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(54) **COMPRESSOR**

(57) This compressor is provided with a seating plate (28) disposed between a base (15, 17) and a valve body (25) and in contact with the surface of the valve body (25), which faces the base (15, 17), to support the valve body (25). The seating plate (28) consists of a harder material than the base (15, 17) and has: a through-hole (28a) corresponding to a discharge port (15c, 17c); and a plurality of affixation sections (28b, 28c) for affixing the seating plate (28) to the base (15, 17), the plurality of affixation sections (28b, 28c) being provided on both sides of the center of the through-hole (28a) in the direction of extension.

FIG. 2A

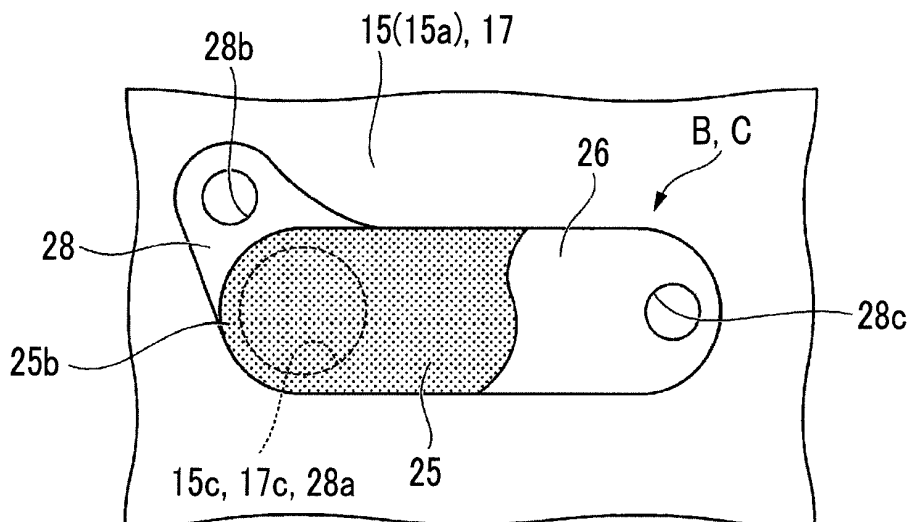
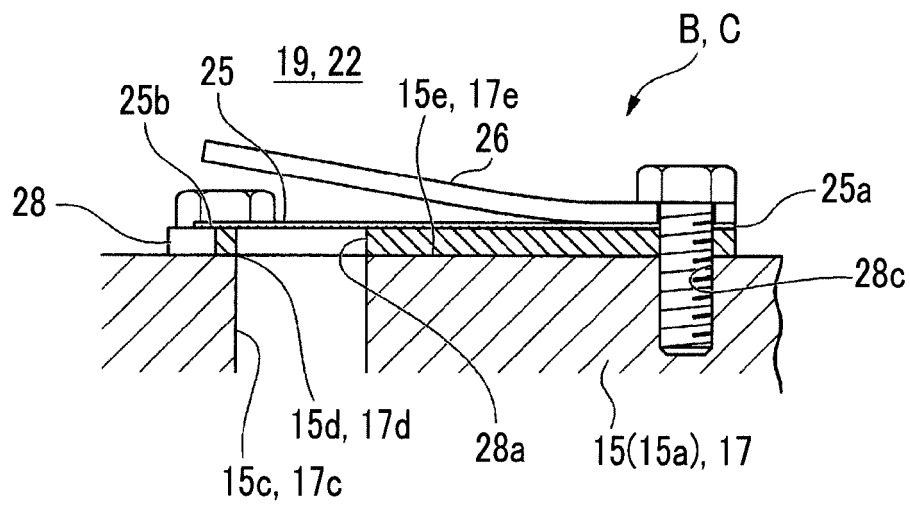


FIG. 2B



Description

Technical Field

[0001] The present invention relates to a compressor.

[0002] This application claims priority from Japanese Patent Application No. 2017-055712 filed on March 22, 2017; the contents of which are incorporated herein by reference.

Background Art

[0003] A compressor for compressing a fluid such as a refrigerant is provided in an air conditioner, a chiller, or the like. Herein, in a scroll compressor, a rotary compressor, and like, which are one type of a compressor, a discharge valve mechanism, in which a reed valve or the like is used, is provided between a compression side on which a refrigerant is compressed and a discharge side on which the compressed refrigerant is discharged.

[0004] For example, a refrigerant compressor of PTL 1 is configured such that a refrigerant compressed by a compression element on a compression side is discharged from a discharge port including a discharge valve mechanism to a discharge side. In the refrigerant compressor, the discharge port is provided by penetrating a main bearing or the like, which separates the compression side from the discharge side, and the discharge port can be opened and closed by a valve seat and a valve body, which are provided on the discharge side.

[0005] Since the valve body of a discharge valve repeatedly abuts against the valve seat and opens and closes the discharge port in such a refrigerant compressor of the PTL 1, impact fretting wear is prevented by making the hardness of the valve seat of the discharge port provided on the discharge side higher than that of the discharge port.

Citation List

Patent Literature

[0006] [PTL 1] Japanese Unexamined Patent Application Publication No. 2001-99066

Summary of Invention

Technical Problem

[0007] However, in the compressor of the related art in which the valve seat is provided in the discharge port, the valve body or the valve seat is likely to be damaged, for example, when a differential pressure between the compression side and the discharge side is made high, when an opening and closing speed is made high, or when the compressor is operated under more severe conditions. In addition, since the valve seat is integrally formed with another part, it is not easy to reinforce or

replace. Even when the valve seat is formed and pressed in another member as in PTL 1, a position shift, floating, deformation, or the like is likely to occur at the time of use, and thus it is not easy to secure sufficient compressing performance.

[0008] The present invention is devised in order to solve the problems, and an object thereof is to provide a compressor that can prevent damage even when the compressor is operated under more severe conditions and can secure compressing performance.

Solution to Problem

[0009] According to an aspect of the present invention, in order to solve the problems, there is provided a compressor including a base portion that separates a compression side from a discharge side, a discharge port that penetrates the base portion, a valve body having one end, which is fixed to the base portion, and the other end, which opposes the base portion to close the discharge port, in which the other end elastically deforms to open the discharge port when a pressure of the compression side becomes higher than a pressure of the discharge side, and a seating plate that supports the valve body by being disposed between the base portion and the valve body and abutting against a surface of the valve body on a base portion side. The seating plate is made of a material harder than the base portion, and has a through-hole corresponding to the discharge port and a plurality of fixing portions to the base portion, which are provided at positions on both sides of an extension direction with respect to a center of the through-hole.

[0010] According to the present invention, the seating plate that is made of a material harder than the base portion is disposed between the base portion and the valve body, and abuts against and supports the surface of the valve body on the base portion side. For this reason, the valve body does not directly abut against the base portion at the time of opening and closing, and thus damage to the base portion can be prevented.

[0011] In addition, the seating plate, which is another member disposed between the base portion and the valve body, is fixed to the base portion at the fixing portions on both sides of the extension direction of the seating plate with respect to the center of the through-hole corresponding to the discharge port. For this reason, the seating plate can be easily mounted onto the base portion. In addition, it is possible to avoid that the seating plate shifts a position thereof, floats, deforms, leaves a gap, or the like with respect to the base portion due to a pressure of a compressed fluid, vibration which occurs at the time of opening and closing of the valve body or the like.

[0012] In addition, in the compressor according to the aspect of the present invention, the seating plate may be fixed to the base portion along with the one end of the valve body at at least one of the fixing portions.

[0013] According to this configuration, since the seat-

ing plate is fixed to the base portion along with the one end of the valve body, a fixed position and fixing means of the seating plate can be shared with the one end of the valve body, and thus a structure can be simplified.

[0014] In addition, in the compressor according to the aspect of the present invention, the through-hole of the seating plate may be formed to be larger than a discharge opening of the discharge port, and may be provided to surround the discharge opening from an outer peripheral side.

[0015] According to this configuration, since the through-hole of the seating plate is larger than the discharge opening of the discharge port, it is possible to avoid that the discharge opening of the discharge port is closed even slightly by the seating plate due to a manufacturing error of the seating plate, a position shift at the time of attaching the seating plate, backlash of the seating plate at the time of operating the compressor, or the like, and it is possible to suppress a pressure loss in the discharge opening when discharging a compressed fluid.

[0016] In addition, in the compressor according to the aspect of the present invention, the through-hole of the seating plate may be formed to be smaller than a discharge opening of the discharge port, and may be provided to be surrounded by the discharge opening from an outer peripheral side.

[0017] According to this configuration, since the through-hole of the seating plate is formed to be smaller than the discharge opening of the discharge port, an opening area of the discharge port on the compression side can be made large, and the opening area can be made smaller than the seating plate on the discharge side of the discharge port. For this reason, a sufficient opening area can be easily secured on the compression side, and a pressure loss, which occurs when a compressed fluid is introduced into the discharge port, can be suppressed. In addition, a structure in which such an opening area changes in a discharge direction in two steps can be easily realized by using the seating plate.

[0018] Since an area closed by the valve body can be made small in a state where a large opening area of the discharge port is secured, the occurrence of deformation in which the valve body gets into the through-hole can be made unlikely when the through-hole is closed by the valve body, and thus sealability between the valve body and a vicinity of the through-hole can be improved.

[0019] In addition, the strength of the seating plate and the strength of the valve body can be improved since the through-hole of the seating plate can be made small.

[0020] In addition, in the compressor according to the aspect of the present invention, a seal member may be mounted between the seating plate and the base portion to annularly surround the discharge port.

[0021] According to this configuration, the seal member gets rid of a gap between the seating plate and the base portion. Thus, it is possible to prevent a compressed fluid from leaking from a portion between the seating plate and the base portion, and it is possible to easily secure

the compressing performance.

[0022] In addition, in the compressor according to the aspect of the present invention, the through-hole may have a chamfer portion in an edge portion on a valve body side.

[0023] According to this configuration, since the through-hole has the chamfer portion on the valve body side, it is possible to avoid that the valve body becomes damaged when the valve body is seated on the seating plate. Since an opening area of the discharge opening can be gradually increased toward the discharge side, a pressure loss of a fluid at the time of discharge can be reduced.

15 Advantageous Effects of Invention

[0024] According to the present invention, damage can be prevented even when the compressor is operated under more severe conditions, and thus compressing performance can be secured.

Brief Description of Drawings

[0025]

Fig. 1 is a longitudinal sectional view of a compressor according to a first embodiment of the present invention.

Fig. 2 shows a discharge valve mechanism according to the first embodiment of the present invention, Fig. 2A is a top view, and Fig. 2B is a longitudinal sectional view.

Fig. 3 is a top view of a seating plate of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 4 is a longitudinal sectional view of a first modification example of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 5 is a longitudinal sectional view of a second modification example of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 6 is a longitudinal sectional view of a third modification example of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 7 is a longitudinal sectional view of a fourth modification example of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 8 is a longitudinal sectional view of a fifth modification example of the discharge valve mechanism according to the first embodiment of the present invention.

Fig. 9 is a longitudinal sectional view of a sixth modification example of the discharge valve mechanism according to the first embodiment of the present in-

vention.

Description of Embodiments

[0026] Hereinafter, an embodiment to which the present invention is applied will be described in detail with reference to the drawings.

[Embodiment]

[0027] In the embodiment, the following description will be made with a vertical scroll compressor, which is provided in an air conditioner, a chiller, and the like, given as an example of the compressor A.

[0028] As shown in Fig. 1, the compressor A of the embodiment is configured by including a housing 1, an electric motor 2 provided inside the housing 1, and a scroll compression mechanism 3, which is equally provided inside the housing 1 and compresses a fluid, such as a refrigerant, by the driving of the electric motor 2.

[0029] The housing 1 includes a cylindrical housing main body 1a, an upper cover 1b that closes an opening in an upper end of the housing main body 1a, and a lower cover 1c that closes an opening in a lower end of the housing main body 1a. A suction pipe 4 for supplying a fluid, such as a refrigerant, into the housing 1 from an accumulator (not shown) or the like is provided in the housing 1, in particular, in a side surface of the housing main body 1a. In addition, a discharge pipe 5 for discharging a fluid compressed by the scroll compression mechanism 3 to the outside is provided in the upper cover 1b.

[0030] The electric motor 2 includes a stator 6 and a rotor 7, power is supplied from a power supply to the stator 6, and the rotor 7 rotates about an axis O1 extending in a vertical direction S1.

[0031] A rotary shaft 8 is integrally attached to the rotor 7 such that an axis O1 direction matches the vertical direction S1. The rotary shaft 8 is provided such that an upper end and a lower end thereof in the axis O1 direction are pivotally supported by an upper bearing 10 and a lower bearing 11 respectively and the rotary shaft rotates about the axis O1 along with the rotation of the rotor 7.

[0032] Each of the upper bearing 10 and the lower bearing 11 is provided to be integrally fixed to the housing main body 1a.

[0033] An eccentric pin 12 is integrally provided on an upper end portion of the rotary shaft 8 such that an axis O2 thereof matches the vertical direction S1 and is eccentric (offset) with respect to the axis O1 of the rotary shaft 8.

[0034] The scroll compression mechanism 3 includes a fixed scroll 15 (base portion), an orbiting scroll 16 that is caused to revolve and orbit eccentrically with respect to the fixed scroll 15 by the electric motor 2, and a discharge cover 17 (base portion).

[0035] The fixed scroll 15 includes a disk-shaped end plate 15a and a fixed wrap 15b that protrudes downwards

from a lower surface of the end plate 15a and is provided in a spiral shape. The fixed scroll 15 is fixedly provided by being bonded to the upper bearing 10 with a bolt or the like and thereby being fixed inside the housing 1.

[0036] The orbiting scroll 16 is formed by including a disk-shaped end plate 16a and an orbiting wrap 16b that protrudes upwards from an upper surface of the end plate 16a and is fixedly provided in a spiral shape. The orbiting wrap 16b of the orbiting scroll 16 is accommodated in the fixed wrap 15b of the fixed scroll 15.

[0037] In addition, a boss 20 is integrally provided on a lower surface of the end plate 16a of the orbiting scroll 16, and the eccentric pin 12 is fitted to the boss 20.

[0038] Accordingly, the orbiting scroll 16 is provided such that the orbiting scroll is eccentrically connected to the rotary shaft 8, follows the rotation about the axis O1 of the rotary shaft 8, and rotates (revolves) with an eccentric distance from the axis (shaft center) O1 of the rotary shaft 8 as a radius. In addition, the orbiting scroll 16 revolves instead of spinning.

[0039] The fixed scroll 15 and the orbiting scroll 16 cause the fixed wrap 15b and the orbiting wrap 16b to be meshed so as to vertically overlap each other. The fixed scroll 15 and the orbiting scroll 16 are eccentric with respect to each other by a predetermined amount, the fixed wrap 15b and the orbiting wrap 16b are meshed with each other with a 180 degree phase shift, and the fixed wrap 15b and the orbiting wrap 16b are in contact with each other at a plurality of places according to a rotation angle of the orbiting scroll 16.

[0040] Between a lower surface of the fixed scroll 15 and an upper surface of the orbiting scroll 16, that is, a portion that allows the fixed wrap 15b and the orbiting wrap 16b to be meshed with each other is set as a compression chamber 21 that compresses a fluid, such as a refrigerant. The scroll compression mechanism 3 of the embodiment is configured such that the compression chamber 21 is formed to be point symmetric with respect to a center portion of a spiral of the fixed wrap 15b and the orbiting wrap 16b, and a fluid is compressed most at the center portion of the spiral by gradually transitioning to an inner peripheral side while decreasing a volume thereof according to orbiting motion of the orbiting scroll 16.

[0041] A discharge port 15c, which penetrates the end plate 15a and communicates with a vertical space, is provided in the end plate 15a of the fixed scroll 15 at a position corresponding to a center portion of the compression chamber 21, and a discharge valve mechanism C is configured on an upper surface side of the discharge port 15c. The discharge valve mechanism C is a mechanism that opens and closes a discharge opening 15d of the discharge port 15c according to a pressure difference between an intermediate chamber 19, which is between the fixed scroll 15 and the discharge cover 17, and the compression chamber 21.

[0042] The discharge cover 17 is fixedly provided above the fixed scroll 15, and separates and divides the

inside of the housing 1 into a space on a lower portion side, to which is connected the suction pipe 4, and the intermediate chamber 19, and a discharge chamber 22 that is an upper portion side to which the discharge pipe 5 is connected.

[0043] A discharge port 17c, which penetrates the discharge cover 17 and communicates with the vertical space, is provided in the discharge cover 17, and a discharge valve mechanism B is configured on an upper surface side of the discharge port 17c. The discharge valve mechanism B is a mechanism that opens and closes a discharge opening 17d of the discharge port 17c according to a pressure difference between the intermediate chamber 19 and the discharge chamber 22.

[0044] As shown in Fig. 2A and 2B, each of the discharge valve mechanism B and the discharge valve mechanism C includes the discharge port 15c or 17c that penetrates the end plate 15a of the fixed scroll 15 or the discharge cover 17, a valve seat 15e or 17e that is provided on the end plate 15a of the fixed scroll 15 or an upper surface of the discharge cover 17, a valve body 25 that opposes and closes the discharge opening 15d or 17d of the discharge port 15c or 17c, a seating plate 28 that is disposed between the end plate 15a of the fixed scroll 15 or the discharge cover 17 and the valve body 25, and a retainer 26 that is disposed such that the retainer overlaps the valve body 25 and the discharge opening 17d from above.

[0045] The valve seats 15e and 17e are directly formed on an upper surface of the end plate 15a of the fixed scroll 15 and the upper surface of the discharge cover 17, respectively. Each of the valve seats 15e and 17e has a surface shape corresponding to a surface shape of the valve body 25 that the valve seat opposes, and is formed in a planar shape substantially over the entire region that opposes the valve body 25 in the embodiment. The end plate 15a, the valve seat 15e, the discharge cover 17, and the valve seat 17e are made of, for example, cast iron.

[0046] The valve body 25 is, for example, a reed valve made of stainless steel, one end 25a thereof is fixed to the end plate 15a of the fixed scroll 15 or the upper surface of the discharge cover 17. The other end 25b thereof closes the discharge port 15c or 17c in a state of opposing and abutting against the valve seat 15e or 17e.

[0047] The valve body 25 is formed to be able to elastically deform with the one end 25a fixed to the end plate 15a of the fixed scroll 15 or the upper surface of the discharge cover 17 as fulcrum.

[0048] The seating plate 28 is made of a material such as a metal harder than the end plate 15a of the fixed scroll 15 or the discharge cover 17 (for example, carbon tool steel (SK material) or the like). Both surfaces of the seating plate 28 are formed in a planar shape. One surface abuts against and supports a surface of the valve body 25 on one side, and the other surface abuts against and is airtightly in close contact with the valve seat 15e or 17e.

[0049] As shown in Fig. 3, the seating plate 28 has a through-hole 28a corresponding to the discharge port 15c or 17c and a plurality of fixing portions 28b and 28c of the end plate 15a of the fixed scroll 15 or the discharge cover 17, which are provided at positions on both sides with respect to the center of the through-hole 28a. The fixing portions 28b and 28c are holes that penetrate the seating plate 28.

[0050] Specifically, a position of a center P1 of one fixing portion 28b is disposed on an opposite side to a center P3 with a straight line 04 that passes through a center P2 of the through-hole 28a and is orthogonal to a line 03, which links the center P3 of the other fixing portion 28c and the center P2 of the through-hole 28a together, interposed therebetween. That is, the fixing portion 28b and the fixing portion 28c are disposed on both sides of an extension direction of the seating plate 28 with the center P2 of the through-hole 28a interposed therebetween. On the seating plate 28, the center P2 of the through-hole 28a and the center P3 of the fixing portion 28c are disposed on the line 03 in a straight line, and the position of the center P1 of the fixing portion 28b is not disposed on the line 03. Accordingly, the seating plate 28 has an L-shape in top view.

[0051] In the embodiment, one fixing portion 28c is fixed to one end 25a of the valve body 25 and the end plate 15a of the fixed scroll 15 or the discharge cover 17.

[0052] Although not particularly limited, as shown in Fig. 4, the through-hole 28a of the seating plate 28 may be formed to be larger than the discharge opening 15d or 17d of the discharge port 15c or 17c in the embodiment. The through-hole 28a is formed to be a size larger than the discharge opening 15d or 17d such that the through-hole 28a and the discharge opening 15d or 17d are concentrically provided and the through-hole 28a surrounds the discharge opening 15d or 17d from an outer peripheral side.

[0053] In addition, as shown in Fig. 5, a chamfer portion 28e may be provided in an edge portion of the through-hole 28a on a valve body 25 side in the embodiment. The chamfer portion 28e is a surface inclined radially inner side of the through-hole 28a toward the end plate 15a or the discharge cover 17. In an example of Fig. 5, the chamfer portion 28e is formed from the edge portion of the through-hole 28a on the valve body 25 side to a middle position in the extension direction of the through-hole 28a. The chamfer portion 28e may be formed by machining the edge portion of the through-hole 28a, or press-sag formed when punching out the through-hole 28a may be set as the chamfer portion 28e at it is.

[0054] In addition, as shown in Fig. 6, a seal member 28d may be mounted between the seating plate 28 and the end plate 15a of the fixed scroll 15 or the discharge cover 17 to annularly surround the discharge port 15c or 17c, in the embodiment. The seal member 28d is a gasket, an O-ring, or the like.

[0055] The retainer 26 is provided such that one end side thereof is fixed and supported by the discharge cover

17 and is inclined upwards toward the other end side thereof so as to overlap the valve body 25 and the discharge opening 17d from above. The retainer 26 restricts a lifted amount at each position when the valve body 25 elastically deforms and is lifted up due to a pressure difference since the retainer is formed to be inclined from the one end side to the other end side.

[0056] In the embodiment, the seating plate 28, the valve body 25, and the retainer 26 are tightened together and fixed to the end plate 15a of the fixed scroll 15 or the discharge cover 17 at the same position on one side.

[0057] When the electric motor 2 causes the orbiting scroll 16 to revolve by orbiting at an eccentric position with respect to the fixed scroll 15 in such a compressor A, a refrigerant is compressed in the compression chamber 21 between the fixed wrap 15b and the orbiting wrap 16b, both of which have a spiral shape, while the refrigerant is compressed most at the center portion of the spiral.

[0058] When a pressure of the compression chamber 21 is equal to or lower than a pressure of the intermediate chamber 19 in the discharge valve mechanism B, the other end 25b side is maintained in a state of closing the discharge opening 17d. Then, when the pressure of the compression chamber 21 becomes higher than the pressure of the intermediate chamber 19, the fixed portion on the one end 25a side is set as fulcrum, the valve body elastically deforms according to a pressure difference, and the other end 25b side is lifted up from the valve seat 15e and the seating plate 28, thereby opening the discharge opening 17d. Accordingly, a compressed fluid is fed from the compression chamber 21 to the intermediate chamber 19 through the discharge opening 17d. When the pressure of the compression chamber 21 becomes equal to or lower than the pressure of the intermediate chamber 19, the other end 25b side of the valve body 25 returns to an original state, thereby closing the discharge opening 17d.

[0059] In addition, when the pressure of the intermediate chamber 19 is equal to or lower than the discharge chamber 22 in the discharge valve mechanism C, the other end 25b side is maintained in a state of closing the discharge opening 17d. Then, when the pressure of the intermediate chamber 19 becomes higher than the pressure of the discharge chamber 22, the fixed portion on the one end 25a side is set as fulcrum, the valve body elastically deforms according to a pressure difference, and the other end 25b side is lifted up from the valve seat 15e and the seating plate 28, thereby opening the discharge opening 17d. Accordingly, a compressed fluid is fed from the intermediate chamber 19 to the discharge chamber 22 through the discharge opening 17d. When the pressure of the compression chamber 21 becomes equal to or lower than the pressure of the intermediate chamber 19, the other end 25b side of the valve body 25 returns to an original state, thereby closing the discharge opening 17d.

[0060] By these processes being continued, the com-

pressed fluid is in turn discharged from the discharge pipe 5 and becomes available for use.

[0061] According to such a compressor A, the seating plate 28, which is made of a material harder than the end plate 15a of the fixed scroll 15 or the discharge cover 17, is disposed between the end plate 15a of the fixed scroll 15 or the discharge cover 17 and the valve body 25, and abuts against and supports one side surface of the valve body 25. For this reason, the valve body 25 does not directly abut against the end plate 15a of the fixed scroll 15 or the discharge cover 17 at the time of opening and closing. Accordingly, it is possible to reliably prevent the valve seat 15e or 17e provided in the end plate 15a of the fixed scroll 15 or the discharge cover 17 from being damaged by a shock which occurs at the time of opening and closing of the valve body 25.

[0062] In addition, the seating plate 28, which is another member disposed between the end plate 15a of the fixed scroll 15 or the discharge cover 17 and the valve body 25, is fixed to the end plate 15a of the fixed scroll 15 or the discharge cover 17 by the plurality of fixing portions 28b and 28c provided at positions on both sides of the extension direction of the seating plate 28 with the center P2 of the through-hole 28a corresponding to the discharge port 15c or 17c interposed therebetween. For this reason, the seating plate 28 can be easily mounted onto the end plate 15a of the fixed scroll 15 or the discharge cover 17. It is possible to avoid that the seating plate 28 shifts a position thereof, floats, deforms, leaves a gap, or the like with respect to the valve seat 15e or 17e due to a pressure of a compressed fluid released from the discharge port 15c or 17c, vibration which occurs at the time of opening and closing of the valve body 25, or the like.

[0063] Therefore, the compressing performance of the compressor A can be easily secured even under severe use conditions (operation conditions in a state where a rotation speed is high, or the like) while damage to the valve seat 15e or 17e is prevented.

[0064] In addition, in the compressor A of the embodiment, since the seating plate 28 is fixed at one fixing portion 28b to the end plate 15a of the fixed scroll 15 or the discharge cover 17 along with the one end 25a of the valve body 25, a fixed position and fixing means of the seating plate 28 can be shared with the one end 25a of the valve body 25, and thus a structure can be simplified.

[0065] In addition, as shown in Fig. 4, the through-hole 28a of the seating plate 28 may be formed to be larger than the discharge opening 15d or 17d of the discharge port 15c or 17c in the compressor A of the embodiment.

[0066] In this case, it is possible to avoid that the discharge opening 15d or 17d of the discharge port 15c or 17c is closed even slightly by the seating plate 28 due to a manufacturing error of the seating plate 28, a position shift at the time of attaching the seating plate 28, backlash of the seating plate 28 at the time of operating the compressor A, or the like, and it is possible to suppress a pressure loss in the discharge opening 15d or 17d when

discharging a compressed fluid.

[0067] In addition, as shown in Fig. 5, the chamfer portion 28e may be provided in the seating plate 28 in the compressor A of the embodiment. In this case, when the valve body 25 is seated on the seating plate 28, it is possible to avoid that the valve body 25 becomes damaged. Since an opening area of the discharge opening 15d or 17d can be gradually increased toward a discharge side, a pressure loss of a fluid at the time of discharge can be reduced.

[0068] In addition, as shown in Fig. 6, the seal member 28d may be mounted between the seating plate 28 and the end plate 15a of the fixed scroll 15 or the discharge cover 17 to annularly surround the discharge port 15c or 17c, in the compressor A of the embodiment. In this case, it is possible to prevent a compressed fluid from leaking from a portion between the seating plate 28 and the end plate 15a of the fixed scroll 15 or the discharge cover 17, and it is possible to easily secure the compressing performance of the compressor A.

[0069] Although an embodiment of the present invention has been described hereinbefore in detail with reference to the drawings, a specific configuration is not limited to the embodiment, and design modification that does not depart from the scope of the present invention is also included.

[0070] For example, as shown in Fig. 7, a recessed portion 15f or 17f, which corresponds to the shape of the seating plate 28 and has a depth that is the same as a thickness of the seating plate 28, may be formed in the end plate 15a or the discharge cover 17. The seating plate 28 is fitted in the recessed portion 15f or 17f. In this case, it is possible to further avoid a position shift of the seating plate 28 with respect to the end plate 15a or the discharge cover 17.

[0071] In addition, as shown in Fig. 8, the through-hole 28a of the seating plate 28 may be formed to be smaller than the discharge opening 15d or 17d of the discharge port 15c or 17c. The through-hole 28a and the discharge opening 15d or 17d are coaxially provided, and the through-hole 28a is provided to be surrounded by the discharge opening 15d or 17d from the outer peripheral side.

[0072] In this case, since the through-hole 28a of the seating plate 28 is formed to be smaller than the discharge opening 15d or 17d, the opening area of the discharge port 15c or 17c on a compression side can be made large, and the opening area can be made smaller than the seating plate 28 on the discharge side of the discharge port.

[0073] For this reason, a sufficient opening area can be easily secured on the compression side, and a pressure loss, which occurs when a compressed fluid is introduced into the discharge port 15c or 17c, can be suppressed. In addition, a structure in which such an opening area changes in a discharge direction in two steps can be easily realized by using the seating plate 28. Since an area closed by the valve body 25 can be made small

in a state where a large opening area of the discharge port 15c or 17c is secured on the compression side, the occurrence of deformation in which the valve body 25 gets into the through-hole 28a can be made unlikely when the through-hole 28a is closed by the valve body 25, and thus sealability between the valve body 25 and a vicinity of the through-hole 28a can be improved. In addition, the strength of the seating plate 28 and the strength of the valve body 25 can be improved since the through-hole 28a of the seating plate 28 can be made small.

[0074] In addition, as shown in Fig. 9, each of the centers P1, P2, and P3 is arranged in a straight line shape on a seating plate 38, and the seating plate 38 may be in a straight line shape instead of being in an L-shape. That is, the shape of the seating plate is not particularly limited. It is sufficient that the fixing portions are provided on both sides of the extension direction of the seating plate with at least the center P2 of the through-hole 28a interposed therebetween.

[0075] In addition, although an example in which the shapes of various holes, including the discharge port 15c or 17c, are formed in a circular shape has been described above, without being particularly limited thereto, the holes may be long holes, elliptical holes, square holes, or the like.

[0076] In addition, it is not necessary to apply the configuration of the embodiment to both of the discharge valve mechanism B and the discharge valve mechanism C, and the configuration of the embodiment may be applied to at least one of the discharge valve mechanisms.

[0077] In addition, although the compressor A has been described as a scroll compressor in the description above, each of the configurations described above may be applied to a rotary compressor or other compressors.

Industrial Applicability

[0078] The present invention is applicable to a compressor. Reference Signs List

[0079]

- 1: housing
- 1a: housing main body
- 1b: upper cover
- 1c: lower cover
- 2: electric motor
- 3: scroll compression mechanism
- 4: suction pipe
- 5: discharge pipe
- 6: stator
- 7: rotor
- 8: rotary shaft
- 10: upper bearing
- 11: lower bearing
- 12: eccentric pin
- 15: fixed scroll (base portion)
- 15a: end plate
- 15b: fixed wrap

15c: discharge port
 15d: discharge opening
 15e: valve seat
 15f: recessed portion
 16: orbiting scroll
 16a: end plate
 16b: orbiting wrap
 17: discharge cover (base portion)
 17c: discharge port
 17d: discharge opening
 17e: valve seat
 17f: recessed portion
 19: intermediate chamber
 20: boss
 21: compression chamber
 22: discharge chamber
 25: valve body
 25a: one end
 25b: the other end
 26: retainer
 28: seating plate
 28a: through-hole
 28b: fixing portion
 28c: fixing portion
 28d: seal member
 28e: chamfer portion
 38: seating plate
 A: compressor
 B, C: discharge valve mechanism
 O1: axis
 O2: axis
 O3: line that links centers together
 O4: orthogonal line
 S1: vertical direction
 P1: center of one fixing portion
 P2: center of through-hole
 P3: center of the other fixing portion

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wherein the seating plate is made of a material harder than the base portion, and has a through-hole corresponding to the discharge port and a plurality of fixing portions to the base portion, which are provided at positions on both sides of an extension direction with respect to a center of the through-hole.

The compressor according to Claim 1, wherein the seating plate is fixed to the base portion along with the one end of the valve body at at least one of the fixing portions.

The compressor according to Claim 1 or 2, wherein the through-hole of the seating plate is formed to be larger than a discharge opening of the discharge port, and is provided to surround the discharge opening from an outer peripheral side.

The compressor according to Claim 1 or 2, wherein the through-hole of the seating plate is formed to be smaller than a discharge opening of the discharge port, and is provided to be surrounded by the discharge opening from an outer peripheral side.

The compressor according to any one of Claims 1 to 4, wherein a seal member is mounted between the seating plate and the base portion to annularly surround the discharge port.

The compressor according to any one of Claims 1 to 5, wherein the through-hole has a chamfer portion in an edge portion on a valve body side.

Claims

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1. A compressor comprising:

a base portion that separates a compression side from a discharge side;
 a discharge port that penetrates the base portion;
 a valve body having one end, which is fixed to the base portion, and the other end, which opposes the base portion to close the discharge port, in which the other end elastically deforms to open the discharge port when a pressure of the compression side becomes higher than a pressure of the discharge side; and
 a seating plate that supports the valve body by being disposed between the base portion and the valve body and abutting against a surface of the valve body on a base portion side,

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FIG. 1

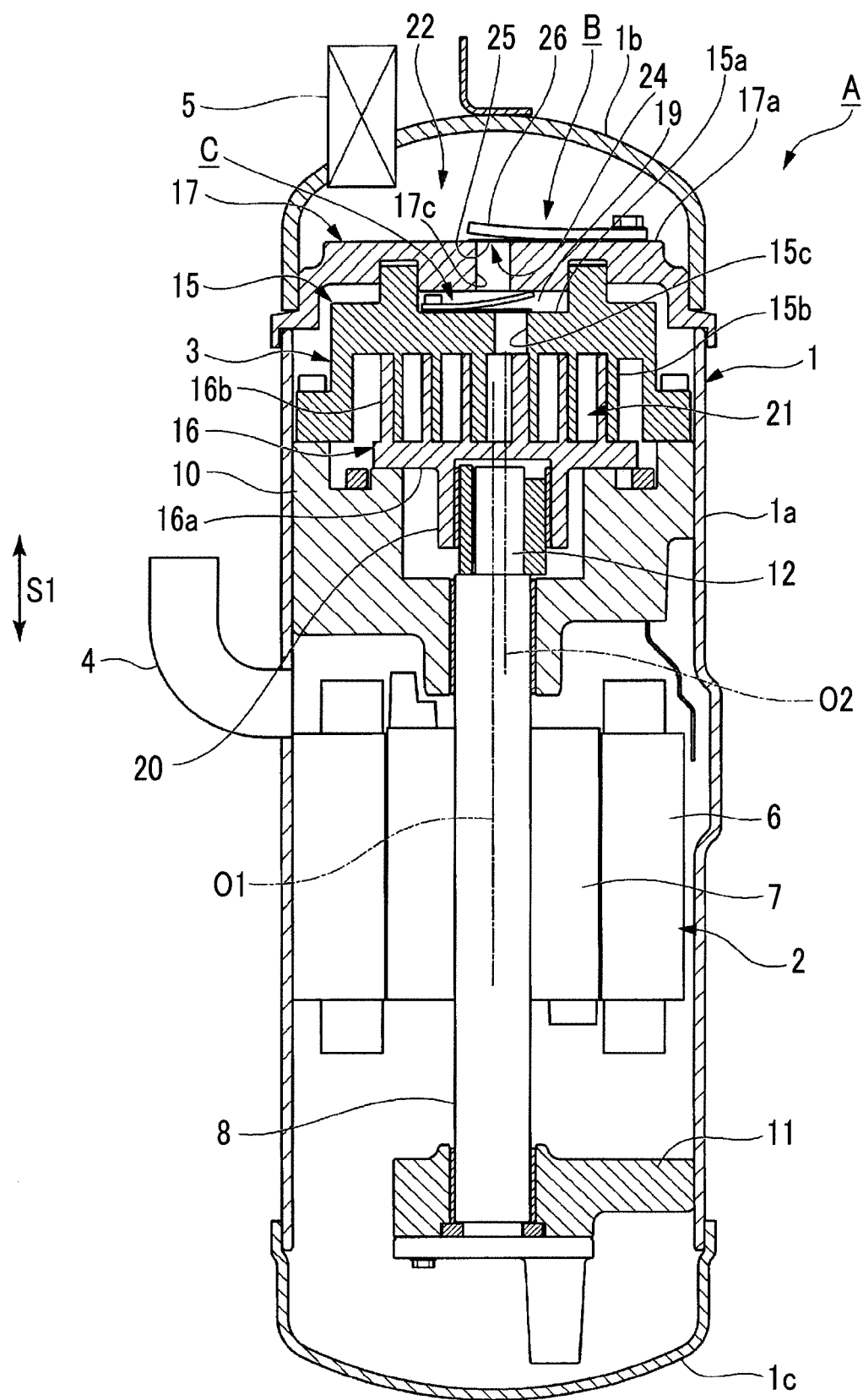


FIG. 2A

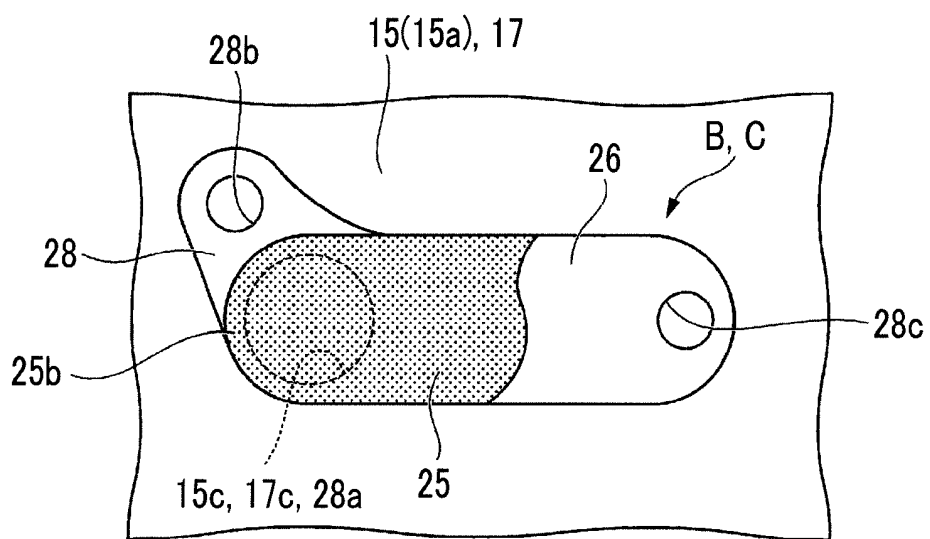


FIG. 2B

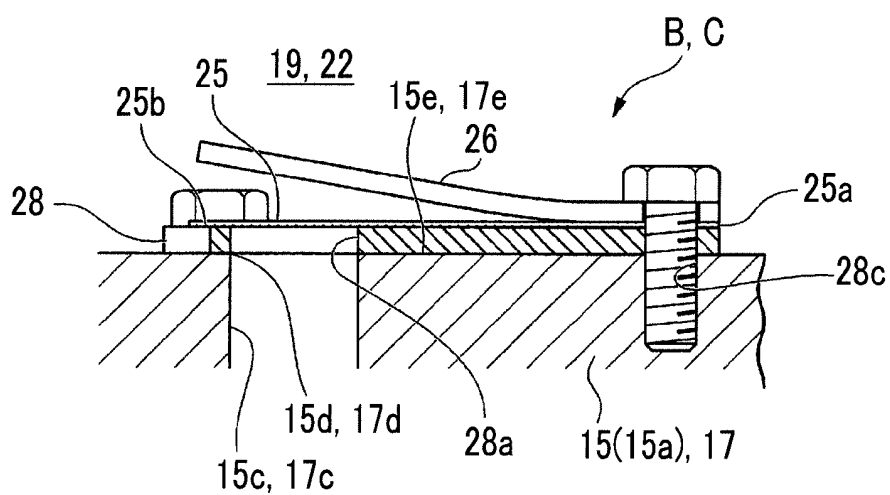


FIG. 3

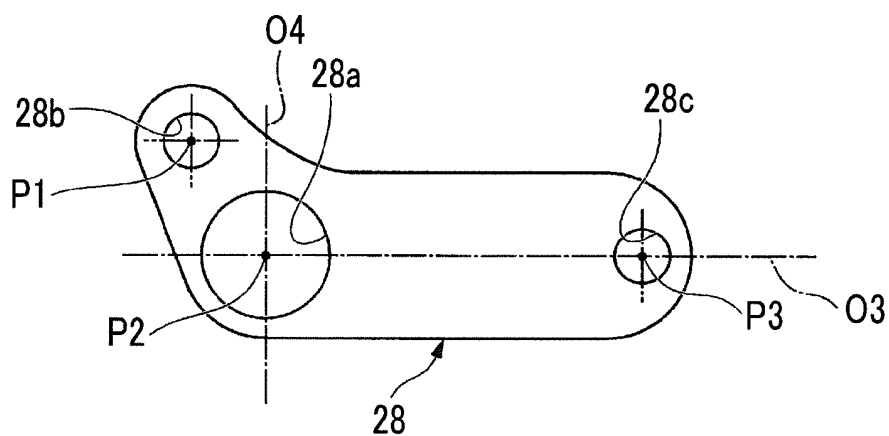


FIG. 4

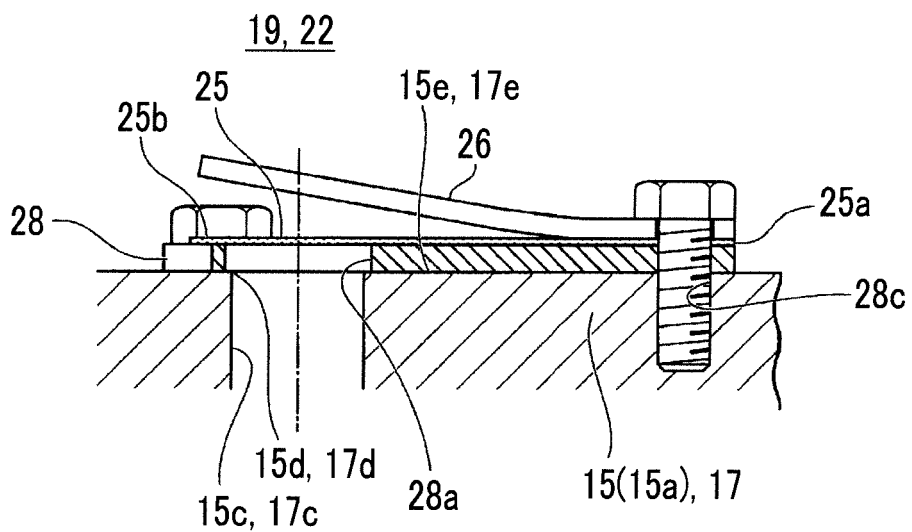


FIG. 5

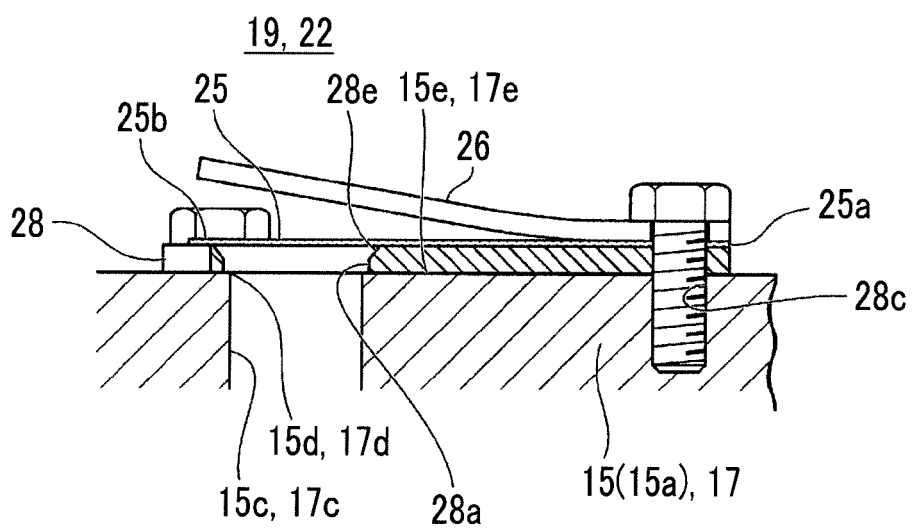


FIG. 6

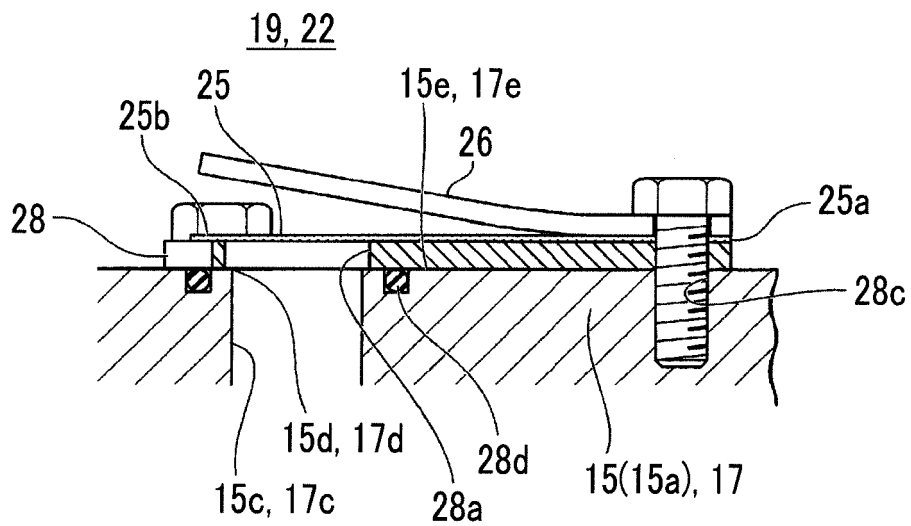


FIG. 7

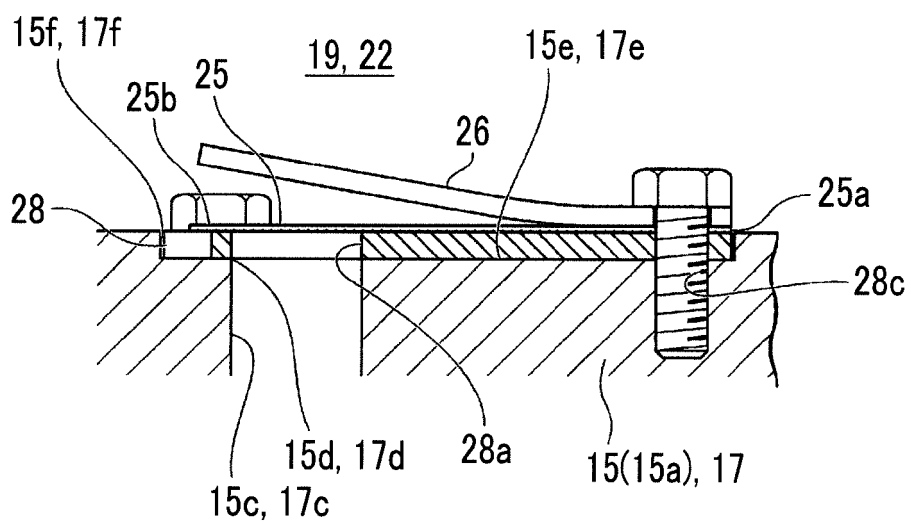


FIG. 8

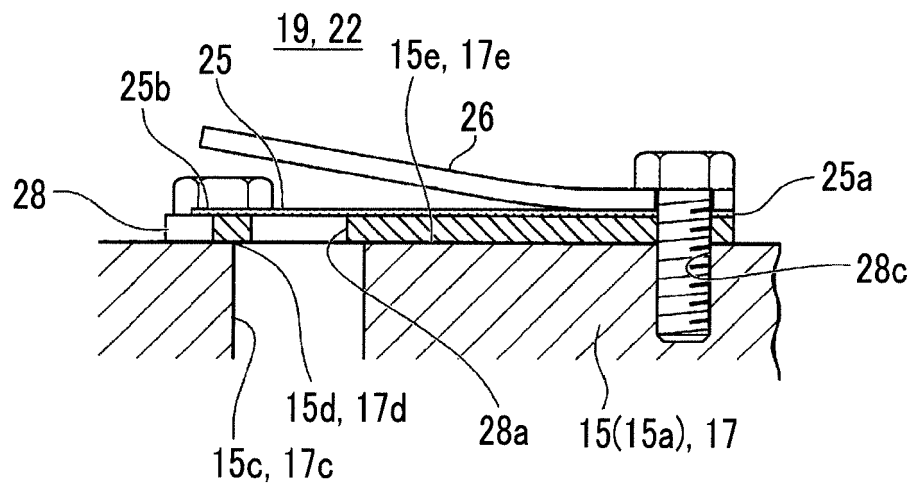
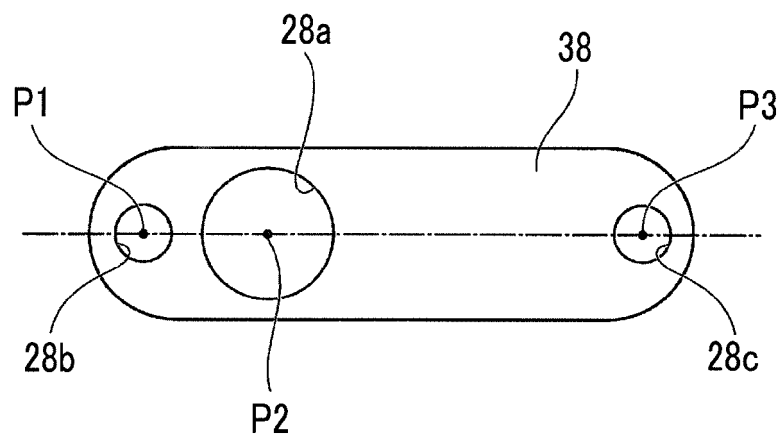


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/000434

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F04B39/10(2006.01)i, F04C29/12(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)

Int.Cl. F04B39/10, F04C29/12

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-99066 A (SANYO ELECTRIC CO., LTD.) 10 April 2001, paragraphs [0022]-[0023], fig. 2-4 (Family: none)	1-6
Y	JP 8-338368 A (TOKICO, LTD.) 24 December 1996, paragraphs [0007]-[0013], fig. 1 (Family: none)	1-6
Y A	JP 2016-14326 A (CALSONIC KANSEI CORPORATION) 28 January 2016, paragraph [0032], fig. 4-5 (Family: none)	5 1-4, 6

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

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Date of the actual completion of the international search
20 March 2018 (20.03.2018)Date of mailing of the international search report
03 April 2018 (03.04.2018)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/000434

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2014-40827 A (DAIKIN INDUSTRIES, LTD.) 06 March 2014, paragraphs [0057]-[0060], fig. 1, 5 & US 2015/0211508 A1, paragraphs [0077]-[0081], fig. 1, 5 & WO 2014/017081 A1 & EP 2886864 A1 & CN 104487708 A	6 1-5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 107795/1990 (Laid-open No. 66391/1992) (MITSUBISHI ELECTRIC CORP.) 11 June 1992, fig. 3 (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2017055712 A [0002]
- JP 2001099066 A [0006]