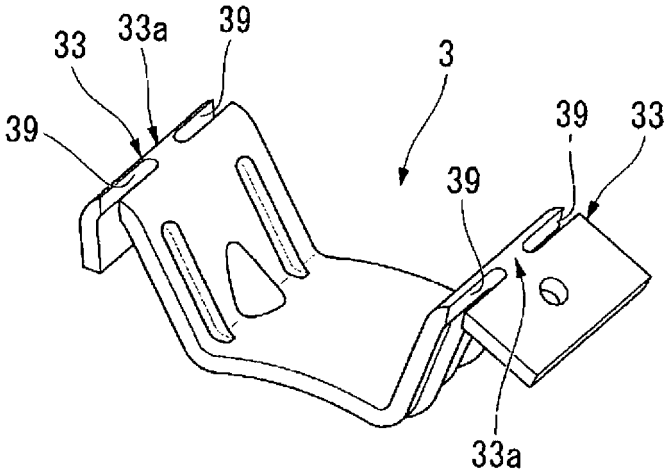
33
33a
39
3
39
39
39
33
33a

FIG. 7

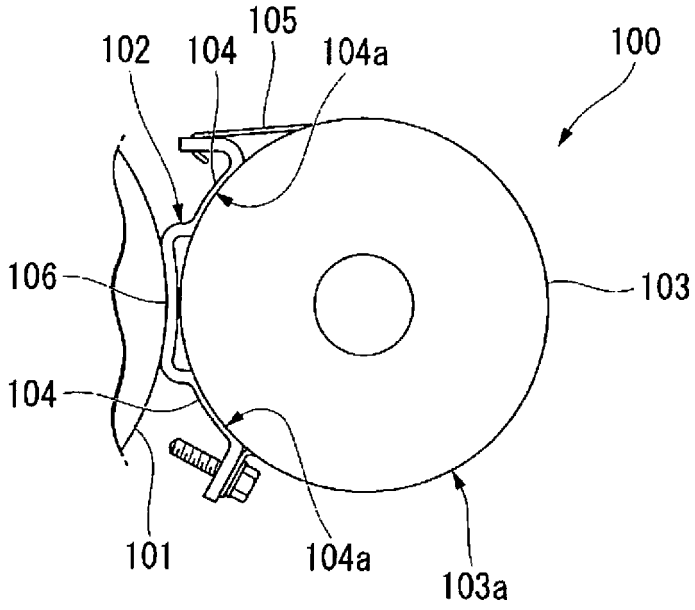
105
102
104
104a
100
106
103
104
101
104a
103a

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/073419

A. CLASSIFICATION OF SUBJECT MATTER
F04C29/12(2006.01)i, *F04B39/00*(2006.01)i, *F04C29/00*(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04C29/12, F04B39/00, F04C29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015
Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	WO 2009/078355 A1 (Daikin Industries, Ltd.), 25 June 2009 (25.06.2009), paragraphs [0026] to [0029]; fig. 5 to 6 & JP 2009-162222 A	1-3 5-7 4
Y	JP 2011-80377 A (Mitsubishi Electric Corp.), 21 April 2011 (21.04.2011), paragraph [0022]; fig. 4 (Family: none)	5-7
Y	JP 2010-275969 A (Daikin Industries, Ltd.), 09 December 2010 (09.12.2010), paragraphs [0026], [0027]; fig. 3 & JP 4591619 B1 & WO 2010/137296 A1 & CN 102422022 A	3,5-7

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

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"O" document referring to an oral disclosure, use, exhibition or other means
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 November 2015 (09.11.15)	17 November 2015 (17.11.15)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/073419

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 9-137788 A (Sanyo Electric Co., Ltd.), 27 May 1997 (27.05.1997), paragraph [0011]; fig. 2 (Family: none)	1,2 3,5-7 4
Y	JP 2013-119817 A (Hitachi Appliances, Inc.), 17 June 2013 (17.06.2013), paragraph [0028]; fig. 8 (Family: none)	7
A	JP 8-219055 A (Sanyo Electric Co., Ltd.), 27 August 1996 (27.08.1996), fig. 13 (Family: none)	1-7
A	JP 61-46869 A (Hitachi, Ltd.), 07 March 1986 (07.03.1986), fig. 1 (Family: none)	7
A	JP 2011-89448 A (Mitsubishi Electric Corp.), 06 May 2011 (06.05.2011), paragraph [0002]; fig. 1 to 2 (Family: none)	1-7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2014211810 A **[0002]**
- JP H9250477 A **[0005]**