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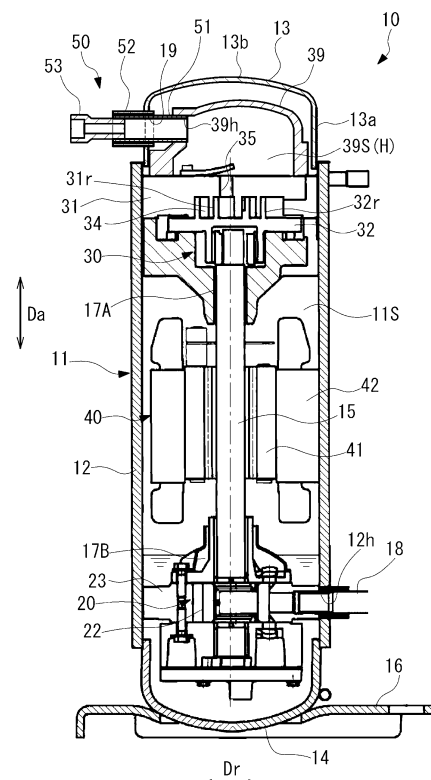
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(54) **COMPRESSOR**

(57) a cylindrical housing (11) extending in an axial direction (Da) and in which an opening (19) is formed in a side wall surface of the housing (11); a suction pipe (18) which allows a refrigerant to be suctioned into the housing (11); and a discharging pipe (50) which allows the refrigerant compressed by a scroll compression unit (30) in the housing (11) to be discharged to the outside of the housing (11). The discharging pipe (50) includes a discharging pipe main body (51) having a linear shape passing through the opening (19) so as to be extended in a radial direction (Dr) outward the housing (11) from an inside thereof. An inner peripheral surface of the opening (19) is separated from an opening facing portion (51d) facing the inner peripheral surface in an outer peripheral surface of the discharging pipe main body (51).

FIG. 1



Description

Technical Field

[0001] The present disclosure relates to a compressor.

Description of Related Art

[0002] For example, Japanese Patent No. 5285455 discloses a compressor including a fixed scroll which is fixed into a cylindrical housing, a turning scroll which revolves in the housing with respect to the fixed scroll, and a discharging pipe which discharges the refrigerant compressed in a compression chamber formed between the fixed scroll and the turning scroll to the outside of the housing. In this compressor, a dome-shaped discharge cover is provided in the housing to cover the compressor. The discharging pipe extends in a direction orthogonal to an axis of the housing and penetrates a top cover and the discharge cover of the housing.

[0003] However, in the compressor described in Japanese Patent No. 5285455, the discharging pipe needs to be inserted through a hole formed in the top cover of the housing and a cylindrical portion provided in the discharge cover at the time of assembly. Therefore, if the hole of the top cover and the cylindrical portion of the discharge cover are not located coaxially with high positional accuracy in an attachment state of the top cover, it is difficult to insert (press-fit) the discharging pipe in some cases.

[0004] The present disclosure has been made to solve the above-described problems and an object thereof is to provide a compressor of which workability of assembly can be improved.

SUMMARY OF THE INVENTION

[0005] In order to solve the above-described problems, a compressor according to the present disclosure includes: a cylindrical housing extending in an axial direction and in which an opening is formed in a side wall surface of the housing; a suction pipe which allows a refrigerant to be suctioned into the housing; and a discharging pipe which allows the refrigerant compressed by a scroll compression unit in the housing to be discharged to the outside of the housing, wherein the discharging pipe includes a discharging pipe main body having a linear shape passing through the opening so as to be extended in a radial direction outward the housing from an inside thereof, and wherein an inner peripheral surface of the opening is separated from an opening facing portion facing the inner peripheral surface in an outer peripheral surface of the discharging pipe main body.

[0006] According to the present disclosure, it is possible to improve the workability of assembly. Further, since residual stress associated with machining such as bending does not occur in the discharging pipe exposed to a high temperature and a high pressure, this is advanta-

geous in pressure resistance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a cross-sectional view of a compressor according to an embodiment of the present disclosure. FIG. 2 is an enlarged cross-sectional view of a configuration of a discharging pipe of the compressor according to the embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

<Embodiments>

(Compressor)

[0008] Hereinafter, a compressor according to an embodiment of the present disclosure will be described with reference to FIGS. 1 and 2.

[0009] As shown in FIG. 1, a compressor 10 compresses a refrigerant suctioned through a suction pipe 18 into a housing 11 and discharges the refrigerant from a discharging pipe 50 to the outside of the housing 11.

[0010] The compressor 10 includes a scroll compression unit 30 in the housing 11.

[0011] The compressor 10 may include the scroll compression unit 30 and a rotary compression unit 20 in the housing 11.

[0012] In this embodiment, the compressor 10 is a closed type two-stage compressor including the scroll compression unit 30 and the rotary compression unit 20.

[0013] The compressor 10 compresses, for example, carbon dioxide (CO₂) as the refrigerant.

[0014] The compressor 10 may compress a refrigerant other than carbon dioxide.

[0015] The compressor 10 includes the housing 11, a rotation shaft 15, the rotary compression unit 20, the scroll compression unit 30, an electric motor 40, the suction pipe 18, and the discharging pipe 50.

(Housing)

[0016] The housing 11 forms the outer shell of the compressor 10.

[0017] The housing 11 extends in an axial direction Da.

[0018] The housing 11 may be provided with the axial direction Da along the up and down direction.

[0019] The housing 11 may be formed in a cylindrical shape as a whole.

[0020] The housing 11 includes a housing main body 12, a top cover 13, and a bottom cover 14.

[0021] The housing 11 defines an inner space 11S extending in the axial direction Da.

[0022] The housing main body 12 is formed in a cylindrical shape extending in the axial direction Da.

[0023] A suction pipe connection opening 12h is formed at the lower portion of the housing main body 12. The suction pipe 18 is connected to the suction pipe connection opening 12h.

[0024] The suction pipe 18 allows the refrigerant to be suctioned into the housing 11. Also, the suction pipe 18 allows the refrigerant to be suctioned from the outside of the housing 11.

[0025] The refrigerant suctioned through the suction pipe 18 into the housing 11 is compressed in two stages by the rotary compression unit 20 and the scroll compression unit 30.

[0026] The top cover 13 is provided at the upper portion of the housing main body 12.

[0027] The top cover 13 closes the opening on one side of the housing main body 12 in the axial direction Da.

[0028] For example, the top cover 13 integrally includes a cylindrical portion 13a and a curved portion 13b.

[0029] The cylindrical portion 13a is formed in a cylindrical shape extending in the axial direction Da.

[0030] The lower end of the cylindrical portion 13a is joined to the upper end of the housing main body 12.

[0031] The curved portion 13b is provided to be continuous to the upper end of the cylindrical portion 13a.

[0032] The curved portion 13b is curved to protrude upward.

[0033] The curved portion 13b closes the upper side of the cylindrical portion 13a.

[0034] The top cover 13 includes an opening 19.

[0035] The opening 19 is formed in, for example, the cylindrical portion 13a.

[0036] The opening 19 penetrates the cylindrical portion 13a in a radial direction Dr. That is, the housing 11 includes the opening 19 formed on the side surface.

[0037] The bottom cover 14 is provided at the lower portion of the housing main body 12.

[0038] The bottom cover 14 closes the opening on the other side of the housing main body 12 in the axial direction Da.

[0039] A base member 16 is provided on the lower side of the bottom cover 14.

[0040] The base member 16 extends outward in the radial direction Dr intersecting the axial direction Da in the housing 11.

[0041] When the compressor 10 is installed on a predetermined attachment target, the base member 16 is fixed to the predetermined attachment target.

(Rotation Shaft)

[0042] The rotation shaft 15 is housed in the housing 11.

[0043] The rotation shaft 15 extends in the axial direction Da in the housing 11.

[0044] The rotation shaft 15 is supported by a bearing 17A and a bearing 17B to be rotatable around the axis along the axial direction Da.

[0045] The bearing 17A and the bearing 17B are pro-

vided with a gap therebetween in the axial direction Da.

[0046] The bearing 17A is provided on one side (upper side) of the rotation shaft 15 in the axial direction Da.

[0047] The bearing 17A is fixed to the inner surface of the housing main body 12.

[0048] The bearing 17B is provided on the other side (lower side) of the rotation shaft 15 in the axial direction Da.

[0049] The bearing 17B is fastened to a cylinder 23 constituting the rotary compression unit 20.

(Rotary Compression Unit)

[0050] The rotary compression unit 20 is provided on the bottom portion in the housing 11.

[0051] The rotary compression unit 20 is disposed below the electric motor 40.

[0052] The rotary compression unit 20 includes a piston rotor 22 and a cylinder 23.

[0053] The piston rotor 22 is provided at the other end on the other side of the rotation shaft 15 in the axial direction Da.

[0054] The piston rotor 22 is provided eccentrically in the radial direction Dr with respect to the central axis of the rotation shaft 15.

[0055] The piston rotor 22 rotates eccentrically with respect to the center axis of the rotation shaft 15 in accordance with the rotation of the rotation shaft 15.

[0056] The cylinder 23 houses the piston rotor 22 therein.

[0057] The piston rotor 22 rotates eccentrically in the cylinder 23.

[0058] The rotary compression unit 20 introduces the refrigerant suctioned through the suction pipe 18 to be described later into the cylinder 23.

[0059] The rotary compression unit 20 compresses the refrigerant by turning the piston rotor 22 inside the cylinder 23.

[0060] The rotary compression unit 20 discharges the compressed refrigerant to the inner space 11S set to an intermediate pressure of the housing 11 through a discharging hole (not shown).

(Scroll Compression Unit)

[0061] The scroll compression unit 30 is provided at the upper portion in the housing 11.

[0062] The scroll compression unit 30 is disposed on the upper portion of the electric motor 40.

[0063] The scroll compression unit 30 includes a fixed scroll 31 and a turning scroll 32.

[0064] The fixed scroll 31 is fixed to the upper surface of the bearing 17A.

[0065] The fixed scroll 31 includes a spiral fixed lap 31r that protrudes downward.

[0066] The turning scroll 32 is disposed below the fixed scroll 31 to face the fixed scroll 31.

[0067] The turning scroll 32 is provided at the end por-

tion (upper end) on one side in the axial direction Da of the rotation shaft 15 in an eccentric manner in the radial direction Dr. Accordingly, the turning scroll 32 rotates eccentrically in accordance with the rotation of the rotation shaft 15.

[0068] The turning scroll 32 revolves with respect to the fixed scroll 31.

[0069] The turning scroll 32 includes a turning lap 32r which protrudes upward.

[0070] The turning lap 32r of the turning scroll 32 meshes with the fixed lap 31r of the fixed scroll 31.

[0071] A compression chamber 34 is formed between the turning lap 32r of the turning scroll 32 and the fixed lap 31r of the fixed scroll 31.

[0072] The scroll compression unit 30 sucks the refrigerant from the inner space 11S into the compression chamber 34 through a suction hole (not shown). The refrigerant suctioned into the compression chamber 34 is compressed by the turning scroll 32 that revolves with respect to the fixed scroll 31. The compressed refrigerant is discharged toward the upper side of the fixed scroll 31 through a discharging hole 35 formed in the fixed scroll 31.

[0073] A discharge cover 39 is provided on the upper side of the fixed scroll 31.

[0074] The discharge cover 39 is housed in the upper portion in the housing 11.

[0075] The discharge cover 39 is disposed between the top cover 13 and the scroll compression unit 30.

[0076] The discharge cover 39 is fixed to the fixed scroll 31 by a bolt and the like.

[0077] A discharging space 39S is formed between the discharge cover 39 and the fixed scroll 31.

[0078] The discharging space 39S is a space separated from the inner space 11S and does not communicate with the inner space 11S.

[0079] In the discharging space 39S, the high-pressure refrigerant compressed by the scroll compression unit 30 is discharged from the discharging hole 35. That is, the discharging space 39S forms a high pressure region H.

(Electric Motor)

[0080] The electric motor 40 is disposed at the intermediate portion in the up and down direction in the housing 11.

[0081] The electric motor 40 includes a rotor 41 and a stator 42.

[0082] The rotor 41 is fixed to the outer surface of the rotation shaft 15.

[0083] The rotor 41 is disposed between the bearing 17A and the bearing 17B in the axial direction Da.

[0084] The stator 42 is disposed on the outside of the radial direction Dr of the rotor 41 to surround the outer surface of the rotor 41.

[0085] The stator 42 is fixed to the inner surface of the housing main body 12 of the housing 11.

[0086] The stator 42 is connected to a power supply

via a wiring (not shown).

[0087] The electric motor 40 rotates the rotation shaft 15 by electric power supplied from the power supply.

5 (Discharging Pipe)

[0088] The discharging pipe 50 allows the refrigerant compressed by the scroll compression unit 30 in the housing 11 to be discharged to the outside of the housing 11.

[0089] In this embodiment, the discharging pipe 50 allows the high-pressure refrigerant compressed in two stages by the rotary compression unit 20 and the scroll compression unit 30 to be discharged to the outside of the housing 11.

[0090] The discharging pipe 50 is disposed at the upper portion of the housing 11.

[0091] The discharging pipe 50 penetrates the top cover 13 and the discharge cover 39.

[0092] One end of the discharging pipe 50 communicates with the discharging space 39S.

[0093] The other end of the discharging pipe 50 opens toward the outside of the housing 11.

[0094] As shown in FIG. 2, the discharging pipe 50 includes a discharging pipe main body 51 and an outer pipe 52.

[0095] The discharging pipe main body 51 has a linear shape penetrating the opening 19 and extending in the radial direction Dr of the housing 11 from the inside of the housing 11 toward the outside of the housing 11.

[0096] A base end portion 51b of the discharging pipe main body 51 is fixed to a through-hole 39h formed in the discharge cover 39.

[0097] For example, the base end portion 51b of the discharging pipe main body 51 may be press-fitted into the through-hole 39h. Also, the base end portion 51b of the discharging pipe main body 51 may be joined to the through-hole 39h by brazing or welding.

[0098] A tip portion 51s of the discharging pipe main body 51 protrudes from the outer surface of the housing 11 toward the outside in the radial direction Dr.

[0099] The outer diameter of the outer peripheral surface 51g of the discharging pipe main body 51 is smaller than the inner diameter of the opening 19 by a predetermined length.

[0100] An opening facing portion 51d facing an inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51 is separated from the inner peripheral surface 19f of the opening 19.

[0101] The opening facing portion 51d of the discharging pipe main body 51 and the inner peripheral surface 19f of the opening 19 are separated from each other by a predetermined length in the pipe radial direction of the discharging pipe main body 51.

[0102] One end portion 52a of the outer pipe 52 is fixed to the opening 19.

[0103] For example, one end portion 52a of the outer

pipe 52 may be press-fitted into the opening 19. Also, one end portion 52a of the outer pipe 52 may be joined to the opening 19 by brazing or welding.

[0104] The outer pipe 52 has a linear shape extending from the housing 11 toward the outside in the radial direction Dr.

[0105] The outer diameter of the discharging pipe main body 51 is smaller than the inner diameter of the outer pipe 52.

[0106] The discharging pipe main body 51 is inserted into the outer pipe 52.

[0107] The tip portion 51s of the discharging pipe main body 51 is disposed at the same position in the radial direction Dr of the housing 11 with respect to a tip 52s of the outer pipe 52 or on the inside in the radial direction Dr of the housing 11 in relation to the tip 52s. That is, the tip portion 51s of the discharging pipe main body 51 does not protrude toward the outside in the radial direction Dr of the housing 11 with respect to the tip 52s of the outer pipe 52.

[0108] The outer pipe 52 and the discharging pipe main body 51 may be joined, for example, by brazing.

[0109] Accordingly, a brazing material W is interposed between the inner surface of the outer pipe 52 and the outer peripheral surface 51g of the discharging pipe main body 51.

[0110] The brazing material W is continuously provided at least from the tip portion 51s of the discharging pipe main body 51 to the opening facing portion 51d.

[0111] In this way, in the discharging pipe main body 51, the base end portion 51b is fixed to the through-hole 39h of the discharge cover 39 and the tip portion 51s is fixed to the opening 19 through the outer pipe 52.

[0112] The intermediate portion of the discharging pipe main body 51 is exposed to a space 11m between the housing 11 and the discharge cover 39.

[0113] For example, a connection pipe member 53 may be connected to the inside of the tip portion 51s of the discharging pipe main body 51. The connection pipe member 53 may be inserted into the tip portion 51s of the discharging pipe main body 51.

[0114] The connection pipe member 53 may be press-fitted into the tip portion 51s of the discharging pipe main body 51. Also, the connection pipe member 53 may be joined to the tip portion 51s of the discharging pipe main body 51 by brazing or welding.

[0115] In the connection pipe member 53, an external pipe is connected to the compressor 10.

[0116] Part of the connection pipe member 53 protrudes toward the outside in the radial direction Dr of the housing 11 in relation to the tip portion 51s of the discharging pipe main body 51.

[0117] The connection pipe member 53 includes an enlarged diameter portion 53d which is formed at a portion protruding toward the outside in the radial direction Dr of the housing 11 in relation to the tip portion 51s of the discharging pipe main body 51.

[0118] An external pipe is connectable to the enlarged

diameter portion 53d.

[0119] The connection pipe member 53 is thicker than the discharging pipe main body 51.

[0120] When assembling the compressor 10, for example, an operator first attaches the discharging pipe main body 51 of the discharging pipe 50 to the through-hole 39h of the discharge cover 39 through the opening 19. At this time, the outer pipe 52 is not mounted on the opening 19. The inner diameter of the opening 19 is larger than the outer diameter of the discharging pipe main body 51. Therefore, the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51 are separated from each other in the pipe radial direction of the discharging pipe main body 51. Therefore, the operator can easily attach the discharging pipe main body 51 to the through-hole 39h of the discharge cover 39 through the opening 19.

[0121] Then, the operator attaches the outer pipe 52 to the opening 19.

[0122] Further, the operator joins the outer pipe 52 to the discharging pipe main body 51 by brazing.

[0123] For example, the operator may subsequently connect the connection pipe member 53 to the tip portion 51s of the discharging pipe main body 51.

(Operation and effect)

[0124] According to the compressor 10 of this embodiment, the discharging pipe 50 penetrates the opening 19 provided on the side surface of the housing 11. The inner peripheral surface 19f of the opening 19 is separated from the opening facing portion 51d of the discharging pipe main body 51. In such a configuration, when the discharging pipe 50 is fixed to the opening 19 after the discharging pipe 50 penetrates the opening 19, the discharging pipe 50 can be easily inserted into the opening 19. Thus, it is possible to improve the workability of assembly of the compressor 10. Since residual stress associated with machining such as bending does not occur in the discharging pipe exposed to a high temperature and a high pressure as compared with a structure in which the discharging pipe is inserted in the axial direction from the upper surface of the housing 11 and is bent in the radial direction, this is advantageous in pressure resistance.

[0125] Further, according to an example of this embodiment, the outer diameter of the outer peripheral surface 51g is smaller than the inner diameter of the inner peripheral surface 19f. Accordingly, a gap can be formed between the opening 19 and the discharging pipe main body 51 by separating the inner peripheral surface 19f of the opening 19 from the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51.

[0126] Further, according to an example of this em-

bodiment, the discharging pipe 50 further includes the outer pipe 52 which has one end portion fixed to the opening 19 and extends toward the outside in the radial direction Dr of the housing 11.

[0127] According to such a configuration, the discharging pipe main body 51 is inserted into the outer pipe 52. The discharging pipe 50 has a double structure in which the outer pipe 52 is provided on the outside of the discharging pipe main body 51 on the outside in the radial direction Dr in relation to the outer peripheral surface 51g of the housing 11. Accordingly, the thickness of the discharging pipe 50 obtained by combining the discharging pipe main body 51 with the outer pipe 52 can be increased and the pressure resistance of the discharging pipe 50 on the outside in the radial direction Dr of the housing 11 can be increased.

[0128] Further, one end portion of the outer pipe 52 is fixed and the discharging pipe main body 51 is located therein. Accordingly, part of a gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d of the discharging pipe main body 51 can be formed (filled) with the outer pipe 52 made of a rigid body. Accordingly, it is possible to more firmly fix the discharging pipe main body 51 to the opening 19, for example, as compared with a structure in which a gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d of the discharging pipe main body 51 is filled with a sealing material or the like. Accordingly, it is possible to suppress the concentration of stress on the discharging pipe main body 51.

[0129] Further, since the outer pipe 52 is provided, the gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d of the discharging pipe main body 51 can be further increased. Accordingly, the inner diameter of the opening 19 can be larger than the outer diameter of the discharging pipe main body 51. Thus, the operator can more easily insert the discharging pipe main body 51 into the opening 19 when assembling the compressor 10.

[0130] Further, it is possible to ensure the long joint area between the outer pipe 52 and the discharging pipe main body 51 in the extension direction of the discharging pipe main body 51 by joining the outer pipe 52 and the discharging pipe main body 51 to each other in a portion in which the discharging pipe main body 51 is inserted into the outer pipe 52. Thus, the discharging pipe main body 51 is more firmly joined to the housing 11 through the outer pipe 52.

[0131] Further, according to an example of this embodiment, in the compressor 10, the brazing material W is interposed between the outer pipe 52 and the discharging pipe main body 51.

[0132] Accordingly, the outer pipe 52 and the discharging pipe main body 51 can be strongly joined to each other.

[0133] Further, since a gap between the outer pipe 52

and the discharging pipe main body 51 is closed by the brazing material W, it is possible to increase the pressure resistance and the sealing property between the outer pipe 52 and the discharging pipe main body 51 as compared with a configuration in which the gap is closed by a sealing material or the like.

[0134] Further, according to an example of this embodiment, the brazing material W is provided at least from the tip portion 51s of the discharging pipe main body 51 to the opening facing portion 51d of the discharging pipe main body 51.

[0135] Accordingly, it is possible to ensure the long joint area in which the outer pipe 52 and the discharging pipe main body 51 are joined to each other by brazing in the extension direction of the discharging pipe main body 51. Thus, the discharging pipe main body 51 is firmly fixed.

[0136] Further, according to an example of this embodiment, the tip portion 51s of the discharging pipe main body 51 is disposed at the same position in the radial direction Dr of the housing 11 with respect to the tip 52s of the outer pipe 52 or on the inside in the radial direction Dr of the housing 11.

[0137] Accordingly, the tip portion 51s of the discharging pipe main body 51 does not protrude from the tip 52s of the outer pipe 52 toward the outside in the radial direction Dr of the housing 11. Accordingly, the discharging pipe main body 51 has a double structure in which the outer pipe 52 is provided on the outside of the discharging pipe main body 51 in a portion on the outside in the radial direction Dr in relation to the outer surface of the housing 11 and can ensure high pressure resistance.

[0138] Further, according to an example of this embodiment, the intermediate portion of the discharging pipe main body 51 is exposed to the space 11m between the housing 11 and the discharge cover 39.

[0139] In the housing 11, the discharging space 39S which faces the scroll compression unit 30 inside the discharge cover 39 becomes the high pressure region H having a higher pressure than the atmosphere outside the housing 11. Further, the space 11m between the housing 11 and the discharge cover 39 in the housing 11 becomes an intermediate pressure region M having a higher pressure than the atmosphere outside the housing 11 and a lower pressure than the discharging space 39S inside the discharge cover 39. That is, the intermediate portion of the discharging pipe main body 51 is exposed to the intermediate pressure region M between the inner surface of the housing 11 and the outer peripheral surface of the discharge cover 39. Therefore, the discharging pipe main body 51 does not need to be exposed to the high pressure region H and the thickness thereof can be reduced.

[0140] Further, according to an example of this embodiment, in the compressor 10, the connection pipe member 53 that is thicker than the discharging pipe main body 51 is connected to the tip portion 51s of the discharging pipe main body 51.

[0141] In this way, an external pipe can be connected to the connection pipe member 53 to which the tip portion 51s of the discharging pipe main body 51 is connected. The high-pressure refrigerant discharged from the inside of the housing 11 flows through the connection pipe member 53. Therefore, the differential pressure between the inside of the connection pipe member 53 through which the high-pressure refrigerant flows and the outside of the connection pipe member 53 which is exposed to the atmosphere increases in a portion protruding toward the outside of the housing 11 in the radial direction Dr in relation to the tip portion 51s of the discharging pipe main body 51 in the connection pipe member 53. Since the connection pipe member 53 is thicker than the discharging pipe main body 51, it is possible to ensure the pressure resistance of the connection pipe member 53.

[0142] Further, according to an example of this embodiment, the compressor 10 compresses the refrigerant in two stages by the rotary compression unit 20 and the scroll compression unit 30.

[0143] Accordingly, the compressor 10 constitutes the two-stage compressor. The pressure of the refrigerant discharged from the compressor 10 with such a configuration is high. Therefore, since the discharging pipe 50 having high pressure resistance while improving the workability of assembly by the above-described configuration is provided, the effectiveness of the compressor 10 is increased.

[0144] Further, according to an example of this embodiment, the refrigerant is carbon dioxide.

[0145] In this way, when the refrigerant to be compressed is carbon dioxide, the compressor 10 is required to have high pressure resistance. On the other hand, the compressor 10 with the above-described configuration is particularly suitable.

<Appendix>

[0146] Examples of the compressor 10 described in the embodiment is understood as below.

(1) The compressor 10 according to the first aspect includes: the cylindrical housing 11 extending in an axial direction Da and in which an opening 19 is formed in the side wall surface of the housing 11; the suction pipe 18 which allows the refrigerant to be suctioned into the housing 11; and the discharging pipe 50 which allows the refrigerant compressed by the scroll compression unit 30 in the housing 11 to be discharged to the outside of the housing 11, wherein the discharging pipe 50 includes the discharging pipe main body 51 having the linear shape passing through the opening 19 so as to be extended in the radial direction Dr outward the housing 11 from an inside thereof, and wherein an inner peripheral surface 19f of the opening 19 is separated from an opening facing portion 51d facing the inner peripheral surface 19f in an outer peripheral surface 51g

of the discharging pipe main body 51.

[0147] In this compressor 10, the discharging pipe 50 is passed through the opening 19 formed in on the side wall surface of the housing 11. The inner peripheral surface 19f of the opening 19 is separated from the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51. In such a configuration, the discharging pipe 50 is passed through the opening 19, and then the discharging pipe 50 is fixed to the opening 19, the discharging pipe 50 can be easily inserted into the opening 19. Thus, it is possible to improve the workability of assembly of the compressor 10.

[0148] (2) The compressor 10 according to a second aspect is the compressor 10 of (1), wherein an outer diameter of the outer peripheral surface 51g of the discharging pipe main body 51 may be smaller than an inner diameter of the inner peripheral surface 19f of the opening 19.

[0149] In this way, since the outer diameter of the outer peripheral surface 51g of the discharging pipe main body 51 is made smaller than the inner diameter of the inner peripheral surface 19f of the opening 19, the inner peripheral surface 19f of the opening 19 can be separated from the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51.

[0150] (3) The compressor 10 according to a third aspect is the compressor 10 of (1) or (2), wherein the discharging pipe 50 may further include an outer pipe 52 of which one end portion is fixed to the opening 19 and extending in the radial direction Dr outward the housing 11, and wherein the discharging pipe main body 51 may be inserted to the outer pipe 52.

[0151] According to such a configuration, the discharging pipe main body 51 is inserted into the outer pipe 52. A double structure in which the outer pipe 52 is provided on the outside of the discharging pipe main body 51 is formed on the outside in the radial direction Dr in relation to the outer peripheral surface 51g of the housing 11. Accordingly, the thickness of the discharging pipe 50 obtained by combining the discharging pipe main body 51 with the outer pipe 52 can be increased and the pressure resistance of the discharging pipe 50 on the outside in the radial direction Dr of the housing 11 can be increased.

[0152] Further, one end portion of the outer pipe 52 is fixed, the discharging pipe main body 51 is located therein, and a part of a gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51 can be formed (filled) with the outer pipe 52 made of a rigid body. Accordingly, it is possible to more firmly fix the discharging pipe main body 51 to the opening 19, for example, as compared with a structure in which a gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d

facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51 is filled with a sealing material or the like. Accordingly, it is possible to suppress the concentration of stress on the discharging pipe main body 51.

[0153] Further, since the outer pipe 52 is provided, the gap between the inner peripheral surface 19f of the opening 19 and the opening facing portion 51d facing the inner peripheral surface 19f of the opening 19 in the outer peripheral surface 51g of the discharging pipe main body 51 can be further increased. Accordingly, the inner diameter of the opening 19 can be larger than the outer diameter of the discharging pipe main body 51. Thus, it is possible to more easily insert the discharging pipe main body 51 into the opening 19 when assembling the compressor 10.

[0154] Further, it is possible to ensure the long joint area between the outer pipe 52 and the discharging pipe main body 51 in the extension direction of the discharging pipe main body 51 by joining the outer pipe 52 and the discharging pipe main body 51 to each other in a portion in which the discharging pipe main body 51 is inserted into the outer pipe 52. Thus, the discharging pipe main body 51 is more firmly joined to the housing 11 through the outer pipe 52.

[0155] (4) The compressor 10 according to a fourth aspect is the compressor 10 of (3), wherein an outer diameter of the discharging pipe main body 51 may be smaller than an inner diameter of the outer pipe 52, and wherein the brazing material W may be interposed between the inner peripheral surface of the outer pipe 52 and the outer peripheral surface 51g of the discharging pipe main body 51.

[0156] In this way, since the brazing material W is interposed between the inner peripheral surface of the outer pipe 52 and the outer peripheral surface 51g of the discharging pipe main body 51, it is possible to firmly join the outer pipe 52 and the discharging pipe main body 51 to each other.

[0157] Further, since the gap between the outer pipe 52 and the discharging pipe main body 51 is closed by the brazing material W, it is possible to increase the pressure resistance and the sealing property between the outer pipe 52 and the discharging pipe main body 51 as compared with a configuration in which the gap is closed by a sealing material or the like.

[0158] (5) The compressor 10 according to a fifth aspect is the compressor 10 of (4), wherein the brazing material W may be interposed at least from the tip portion 51s of the discharging pipe main body 51 to the opening facing portion 51d in which the outer peripheral surface 51g of the discharging pipe main body 51 faces the inner peripheral surface 19f of the opening 19.

[0159] Accordingly, it is possible to ensure the long joint area in which the outer pipe 52 and the discharging pipe main body 51 are joined to each other by brazing in the extension direction of the discharging pipe main body 51. Thus, the discharging pipe main body 51 is firmly

fixed.

[0160] (6) The compressor 10 according to a sixth aspect is the compressor 10 of any one of (3) to (5), wherein the tip portion 51s of the discharging pipe main body 51 may be, with respect to the tip 52s of the outer pipe 52, disposed at the same position in the radial direction Dr of the housing 11, or on the inside in the radial direction Dr thereof.

[0161] Accordingly, the tip portion 51s of the discharging pipe main body 51 does not protrude from the tip 52s of the outer pipe 52 toward the outside in the radial direction Dr of the housing 11. Accordingly, the discharging pipe main body 51 has a double structure in which the outer pipe 52 is provided on the outside of the discharging pipe main body 51 in a portion on the outside in the radial direction Dr in relation to the outer surface of the housing 11 and can ensure high pressure resistance.

[0162] (7) The compressor 10 according to a seventh aspect is the compressor 10 of any one of (1) to (6), wherein the base end portion 51b of the discharging pipe main body 51 may be fixed to the through-hole 39h formed in the discharge cover 39 covering the scroll compression unit 30 installed in the housing 11 and wherein an intermediate portion of the discharging pipe main body 51 may be exposed to the space 11m between the housing 11 and the discharge cover 39.

[0163] Accordingly, a portion facing the scroll compression unit 30 inside the discharge cover 39 in the housing 11 becomes a high pressure region H compared with the atmosphere outside the housing 11. Further, the space 11m between the housing 11 and the discharge cover 39 in the housing 11 becomes an intermediate pressure region M having a higher pressure than the atmosphere outside the housing 11 and a lower pressure than the inside of the discharge cover 39. That is, the intermediate portion of the discharging pipe main body 51 is exposed to the intermediate pressure region M between the inner surface of the housing 11 and the outer peripheral surface of the discharge cover 39. Therefore, the discharging pipe main body 51 does not need to be exposed to the high pressure region H and the thickness thereof can be reduced.

[0164] (8) The compressor 10 according to an eighth aspect is the compressor 10 of any one of (1) to (7), wherein the connection pipe member 53 to which the external pipe is connected may be connected to an inside of the tip portion of the discharging pipe main body 51, and wherein the thickness of the connection pipe member 53 may be larger than that of the discharging pipe main body 51.

[0165] In this way, an external pipe can be connected to the connection pipe member 53 to which the tip portion 51s of the discharging pipe main body 51 is connected. The high-pressure refrigerant discharged from the inside of the housing 11 flows through the connection pipe member 53. Therefore, the differential pressure between the inside of the connection pipe member 53 through which the high-pressure refrigerant flows and the outside of the

connection pipe member 53 which is exposed to the atmosphere increases in a portion protruding toward the outside of the housing 11 in the radial direction Dr in relation to the tip portion 51s of the discharging pipe main body 51 in the connection pipe member 53. Since the connection pipe member 53 is thicker than the discharging pipe main body 51, it is possible to ensure the pressure resistance of the connection pipe member 53.

[0166] (9) The compressor 10 according to a ninth aspect is the compressor 10 of any one of (1) to (8), which may further include: the rotation shaft 15 extending in the housing 11 in the axial direction Da and in which the turning scroll 32 of the scroll compression unit 30 is attached to one end of the rotation shaft 15; and the rotary compression unit 20 including the piston rotor 22 provided at the other end of the rotation shaft 15, wherein the refrigerant suctioned through the suction pipe 18 into the housing 11 is compressed in two stages by the rotary compression unit 20 and the scroll compression unit 30.

[0167] Accordingly, the compressor 10 constitutes the two-stage compressor which compresses the refrigerant in two stages by the rotary compression unit 20 and the scroll compression unit 30. The pressure of the refrigerant discharged from the compressor 10 with such a configuration is high. Therefore, since the discharging pipe 50 having high pressure resistance while improving the workability of assembly by the above-described configuration is provided, the effectiveness of the compressor 10 is increased.

[0168] (10) The compressor 10 according to a tenth aspect is the compressor 10 of any one of (1) to (9), wherein the refrigerant may be carbon dioxide.

[0169] In this way, when the refrigerant to be compressed is carbon dioxide, the compressor 10 is required to have high pressure resistance. On the other hand, the compressor 10 with the above-described configuration is particularly suitable.

EXPLANATION OF REFERENCES

[0170]

10 Compressor
11 Housing
11S Inner space
11m Space
12 Housing main body
12h Suction pipe connection opening
13 Top cover
13a Cylindrical portion
13b Curved portion
14 Bottom cover
15 Rotation shaft
16 Base member
17A, 17B Bearing
18 Suction pipe
19 Opening
19f Inner peripheral surface

20 Rotary compression unit
22 Piston rotor
23 Cylinder
30 Scroll compression unit
31 Fixed scroll
32 Turning scroll
34 Compression chamber
35 Discharging hole
39 Discharge cover
39S Discharging space
39h Through-hole
40 Electric motor
41 Rotor
42 Stator
50 Discharging pipe
51 Discharging pipe main body
51b Base end portion
51d Opening facing portion
51g Outer peripheral surface
51s Tip portion
52 Outer pipe
52a One end portion
52s Tip
53 Connection pipe member
53d Enlarged diameter portion
Da Axial direction
Dr Radial direction
H High pressure region
M Intermediate pressure region
W Brazing material

Claims

1. A compressor (10) comprising:
 - a cylindrical housing (11) extending in an axial direction (Da) and in which an opening (19) is formed in a side wall surface of the housing (11);
 - a suction pipe (18) which allows a refrigerant to be suctioned into the housing (11); and
 - a discharging pipe (50) which allows the refrigerant compressed by a scroll compression unit (30) in the housing (11) to be discharged to the outside of the housing (11),
 - wherein the discharging pipe (50) includes a discharging pipe main body (51) having a linear shape passing through the opening (19) so as to be extended in a radial direction (Dr) outward the housing (11) from an inside thereof, and
 - wherein an inner peripheral surface of the opening (19) is separated from an opening facing portion (51d) facing the inner peripheral surface in an outer peripheral surface of the discharging pipe main body (51).
2. The compressor (10) according to claim 1, wherein an outer diameter of the outer peripheral surface of

the discharging pipe main body (51) is smaller than an inner diameter of the inner peripheral surface of the opening (19).

3. The compressor (10) according to claim 1 or 2, wherein the discharging pipe (50) further includes an outer pipe (52) of which one end portion is fixed to the opening (19) and extending in the radial direction (Dr) outward the housing (11), and wherein the discharging pipe main body (51) is inserted to the outer pipe (52). 5
4. The compressor (10) according to claim 3, wherein an outer diameter of the discharging pipe main body (51) is smaller than an inner diameter of the outer pipe (52), and wherein a brazing material (W) is interposed between an inner peripheral surface of the outer pipe (52) and the outer peripheral surface of the discharging pipe main body (51). 10 20
5. The compressor (10) according to claim 4, wherein the brazing material (W) is interposed at least from a tip portion (51s) of the discharging pipe main body (51) to the opening facing portion (51d) in which the outer peripheral surface of the discharging pipe main body (51) faces the inner peripheral surface of the opening (19). 25
6. The compressor (10) according to any one of claims 3 to 5, wherein the tip portion (51s) of the discharging pipe main body (51) is, with respect to a tip (52s) of the outer pipe (52), disposed at the same position in the radial direction (Dr) of the housing (11), or on the inside in the radial direction (Dr) thereof. 30 35
7. The compressor (10) according to any one of claims 1 to 6, wherein a base end portion (51b) of the discharging pipe main body (51) is fixed to a through-hole (39h) formed in a discharge cover (39) covering the scroll compression unit (30) installed in the housing (11), and wherein an intermediate portion of the discharging pipe main body (51) is exposed to a space (11m) between the housing (11) and the discharge cover (39). 40 45
8. The compressor (10) according to any one of claims 1 to 7, wherein a connection pipe member (53) to which an external pipe is configured to be connected is connected to an inside of the tip portion (51s) of the discharging pipe main body (51), and wherein the thickness of the connection pipe member (53) is larger than that of the discharging pipe main body (51). 50 55
9. The compressor (10) according to any one of claims 1 to 8, further comprising:

a rotation shaft (15) extending in the housing (11) in the axial direction (Da) and in which a turning scroll (32) of the scroll compression unit (30) is attached to one end of the rotation shaft (15); and

a rotary compression unit (20) including a piston rotor (22) provided at the other end of the rotation shaft (15),

wherein the refrigerant suctioned through the suction pipe (18) into the housing (11) is compressed in two stages by the rotary compression unit (20) and the scroll compression unit (30).

10. The compressor (10) according to any one of claims 1 to 9, wherein the refrigerant is carbon dioxide.

FIG. 1

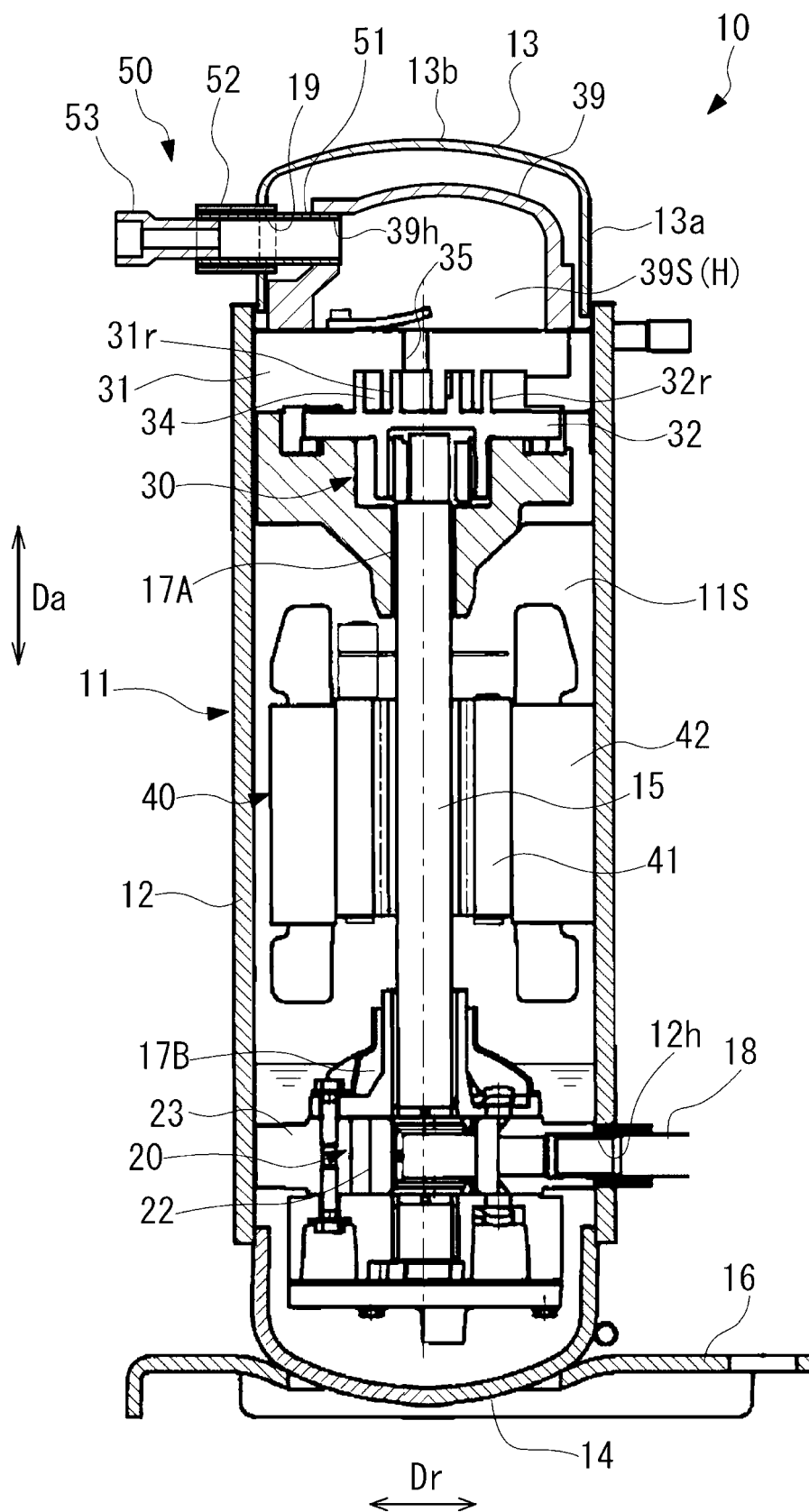
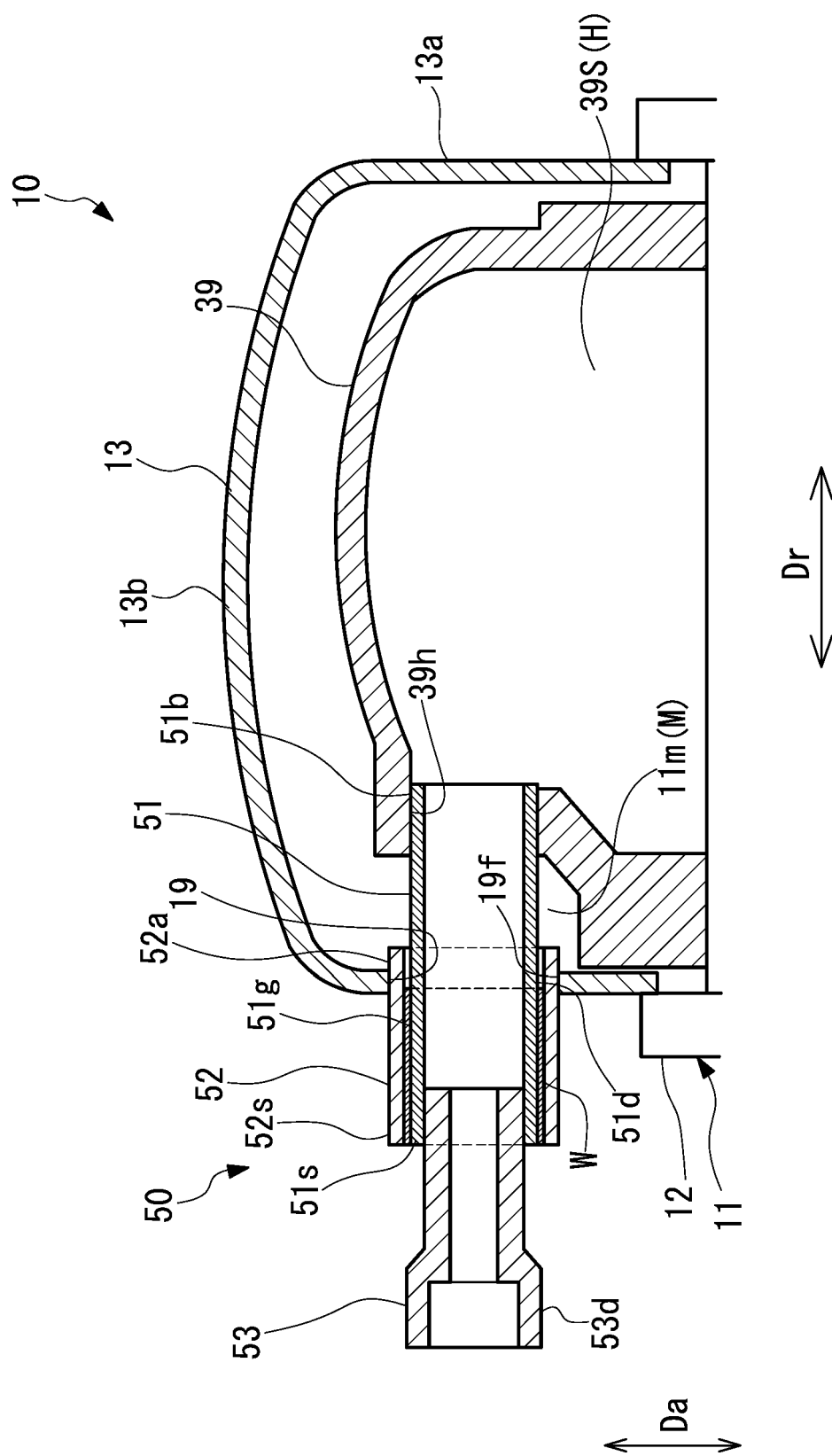


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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