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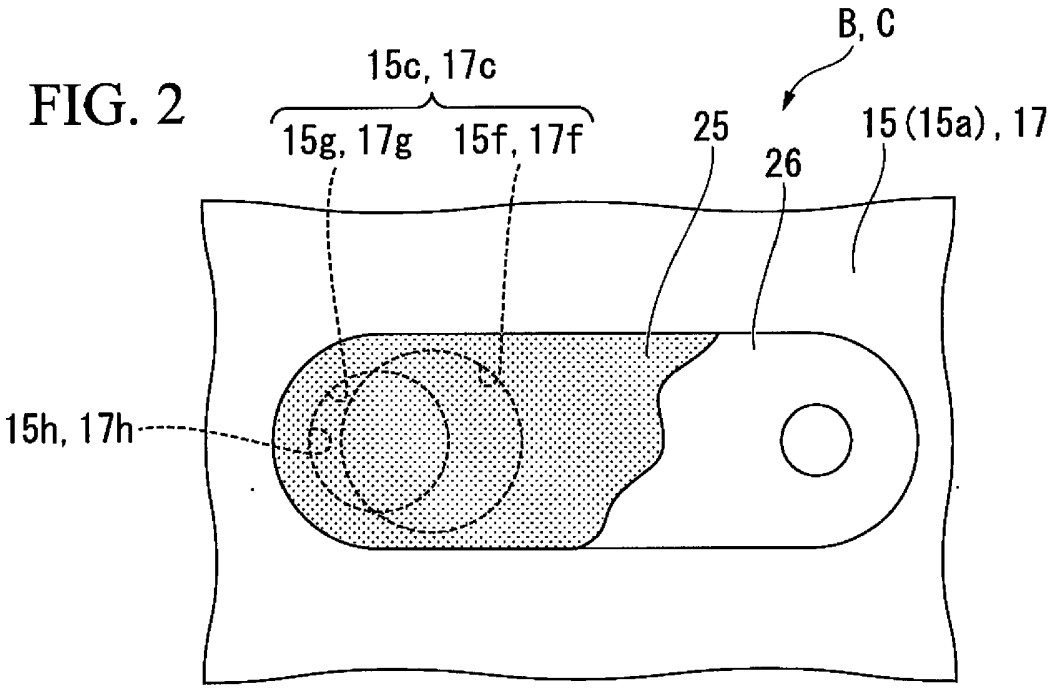
(54) COMPRESSOR

(57) Discharge port (15c, 17c) provided in base portion (15, 17) partitioning a compression side and a discharge side have compression side hole portion (15f, 17f) provided on the compression side, and discharge side hole portion (15g, 17g) which is provided on the discharge side, communicate with the compression side hole (15f, 17f), and have a discharge opening. Part of inner circumferential surface of the discharge side hole portion (15g, 17g) is bulging portion (15h, 17h) that are spaced apart from the one end of the valve body (25) further than the inner circumferential surface of the compression side hole portion (15f, 17f).

FIG. 2



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a compressor.

Description of Related Art

[0002] A compressor for compressing a fluid such as a refrigerant is provided in an air conditioner, a refrigerator, and the like. Here, in a scroll compressor, a rotary compressor, or the like, which are types of compressors, a discharge valve mechanism using a reed valve or the like is provided between a compression side on which a refrigerant is compressed and a discharge side which discharges a compressed refrigerant.

[0003] For example, a refrigerant compressor disclosed in Patent Document 1 is configured so that the refrigerant compressed by a compression element on the compression side is discharged from the discharge port equipped with the discharge valve mechanism to the discharge side. In this refrigerant compressor, a discharge port is provided to pass through a main bearing or the like which partitions the compression side and the discharge side, and the discharge port can be opened and closed by a valve seat and a valve body provided on the discharge side.

[Patent Documents]

[0004] [Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2001-99066

SUMMARY OF THE INVENTION

[0005] However, in the conventional compressor, since the pressure loss at the discharge port having the discharge valve mechanism was large, for example, in order to increase the capacity or operate under severe conditions, it was desired to reduce the pressure loss at the discharge port.

[0006] However, if the discharge port is made large in order to reduce the pressure loss, the valve body is easily deformed or misaligned in the state in which the valve body is closed, the sealing property is easily lowered, and the valve strength is easily lowered.

[0007] The present invention has been made to solve the aforementioned problems, and an object of the present invention is to provide a compressor capable of reducing a pressure loss at a discharge port, without lowering the sealing property and the valve strength in a state in which the valve body is closed.

[0008] According to a first aspect of the present invention, there is provided a compressor including: a base portion which partitions a compression side and a discharge side; a discharge port penetrating the base portion; and a valve body in which one end is fixed to the base portion, the other end faces the discharge port to close the discharge port, and when a pressure on the compression side becomes larger than a pressure on the discharge side, the other end is elastically deformed to open the discharge port. The discharge port has a compression side hole portion provided on the compression side, and a discharge side hole portion which is provided on the discharge side, communicates with the compression side hole portion, and has a discharge opening. The discharge side hole portion has a bulging portion at an end portion on the discharge side, the bulging portion being separated from the one end of the valve body further than an inner circumferential surface of the compression side hole portion in a plan view in part of an inner circumferential surface of the discharge side hole portion.

[0009] Since only the one end of the valve body is fixed to the base portion, when the discharge port is opened, the valve body is obliquely disposed from the one end toward the other end with respect to the base portion. Accordingly, the compressed fluid discharged from the discharge port is guided by the surface of the obliquely disposed valve body to flow obliquely from the one end toward the other end. Here, according to the present aspect, bulging portion spaced apart from the one end of the valve body further than the inner circumferential surface of the compression side hole portion is provided on the inner circumferential surface of the discharge side hole portion in a plan view. Therefore, the discharge direction of the compressed fluid introduced into the compression side hole portion and discharged from the discharge side hole portion can be made to coincide with the direction along the valve body. Further, the other side of the valve body is elastically deformed obliquely to open the discharge port, and it is possible to discharge the compressed fluid toward the side on which the valve body is more greatly separated from the discharge port by discharging the compressed fluid discharged from the discharge side hole portion toward the other end side of the valve body. Therefore, it is possible to reduce the pressure loss at the time of discharge of the compressed fluid from the discharge port.

[0010] Further, by providing the bulging portion on the inner circumferential surface of the discharge side hole portion, the distance from the one end of the valve body to the discharge port is long. Therefore, the length from one end of the valve body fixed to the base portion to the opening and closing portion of the discharge opening becomes longer. As a result, the valve body is easily elastically deformed, and the pressure loss of the compressed fluid at the time of discharge can be further reduced. Moreover, since the valve body is easily elastically deformed, the durability of the valve body is enhanced. Accordingly, it is possible to avoid the degradation of the sealing property of the discharge port due to long-term use.

[0011] According to the compressor of a second aspect of the present invention, in the first aspect, the discharge

side hole portion may be formed to have a smaller diameter than the compression side hole portion, the center of the discharge side hole portion may be disposed on a side separated from the one end of the valve body further than the center of the compression side hole portion, and the bulging portion may be part of the inner circumferential surface of the discharge side hole portion.

[0012] According to this configuration, by widely providing the opening of the compression side hole portion, the discharge opening of the discharge side hole portion can be made smaller than the opening of the compression side hole portion. Further, by increasing the opening of the compression side hole portion, it is possible to reduce the pressure loss when the compressed fluid is introduced into the compression side hole portion. On the other hand, by decreasing the discharge opening of the discharge side hole portion, it is possible to suppress deformation (deflection of the valve body into the discharge port, etc.) of the valve body when the discharge port is closed by the valve body. Therefore, it is possible to easily ensure a sufficient sealing property when the discharge opening is closed by the valve body and to suppress a decrease in valve strength.

[0013] According to a compressor of a third aspect of the present invention, in the first or second aspect, an opening area of a communication portion between the compression side hole portion and the discharge side hole portion may be formed to be equal to or larger than a cross-sectional area of the discharge side hole portion.

[0014] According to this configuration, since the opening area of the communication portion between the compression side hole portion and the discharge side hole portion is formed to be equal to or larger than the cross-sectional area of the discharge side hole portion, it is possible to reduce the pressure loss at the communication portion. If the compression side hole portion and the discharge side hole portion are made to eccentrically communicate with each other, a portion having an angular shape and having a small opening area is easily generated in the communication portion. Therefore, by securing the opening area of the communication portion, it is possible to greatly reduce the pressure loss of the compressed fluid flowing in the communication portion.

[0015] According to the compressor of a fourth aspect of the present invention, in any one of the first to third aspects, the base portion may have a base portion main body, and a seating plate which is attachable to and detachable from the base portion main body at a position where the valve body is provided and which is made of a harder material than the base portion main body, and the discharge side hole portion may be provided in the seating plate.

[0016] In this way, by providing the rigid seating plate and providing the discharge side hole portion on the seating plate, the surface of the side of the base portion of the valve body abuts on the seating plate and is supported by the seating plate. Therefore, the valve body does not abut on the base portion main body at the time of opening and closing, and breakage of the base portion main body can be avoided.

[0017] Further, according to the compressor of a fifth aspect of the present invention, in any one of the first to fourth aspects, a chamfered portion may be formed at an edge portion of a communication portion between the compression side hole portion and the discharge side hole portion.

[0018] It is possible to reduce the pressure loss at the communication portion between the compression side hole portion and the discharge side hole portion with such a chamfered portion.

[0019] According to the compressor of the present invention, it is possible to provide a compressor capable of reducing the pressure loss at the discharge port without lowering the sealing property or the valve strength in a state in which the valve body is closed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a longitudinal sectional view illustrating a compressor according to an embodiment of the present invention.

FIG. 2 is a top view illustrating a discharge valve mechanism according to an embodiment of the present invention.

FIG. 3 is a longitudinal sectional view illustrating a discharge valve mechanism according to an embodiment of the present invention.

FIG. 4 is a longitudinal sectional view illustrating a discharge valve mechanism according to a first modified example of the embodiment of the present invention.

FIG. 5 is a longitudinal sectional view illustrating a discharge valve mechanism according to a second modified example of the embodiment of the present invention.

FIG. 6 is a longitudinal sectional view illustrating a discharge valve mechanism according to a third modified example of the embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Hereinafter, a compressor A according to an embodiment of the present invention will be described.

[0022] Here, in the present embodiment, description will be provided on the assumption that the compressor A is a vertical type scroll compressor provided in an air conditioner, a refrigerator, or the like.

[0023] As illustrated in FIG. 1, the compressor A of the present embodiment includes a housing 1, an electric motor 2 provided in the housing 1, and a scroll compression mechanism 3 which is similarly provided in the housing 1 and compresses a fluid such as a refrigerant by the driving of the electric motor 2.

[0024] The housing 1 is formed to include a cylindrical housing main body 1a, an upper cover 1b which closes an opening of an upper end of the housing main body 1a, and a lower cover 1c which closes an opening of a lower end of the housing main body 1a. In the housing 1, a suction pipe 4 for supplying a fluid such as a refrigerant from the accumulator or the like into the housing 1 is provided on the side surface of the housing main body 1a, and a discharge pipe 5 for discharging the fluid compressed by the scroll compression mechanism 3 to the outside is provided in the upper cover 1b.

[0025] The electric motor 2 includes a stator 6 and a rotor 7 and is configured such that power is supplied from a power source to the stator 6 and the rotor 7 rotates in one direction around an axis O1 extending in a vertical direction S1.

[0026] A rotary shaft 8 is integrally attached to the rotor 7 with its axis O1 direction oriented in the vertical direction S 1. The upper end side of the rotary shaft 8 in the direction of the axis O1 is supported by an upper bearing 10, and the lower end side thereof is pivotally supported by a lower bearing 11. The rotary shaft 8 is provided to rotate around the axis O1 together with the rotation of the rotor 7. The upper bearing 10 and the lower bearing 11 are integrally fixed to the housing main body 1a.

[0027] An eccentric pin 12 is integrally provided on the upper end portion of the rotary shaft 8 with its axis 02 oriented in the vertical direction S1 and is eccentric (offset) with respect to the axis O1 of the rotary shaft 8.

[0028] The scroll compression mechanism 3 includes a fixed scroll 15 (base portion), an orbiting scroll 16 that revolves and turns eccentrically with respect to the fixed scroll 15 by the electric motor 2, and a discharge cover 17 (base portion).

[0029] The fixed scroll 15 includes a disk-shaped end plate 15a, and a fixed wrap 15b protruding downward from the lower surface of the end plate 15a and disposed in a spiral shape. The fixed scroll 15 is fixedly installed in the housing 1 by being bolt-joined to the upper bearing 10.

[0030] The orbiting scroll 16 is formed to include a disk-shaped end plate 16a, and an orbiting wrap 16b protruding upward from the upper surface of the end plate 16a and disposed in a spiral shape. The orbiting wrap 16b of the orbiting scroll 16 is accommodated between the fixed wraps 15b of the fixed scroll 15.

[0031] A boss 20 is integrally provided on the lower surface of the end plate 16a of the orbiting scroll 16, and the eccentric pin 12 is fitted to the boss 20.

[0032] As a result, the orbiting scroll 16 is provided to be eccentrically connected to the rotary shaft 8, and to follow the rotation about the axis O1 of the rotary shaft 8 and rotates (revolves) about the eccentric distance from the axis (axial center) O1 of the rotary shaft 8 as a radius. Further, the orbiting scroll 16 is configured to revolve without rotating.

[0033] The fixed scroll 15 and the orbiting scroll 16 mesh with the fixed wrap 15b and the orbiting wrap 16b to overlap vertically. The fixed scroll 15 and the orbiting scroll 16 are eccentric to each other by a predetermined amount, the fixed wrap 15b and the orbiting wrap 16b mesh with each other with phases shifted 180 degrees, and the fixed wrap 15b and the orbiting wrap 16b are in contact with each other at a plurality of places in accordance with the rotation angle of the orbiting scroll 16.

[0034] A portion between the lower surface of the fixed scroll 15 and the upper surface of the orbiting scroll 16, that is, a portion in which the fixed wrap 15b and the orbiting wrap 16b mesh with each other, is a compression chamber 21 which compresses a fluid such as a refrigerant. In the scroll compression mechanism 3 of the present embodiment, the compression chamber 21 is formed in point symmetry with respect to the center portion of the spiral of the fixed wrap 15b and the orbiting wrap 16b, and the compression chamber 21 gradually transitions to the inner circumference side, while reducing the volume in accordance with the orbiting motion of the orbiting scroll 16, thereby compressing the fluid to the maximum at the center portion of the spiral.

[0035] A discharge port 15c formed to penetrate the end plate 15a of the fixed scroll 15 to allow the upper and lower spaces to communicate with each other is provided in the end plate 15a at a position corresponding to the center portion of the compression chamber 21, and a discharge valve mechanism C is configured on the upper surface side of the discharge port 15c. The discharge valve mechanism C is a mechanism which opens and closes the discharge opening 15d of the discharge port 15c in accordance with a pressure difference between the intermediate chamber 19 between the fixed scroll 15 and the discharge cover 17 and the compression chamber 21.

[0036] The discharge cover 17 is disposed above the fixed scroll 15, and partitions and divides the interior of the housing 1 into a space on a lower side to which the suction pipe 4 is connected and an intermediate chamber 19, and a discharge chamber 22 on an upper side to which the discharge pipe 5 is connected.

[0037] A discharge port 17c through which upper and lower spaces communicate with each other is provided to penetrate the discharge cover 17, and a discharge valve mechanism B is formed on the upper surface side of the discharge port 17c. The discharge valve mechanism B is a mechanism which opens and closes the discharge port 17d of the discharge port 17c in accordance with a pressure difference between the intermediate chamber 19 and the discharge chamber 22.

[0038] As illustrated in FIGS. 2 and 3, the discharge valve mechanism B and the discharge valve mechanism C include discharge ports 15c and 17c which penetrate the end plate 15a of the fixed scroll 15 or the discharge cover 17, valve seats 15e and 17e provided on the end plate 15a of the fixed scroll 15 or the upper surface of the discharge cover 17, a valve body 25 which closes to face the discharge openings 15d and 17d of the discharge ports 15c and 17c, and a retainer 26 disposed

over the valve body 25 and the discharge port 17d to overlap.

[0039] The discharge port 17c of the discharge valve mechanism B and the discharge port 15c of the discharge valve mechanism C have compression side hole portions 15f and 17f provided on the compression chamber 21 side, and discharge side hole portions 15g and 17g provided on the discharge chamber 22 side and having the discharge openings 15d and 17d.

[0040] The compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g are bottomed holes having circular cross sections and are formed to opposite directions to each other. That is, the compression side hole portions 15f and 17f are formed in the end plate 15a of the fixed scroll 15 or the discharge cover 17 from the compression side, and the discharge side hole portions 15g and 17g are formed on the end plate 15a of the fixed scroll 15 or the discharge cover 17 from the discharge side, for example, by a drill. The cross-sectional areas of the discharge side hole portions 15g and 17g are smaller than the cross-sectional areas of the compression side hole portions 15f and 17f, and the discharge side hole portions 15g and 17g are formed to be smaller in diameter than the compression side hole portions 15f and 17f. The cross-sectional area referred to here is a cross-sectional area in a plane orthogonal to the center line at each hole portion and is the maximum cross-sectional area at each hole portion.

[0041] The centers of the discharge side hole portions 15g and 17g are eccentric with respect to the centers of the compression side hole portions 15f and 17f, and the centers of the discharge side hole portions 15g and 17g are separated from one end 25a of the valve body 25 further than the centers of the compression side hole portions 15f and 17f. Due to the eccentricity of the discharge side hole portions 15g and 17g with respect to the compression side hole portions 15f and 17f, some parts of the inner circumferential surfaces of the discharge side hole portions 15g and 17g are bulging portions 15h and 17h bulging to the side separated from one end 25a of the valve body 25 further than the inner circumferential surfaces of the compression side hole portions 15f and 17f as viewed in a plan view.

[0042] Further, on the bottom side of the compression side hole portions 15f and 17f and the bottom side of the discharge side hole portions 15g and 17g, communication portions 15i and 17i, through which the compression side hole portions 15f and 17f communicate with the discharge side hole portions 15g and 17g communicate with each other, are provided. The opening areas of the communication portions 15i and 17i are formed to be equal to or larger than the cross-sectional areas of the discharge side hole portions 15g and 17g. The opening areas of the communication portions 15i and 17i are the areas of the portion surrounded by a boundary line X (see FIG. 3) between the compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g.

[0043] Here, a chamfered portion such as an R surface or a C surface may be provided on the edge portion forming the boundary line X in the communication portions 15i and 17i.

[0044] The valve seats 15e and 17e are directly formed on the upper surface of the end plate 15a of the fixed scroll 15 and the upper surface of the discharge cover 17. The valve seats 15e and 17e have a surface shape corresponding to the surface shape of the opposite valve body 25, and the valve seats 15e and 17e are formed in a planar shape in substantially the entire region facing the valve body 25 in this embodiment.

[0045] The valve body 25 includes a reed valve, and 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 closes the discharge ports 15c and 17c in a state in which it abuts the valve seats 15e and 17e.

[0046] The valve body 25 is provided to be elastically deformable in a direction in which it approaches and separates from the end plate 15a or the upper surface of the discharge cover 17 with one end 25a fixed to the end plate 15a of the fixed scroll 15 or the upper surface of the discharge cover 17 as a fulcrum.

[0047] One end side of the retainer 26 is fixed to and supported by the discharge cover 17, and the retainer 26 is inclined upward toward the other end side to overlap the upper part of the valve body 25 and the discharge opening 17d. Since the retainer 26 is formed to be inclined from one end side to the other end side, the valve body 25 is elastically deformed by the pressure difference and restricts the lift amount of each position during lifting.

[0048] In the present embodiment, the valve body 25 and the retainer 26 are fastened together at one end 25a to the end plate 15a of the fixed scroll 15 or the discharge cover 17.

[0049] In the compressor A as described above, when the orbiting scroll 16 revolves by orbiting at the eccentric position with respect to the fixed scroll 15 by the electric motor 2, in the compression chamber 21, the refrigerant is compressed maximally at the center of the spiral while being compressed in the compression chamber 21 between the fixed spiral wrap 15b and the orbiting spiral wrap 16b.

[0050] In the discharge valve mechanism B, when the pressure in the compression chamber 21 is equal to or lower than the pressure of the intermediate chamber 19, the other end 25b side is kept in a state in which the discharge opening 17d is closed. Further, when the pressure of the compression chamber 21 becomes larger than the pressure of the intermediate chamber 19, the discharge valve mechanism B is elastically deformed in accordance with the pressure difference with the fixed portion (bolt 30) on the one end 25a side as a fulcrum, and the other end 25b side is lifted up from the valve seat 15e to open the discharge opening 17d. As a result, the compressed fluid is fed from the intermediate chamber 19 to the compression chamber 21 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 restores to its original state to close the discharge opening 17d.

[0051] Further, in the discharge valve mechanism C, when the pressure of the intermediate chamber 19 is lower than the pressure of the discharge chamber 22, the other end 25b side is kept in a state in which the discharge opening 17d is closed. Further, when the pressure of the intermediate chamber 19 becomes greater than the pressure of the discharge chamber 22, the discharge valve mechanism C is elastically deformed in accordance with the pressure difference with the fixed portion (bolt 30) on the one end 25a side as a fulcrum, and the other end 25b side is lifted up from the valve seat 15e to open the discharge opening 17d. As a result, compressed fluid is supplied 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 its original state to close the discharge opening 17d.

[0052] As these processes are continued, the compressed fluid is sequentially discharged from the discharge pipe 5 for use.

[0053] According to the compressor A as described above, since only the one end 25a of the valve body 25 is fixed to the end plate 15a or the discharge cover 17, when the discharge openings 15d and 17d are opened, the valve body 25 is obliquely disposed from the one end 25a toward the other end 25b with respect to the end plate 15a or the discharge cover 17. Accordingly, the compressed fluid discharged from the discharge openings 15d and 17d is guided by the surface of the obliquely disposed valve body 25 to flow obliquely from one end 25a toward the other end 25b.

[0054] In the present embodiment, bulging portions 15h and 17h spaced apart from one end 25a of the valve body 25 from the inner circumferential surface of the compression side hole portions 15f and 17f are provided on the inner circumferential surfaces of the discharge side hole portions 15g and 17g in a plan view. Therefore, the discharge direction of the compressed fluid introduced into the compression side hole portions 15f and 17f and discharged from the discharge side hole portions 15g and 17g can be made to coincide with the direction along the valve body 25 (see arrow Y of FIG. 3).

[0055] As described above, the valve body 25 is elastically deformed obliquely by separating the other end 25b from the discharge openings 15d and 17d while the one end 25a is fixed, thereby opening the discharge openings 15d and 17d. Therefore, by discharging the compressed fluid discharged from the discharge side hole portions 15g and 17g toward the other end 25b side of the valve body 25 in the direction of the arrow Y, it is possible to discharge the compressed fluid toward the side on which the valve body 25 is more greatly separated from the discharge openings 15d and 17d. Therefore, it is possible to reduce the pressure loss at the time of discharge of the compressed fluid.

[0056] Further, by providing the bulging portions 15h and 17h on the inner circumferential surfaces of the discharge side hole portions 15g and 17g, the distance from the one end 25a of the valve body 25 to the discharge openings 15d and 17d is longer than the distance from the one end 25a to the compression side hole portions 15f and 17f. Therefore, the length from one end 25a of the valve body 25 to the opening and closing portion of the discharge openings 15d and 17d becomes longer. As a result, the valve body 25 is easily elastically deformed, the discharge openings 15d and 17d can be opened to a greater extent, and the pressure loss of the compressed fluid at the time of discharge can be further reduced.

[0057] Further, since the valve body 25 is easily elastically deformed, the durability of the valve body 25 is enhanced. Thus, it is possible to avoid the degradation of the sealing property of the discharge openings 15d and 17d due to long-term use.

[0058] According to the compressor A of the present embodiment, by increasing the opening areas of the compression side hole portions 15f and 17f compared to the opening areas of the discharge openings 15d and 17d of the discharge side hole portions 15g and 17g, it is possible to reduce the pressure loss when the compressed fluid is introduced into the compression side hole portions 15f and 17f. On the other hand, since the discharge openings 15d and 17d of the discharge side hole portions 15g and 17g are reduced, it is possible to avoid the valve body 25 from being deformed (flexural deformation such as fitting to the discharge openings 15d and 17d) when the discharge openings 15d and 17d are closed by the valve body 25. Further, the end plate 15a of the fixed scroll 15 or the discharge cover 17 around the discharge openings 15d and 17d can be easily brought into contact with the valve body 25 with a sufficient area. Therefore, it is possible to easily ensure sufficient sealing property when the discharge openings 15d and 17d are closed by the valve body 25.

[0059] Here, when the compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g are made eccentric to communicate with each other, a part having a small opening area with an angular shape is likely to occur at the communication portions 15i and 17i. Regarding this point, in the present embodiment, since the opening areas of the communication portions 15i and 17i between the compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g are formed to be equal to or greater than the cross-sectional areas of the discharge side hole portions 15g and 17g, the opening areas of the communication portions 15i and 17i can be sufficiently secured to reduce the pressure loss in the communication portions 15i and 17i, and a decrease in valve strength can be suppressed.

[0060] Although the embodiments of the present invention have been described in detail with reference to the drawings, the specific configuration is not limited to this embodiment, and design changes and the like within a scope not departing from the gist of the present invention are also included.

[0061] The compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g are not necessarily formed using a drill. For example, as illustrated in FIG. 4, it is also possible to form the discharge side hole portions 15g and 17g with an end mill.

[0062] Further, as illustrated in FIG. 5, the end plate 15a of the fixed scroll 15 or the discharge cover 17 may have the main body portions 35 and 37, and seating plate 31 detachably provided in the main body portions 35 and 37.

[0063] The seating plate 31 is disposed between the main body portions 35 and 37 and the valve body 25 at a position on which the valve body 25 is provided. The seating plate 31 is made of a material harder than the main body portions 35 and 37. Specifically, the main body portions 35 and 37 are made of cast iron, and the seating plate 31 is made of metal such as carbon tool steel material (SK material). Further, the valve body 25 is made of, for example, stainless steel.

[0064] Compression side hole portions 15f and 17f are formed in the main body portion 35 and 37, and discharge side hole parts 15g and 17g are formed in the seating plate 31. That is, the communication portions 15i and 17i are provided between the seating plate 31 and the main body portions 35 and 37. Further, in the communication portions 15i and 17i, a chamfered portion 41 is formed on the opening edge portion on the compression side of the discharge side hole portions 15g and 17g which are the edge portions. Further, a chamfered portion 42 is formed on the opening edge portion on the discharge side of the compression side hole portions 15f and 17f.

[0065] By providing the rigid seating plate 31 and providing the discharge side hole portions 15g and 17g on the seating plate 31, the surface of the valve body 25 abuts on the seating plate 31 and is supported by the seating plate 31. Therefore, since the valve body 25 does not abut on the main body portions 35 and 37 at the time of opening and closing, breakage of the main body portions 35 and 37 can be avoided.

[0066] Furthermore, since the discharge side hole portions 15g and 17g can be provided on the seating plate 31, the discharge side hole portions 15g and 17g can be provided by being easily offset with respect to the compression side hole portions 15f and 17f.

[0067] Further, since the chamfered portions 41 and 42 are provided, the opening area can be increased at the portions of the chamfered portions 41 and 42, which leads to a further reduction in pressure loss. Further, the chamfered portions 41 and 42 may not be necessarily provided.

[0068] Further, as long as the centers of the compression side hole portions 15f and 17f are disposed at positions separated from the one end 25a with respect to the centers of the discharge side hole portions 15g and 17g, these positions are not limited to the above-described case. That is, as illustrated in FIG. 6, a center P3 of the discharge side hole portions 15g and 17g may not be disposed on a straight line which connects a center P1 of the fixed portion (bolt 30) of the one end 25a and a center P2 of the compression side hole portions 15f and 15f.

[0069] In the above description, an example in which the compression side hole portions 15f and 17f and the discharge side hole portions 15g and 17g are formed in a circular form has been described, but the shapes of the compression side hole portions 15f and 17f, the discharge side hole portions 15g and 17g, the discharge ports 15c and 17c and the like are not particularly limited, and may be a long hole, an elliptical hole, a rectangular hole, or the like.

[0070] Further, it is not necessary to apply the configuration of the above embodiment to both the discharge valve mechanism B and the discharge valve mechanism C, and the configuration of the above embodiment may be applied to at least one of them.

[0071] While preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modified examples can be made without departing from the spirit or scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

EXPLANATION OF REFERENCES

[0072]

1 Housing
1a Housing main body
1b Top 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
15a End plate
15b Fixed wrap
15c Discharge port
15d Discharge opening
15e Valve seat
15f Compression side hole portion

15g Discharge side hole portion
15h Bulging portion
15i Communication portion
16 Orbiting scroll
16a End plate
16b Orbiting wrap
17 Discharge cover
17c Discharge port
17d Discharge opening
17e Valve seat
17f Compression side hole portion
17g Discharge side hole portion
17h Bulging portion
17i Communication portion
19 Intermediate chamber
20 Boss
21 Compression chamber
22 Discharge chamber
25 Valve body
25a One end
25b The other end
26 Retainer
30 Bolt
31 Seating plate
35 Main body portion (base portion main body)
37 Main body portion (base portion main body)
41 Chamfered portion
42 Chamfered portion
A Compressor
B, C Discharge valve mechanism
O1 Axis
O2 Axis
S1 Vertical direction

Claims

1. A compressor comprising:

a base portion (15,17) which partitions a compression side and a discharge side;
a discharge port (15c,17c) penetrating the base portion; and
a valve body (25) in which one end (25a) is fixed to the base portion, the other end (25b) faces the discharge port to close the discharge port, and when a pressure on the compression side becomes larger than a pressure on the discharge side, the other end is elastically deformed to open the discharge port,
wherein the discharge port (15c, 17c) has a compression side hole portion (15f, 17f) provided on the compression side, and a discharge side hole portion (15g, 17g) which is provided on the discharge side, communicates with the compression side hole portion, and has a discharge opening (15d, 17d), and
the discharge side hole portion has a bulging portion (15h, 17h) at an end portion on the discharge side, the bulging portion being separated from the one end of the valve body further than an inner circumferential surface of the compression side hole portion in a plan view in part of an inner circumferential surface of the discharge side hole portion.

2. The compressor according to claim 1, wherein the discharge side hole portion (15g, 17g) is formed to have a smaller diameter than the compression side hole portion (15f, 17f), and the center of the discharge side hole portion is disposed on a side separated from the one end of the valve body further than the center of the compression side hole portion, and
the bulging portion (15h, 17h) is part of the inner circumferential surface of the discharge side hole portion.

3. The compressor according to claim 1 or 2, wherein an opening area of a communication portion (15i, 17i) between the compression side hole portion (15f, 17f) and the discharge side hole portion (15g, 17g) is formed to be equal to or larger than a cross-sectional area of the discharge side hole portion.

4. The compressor according to any one of claims 1 to 3, wherein the base portion (15, 17) has a base portion main body (35, 37), and a seating plate (31) which is attachable to and detachable from the base portion main body at a position where the valve body (25) is provided and which is made of a harder material than the base portion main body, and
the discharge side hole portion (15g, 17g) is provided in the seating plate.

5. The compressor according to any one of claims 1 to 4, wherein a chamfered portion (41, 42) is formed at an edge portion of a communication portion between the compression side hole portion and the discharge side hole portion.

FIG. 1

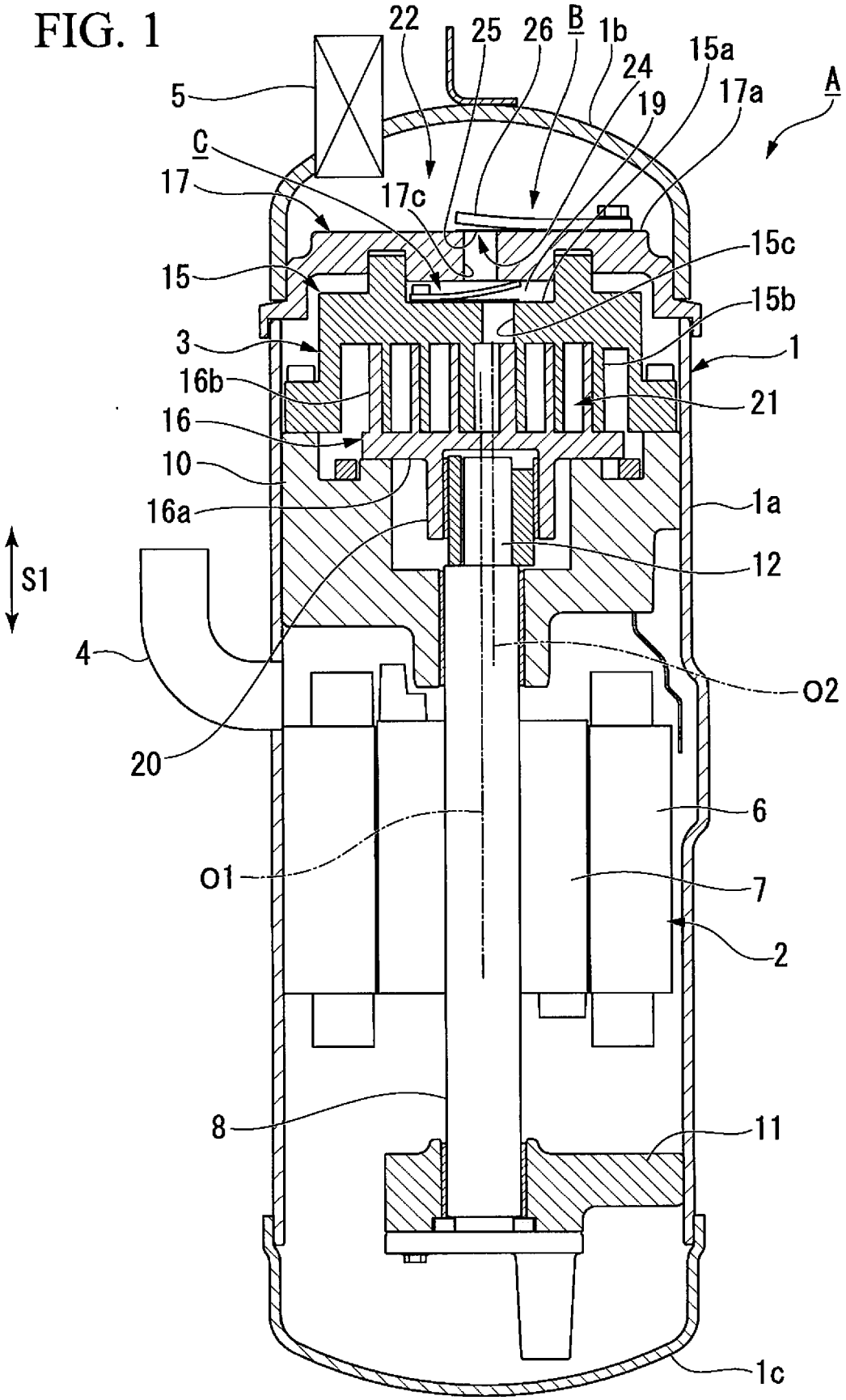

22
25
26
B
1b
24
15a
17a
A
19
5
C
17
17c
15
15c
15b
3
1
16b
21
16
10
16a
1a
S1
12
4
O2
20
6
O1
7
2
8
11
1c

FIG. 2

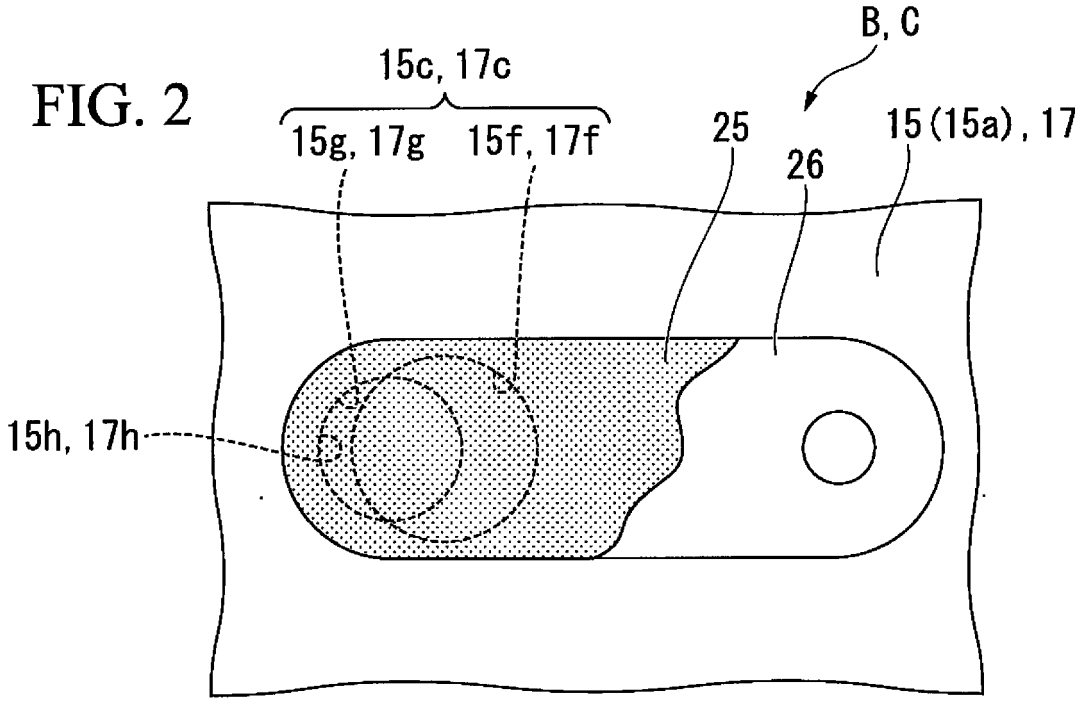

B, C
15c, 17c
15g, 17g
15f, 17f
25
26
15 (15a), 17
15h, 17h

FIG. 3

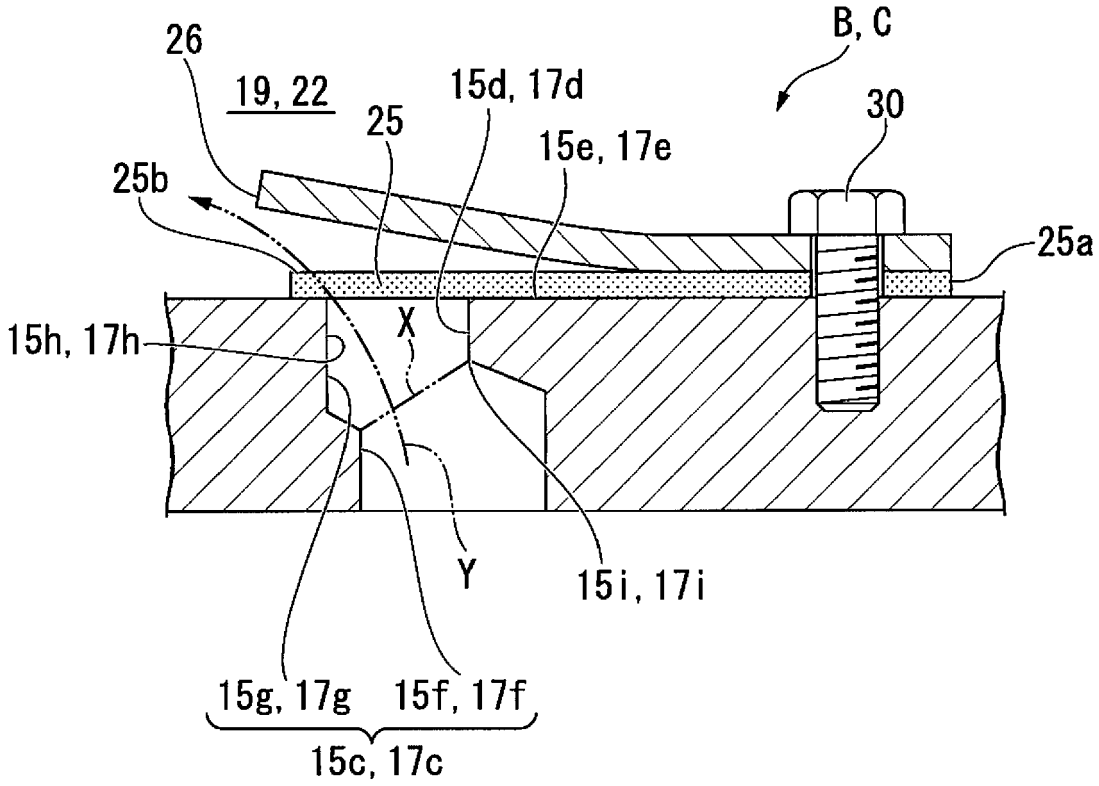

26
19, 22
25
15d, 17d
15e, 17e
B, C
30
25b
25a
15h, 17h
X
Y
15i, 17i
15g, 17g
15f, 17f
15c, 17c

FIG. 4

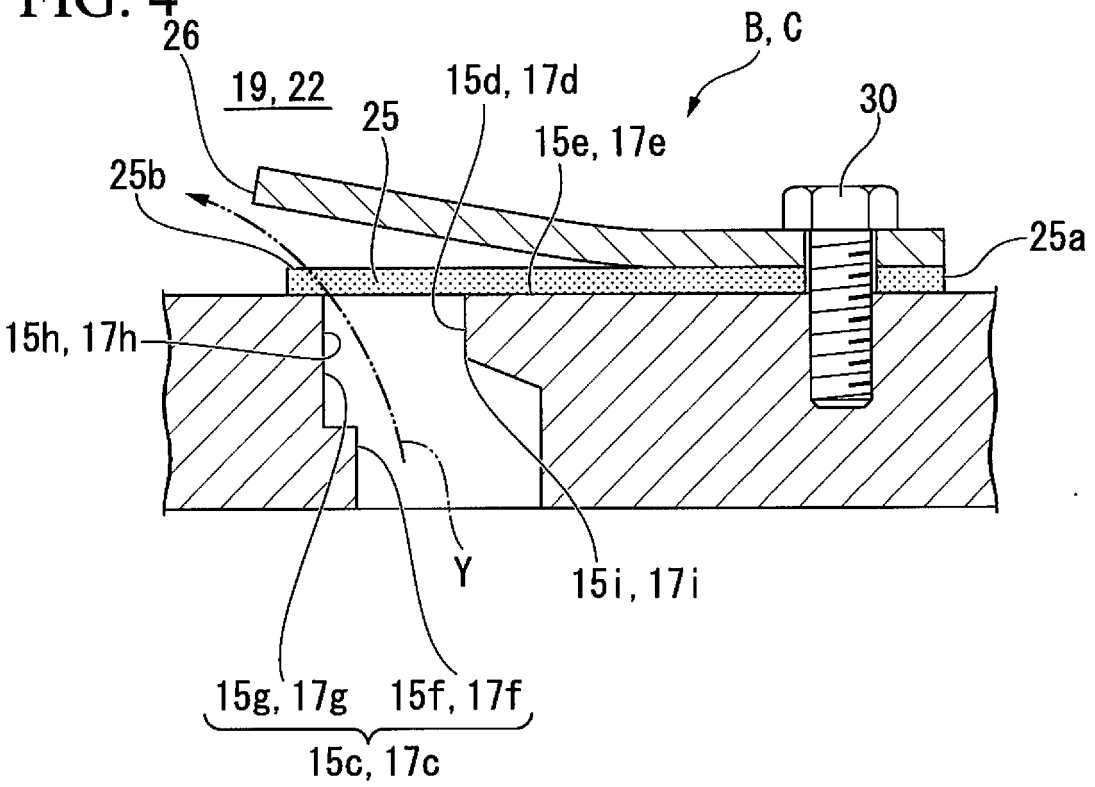

26
19, 22
25
15d, 17d
B, C
30
15e, 17e
25b
25a
15h, 17h
Y
15i, 17i
15g, 17g
15f, 17f
15c, 17c

FIG. 5

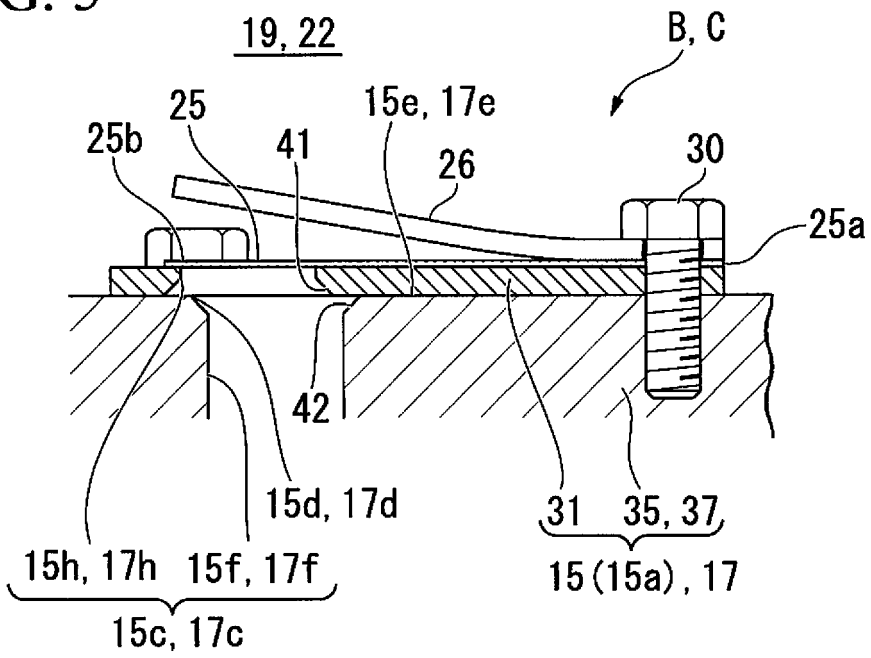
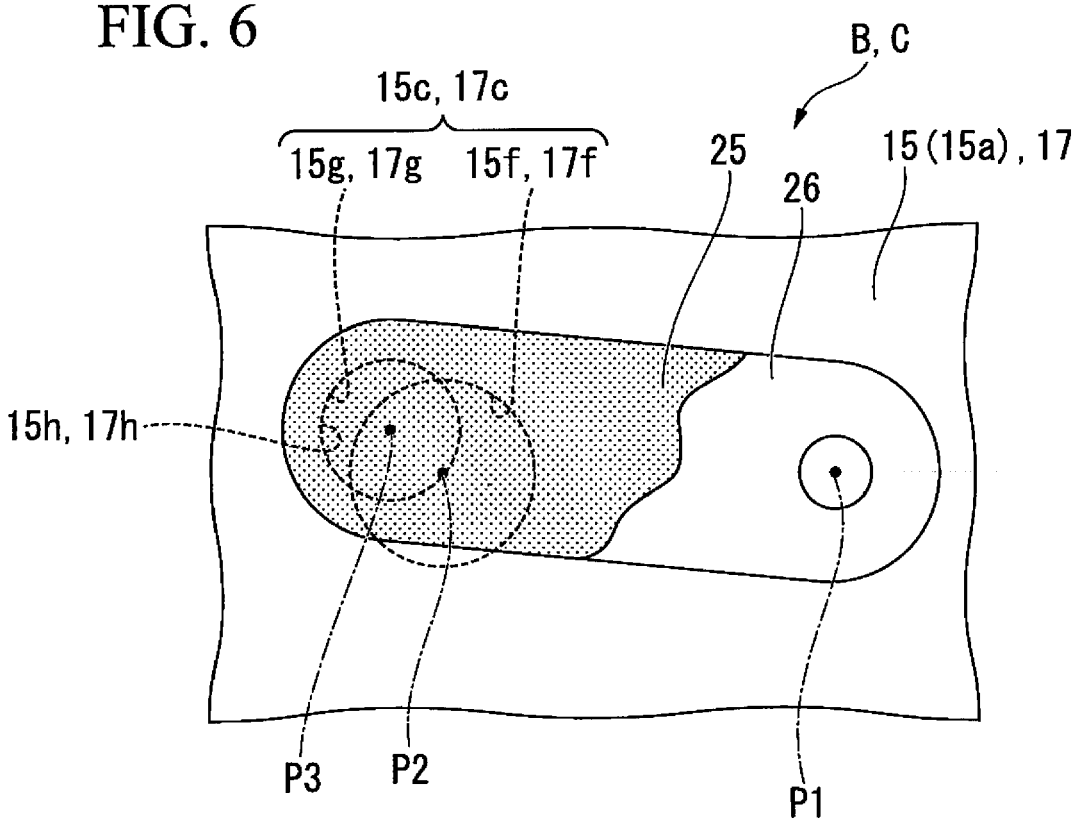

19, 22
B, C
25
15e, 17e
25b
41
26
30
25a
42
15d, 17d
31
35, 37
15h, 17h
15f, 17f
15c, 17c
15 (15a), 17

FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 1496

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F04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 May 2018	Grilli, Muzio

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