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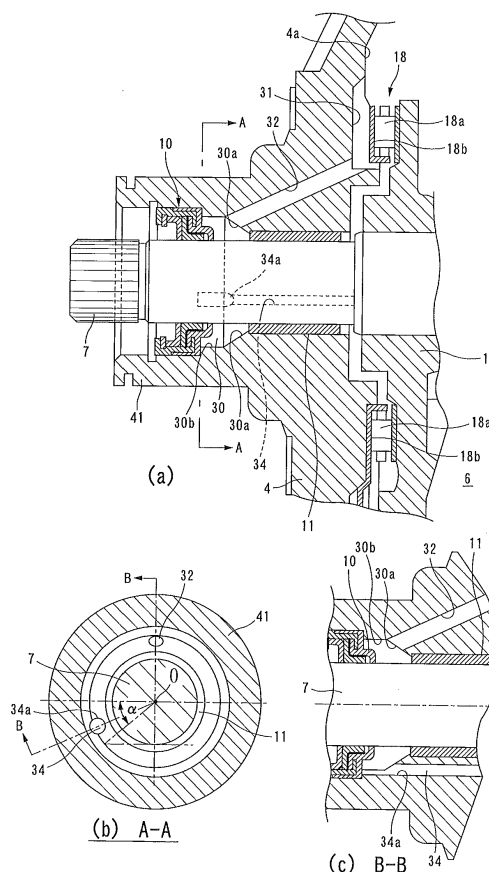
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(54) **COMPRESSOR**

(57) To provide a compressor capable of securing good lubrication by holding oil in a sealed space in a suitable amount to avoid oil shortage and suppressing the reduction of a shaft sealing function (oil leakage) due to the temperature increase in the shaft sealing member by promoting replacement of lubricating oil supplied to the shaft sealing member. In a compressor which includes, in a housing, an oil supply passage 32 one end of which communicates with a crank chamber 6 and the other end of which communicates with a sealed space 30 formed between a radial bearing 11 and a shaft sealing member 10 and an oil discharge passage 34 one end of which communicates with the sealed space 30 and the other end of which communicates with the crank chamber 6, an inflow port 34a opening to the sealed space of the oil discharge passage 34 opens to a position on an upper side of the lowest position at which the drive shaft 7 is in contact with the sealed member 10 as well as on the same position as a horizontal surface including an axial center "O" of the drive shaft 7 or on a lower side of the horizontal surface.

Fig. 2



Description

Technical Field

[0001] The present invention relates to a compressor used for a vehicle air conditioner and so on, and relates to a compressor capable of improving a structure of a passage for lubricating oil to be supplied to a shaft sealing member which is provided around a drive shaft for sealing between the drive shaft and a housing.

Background Art

[0002] In a compressor including a drive shaft rotatably supported in a housing so as to penetrate a crank chamber, a power transmission member which is arranged in the crank chamber and rotates in synchronization with rotation of the drive shaft and is rotatably supported in an inner wall surface of the housing through a thrust bearing, and a drive means for reciprocally sliding a piston in a cylinder bore formed in the housing with the rotation of the power transmission member, a radial bearing receiving the drive shaft and a shaft sealing member which prevents liquid leakage in the crank chamber are arranged between the housing and the drive shaft, and good lubrication is required at a sliding contact portion between the drive shaft and the shaft sealing member for preventing seizure.

[0003] In response to the above, there have been considered a structure where lubricating oil introducing grooves for introducing lubricating oil of the crank chamber into a bearing surface of the thrust bearing on the inner wall surface of the housing are provided, and the lubricating oil to be introduced along the lubricating oil introducing grooves is guided to a sliding portion of the shaft sealing member and the like with respect to a rotary shaft through a lubricating oil supply hole (refer to Patent Literature 1), a structure where a sealed space formed to be demarcated between a radial bearing and a shaft sealing member (a sealing part formed by a lip seal) is allowed to communicate with the crank chamber through a lubricating oil passage provided in the housing and to communicate with the crank chamber through a clearance between a flat part provided on the drive shaft and a slide bearing, in which the lubricating oil inside the crank chamber is introduced into the sealed space through one of the lubricating oil passage and the clearance, and the lubricating oil inside the sealed space is returned to the crank chamber through the other thereof (refer to Patent Literature 2) and other structures.

[0004] Although the supply of lubricating oil to the sealed space is secured in the above structure of Patent Literature 1, it doesn't have a structure for positively releasing lubricating oil introduced into the sealed space. Therefore, some inconveniences may occur: lubricating oil does not flow in the sealed space, the temperature in the shaft sealing member is increased, the lubricating oil is carbonized and sludge is generated, the sludge is ac-

cumulated in the sliding portion of the shaft sealing member to reduce the shaft sealing function and lubricating oil is leaked from between the shaft sealing member and the drive shaft.

[0005] In the latter structure, the flat part is provided on an outer peripheral portion of the drive shaft, therefore, the lubricating oil is returned to the crank chamber through the clearance between the flat part and the slide bearing. However, the clearance between the flat part and the slide bearing is not fixed in a given position, therefore (as the clearance rotates with rotation of the drive shaft), it is anticipated that a more than necessary amount of lubricating oil is accumulated in a lower part of the sealed space. Consequently, also in this structure, a failure may arise such that the temperature of the shaft sealing member is increased and the leakage of lubricating oil is caused by the reduction of the shaft sealing function in the same manner as the former example.

[0006] In response to the above, there is considered a structure provided with an oil supply passage positioned above the drive shaft for supplying oil to a sealed space formed from an inner wall surface of a housing around the drive shaft between a radial bearing and a shaft sealing member, and an oil discharge passage which is provided between a bearing surface receiving the radial bearing and the radial bearing, one end of which communicates with the sealed space and the other end of which communicates with a crank chamber, thereby securing good lubrication by supplying the lubricating oil positively to the shaft sealing member and the radial bearing, and reducing leakage of oil due to the temperature increase of the shaft sealing member by promoting replacement of lubricating oil supplied to the shaft sealing member (refer to Patent Literature 3).

Citation List

Patent Literature

[0007]

Patent Literature 1: JP-A-H8-284820

Patent Literature 2: JP-A-2002-310067

Patent Literature 3: JP-A-2005-23849

Summary of Invention

Technical Problem

[0008] However, in the above Patent Literature 3, the oil discharge passage for discharging oil in the sealed space to the crank chamber is provided between the bearing surface receiving the radial bearing and the radial bearing, therefore, in the case where sufficient oil is not introduced from the oil supply passage, a discharging amount of oil becomes relatively higher than an introducing amount, the oil is not sufficiently held in the sealed space, which may lead to an inconvenient that seizure

occurs in the sliding contact portion between the drive shaft and the shaft sealing member.

[0009] The present invention has been made in view of the above points, and a principal object thereof is to provide a compressor capable of securing good lubrication by holding oil in the sealed space in a suitable amount to avoid oil shortage and suppressing reduction of the shaft sealing function (oil leakage) due to the temperature increase in the shaft sealing member by promoting replacement of lubricating oil supplied to the shaft sealing member.

Solution to Problem

[0010] A compressor including a housing which demarcates a crank chamber, a drive shaft rotatably supported in the housing so as to penetrate the crank chamber through a radial bearing, one end of which protrudes from the housing, a shaft sealing member arranged at a position closer to the one end side of the drive shaft than a position of the radial bearing, and sealing between the drive shaft and the housing, an oil supply passage formed in the housing, one end of which communicates with the crank chamber and the other end communicates with a sealed space formed between the radial bearing and the shaft sealing member and an oil discharge passage one end of which communicates with the sealed space and the other end of which communicates with the crank chamber, in which an inflow port of the oil discharge passage opening to the sealed space opens to a position on an upper side of the lowest position at which the drive shaft is in contact with the shaft sealing member as well as on the same position as a horizontal surface including an axial center of the drive shaft or on a lower side of the horizontal surface.

[0011] The housing is attached so as to be inclined to the axial center of the drive shaft depending on the installation condition of the compressor. Also in such case, it is preferable that the inflow port of the oil discharge passage opening to the sealed space opens to the position on the upper side of the lowest position at which the drive shaft is in contact with the shaft sealing member as well as on the same position as the horizontal surface including the axial center of the drive shaft or on the lower side of the horizontal surface based on the installation condition.

[0012] Accordingly, the inflow port of the oil discharge passage opening to the sealed space opens to the position on the upper side of the lowest position at which the drive shaft is in contact with the shaft sealing member, therefore, oil inside the sealed space is not discharged from the sealed space until a liquid level reaches the oil discharge passage, and the contact position between the drive shaft and the shaft sealing member is immersed in the accumulated oil even when an amount of oil introduced from the oil supply passage is small, which can avoid lubrication shortage at a sliding portion. When the oil accumulated in the sealed space reaches the inflow

port of the oil discharge passage, excessive oil is discharged to the crank chamber through the oil discharge passage, therefore, there is no inconvenience that the oil inside the sealed space is stagnated and replacement of oil can be promoted to avoid the temperature increase in the shaft sealing member.

[0013] Here, it is preferable that the sealed space is surrounded and demarcated by the radial bearing, the shaft sealing member, an inner surface of the housing and a peripheral surface of the drive shaft, and that the inner surface of the housing which demarcates the sealed space has a conical surface an inner diameter of which is increased toward the shaft sealing member.

[0014] According to the structure, oil guided to the sealed space through the oil supply passage is easily guided to a direction of the shaft sealing member along an inclined surface at a lower part of the conical surface due to gravity, and the stagnation of oil can be further suppressed without increasing the capacity of the sealed space more than necessary.

[0015] It is also preferable that the other end of the oil supply passage is connected to the sealed space at a portion of the conical surface.

[0016] According to the structure, in the case where the hole is formed by a drill from the inside toward the outside of the conical surface of the sealed space at the time of drilling the oil supply passage, an entry angle of the drill in the oil supply passage with respect to the conical surface can be increased, which can reduce an inconvenience of generating burrs on a periphery of the drilled hole.

[0017] It is preferable that the other end of the oil supply passage opens to a position where an introduced oil does not abut on the shaft sealing member.

[0018] When the oil flowing to the shaft sealing member from the oil supply passage directly abuts on the shaft sealing member, there may be an inconvenience that the shaft sealing member is deformed due to use for a long time to impair the sealing function. According to the above structure, the deformation of the shaft sealing member can be suppressed and a lifetime of the shaft sealing member can be extended.

Advantageous Effects of Invention

[0019] As described above, in the compressor according to the present invention which includes the oil supply passage one end of which communicates with the crank chamber and the other end of which communicates with the sealed space formed between the radial bearing and the shaft sealing member and the oil discharge passage one end of which communicates with the sealed space and the other end of which communicates with the crank chamber, which are formed in the housing, the inflow port of the oil discharge passage opening to the sealed space opens to the position on the upper side of the lowest position at which the drive shaft is in contact with the shaft sealing member as well as on the same position as

the horizontal surface including the axial center of the drive shaft or on the lower side of the horizontal surface, therefore, it is possible to secure good lubrication by holding oil in a sealed space in a suitable amount to avoid oil shortage and to suppress the reduction of the shaft sealing function (oil leakage) due to the temperature increase in the shaft sealing member by promoting replacement of lubricating oil supplied to the shaft sealing member.

[0020] Moreover, the inner surface of the housing which demarcates the sealed space has the conical surface the inner diameter of which is increased toward the shaft sealing member, therefore, the oil guided to the sealed space through the oil supply passage is easily guided to the shaft sealing member along the inclined surface at the lower part of the conical surface due to gravity, and the stagnation of oil can be suppressed without increasing the capacity of the sealed space more than necessary by forming the peripheral surface of the sealed space into the conical surface.

[0021] Furthermore, the other end of the oil supply passage is connected to the sealed space by the portion of the conical surface, therefore, the inconvenience of generating burrs on the periphery of the drilled hole at the time of drilling the oil supply passage.

[0022] The other end of the oil supply passage opens to the position where the introduced oil does not abut on the shaft sealing member, thereby suppressing deformation of the shaft sealing member and extending the lifetime of the shaft sealing member as well as avoiding the inconvenience that the sealing function is impaired.

Brief Description of Drawings

[0023]

[Fig. 1] Fig. 1 is a cross-sectional view of a compressor according to an embodiment of the present invention.

[Fig. 2] Fig. 2 (a) is a cross-sectional view shown by enlarging part of a front head of the compressor of Fig. 1, (b) is a cross-sectional view taken along A-A line of (a), and (c) is a cross-sectional view taken along B-B line of (b).

[Fig. 3] Fig. 3 is a view for explaining a flow of oil to a sealed space and an accumulation state of oil, (a) is a cross-sectional view shown by enlarging part of the front head of the compressor of Fig. 1, (b) is a cross-sectional view taken along A-A line of (a).

[Fig. 4] Fig. 4 is a cross-sectional view shown by enlarging part of the front head of the compressor showing another example of an oil discharge passage.

[Fig. 5] Fig. 5 is a cross-sectional view shown by enlarging part of the front head of the compressor showing further another example of the oil discharge passage.

Description of Embodiments

[0024] Hereinafter, embodiments of the present invention will be explained with reference to the drawings.

[0025] Fig. 1 shows a variable displacement swash plate-type compressor used for a refrigerating cycle as an example of a compressor. The compressor includes a cylinder block 1, a rear head 3 assembled to a rear side (right side in the drawing) of the cylinder block 1 through a valve plate 2 and a front head 4 assembled so as to cover a front side (left side in the drawing) of the cylinder block 1. These front head 4, the cylinder block 1, the valve plate 2 and the rear head 3 are fastened in an axial direction by fastening bolts 5, which configure a housing of the entire compressor.

[0026] A drive shaft 7 one end of which protrudes from the front head 4 is housed in a crank chamber 6 demarcated by the front head 4 and the cylinder block 1. A not-shown drive pulley connected to an engine of a vehicle through a belt is fixed to a portion of the drive shaft 7 protruding from the front head 4. One end side of the drive shaft 7 is sealed with high airtightness between the drive shaft 7 and the front head 4 through a shaft sealing member 10 provided therebetween, which prevents a refrigerant from leaking along the drive shaft 7. Furthermore, one end side of the drive shaft 7 is rotatably supported by a radial bearing 11 housed in the front head 4 at a position closer to the crank chamber than a position of the shaft sealing member 10, and the other end side of the drive shaft 7 is rotatably supported by a radial bearing 12 housed in the cylinder block 1.

[0027] In the cylinder block 1, a support hole 13 in which the radial bearing 12 is housed and a plurality of cylinder bores 15 arranged on a circumference around the support hole 13 at equal intervals are formed, and single-head pistons 16 are inserted into respective cylinder bores 15 so as to reciprocally slide. The single head piston 16 is formed by bonding a head portion 16a inserted into the cylinder bore 15 and an engaging portion 16b protruding to the crank chamber 6 in the axial direction.

[0028] A thrust flange 17 rotating together with the drive shaft 7 in the crank chamber 6 is fixed to the drive shaft 7. The thrust flange 17 is rotatably supported with respect to an inner wall surface 4a of the front head 4 formed approximately perpendicular to the drive shaft 7 through a thrust bearing 18. A power transmission member is configured by the thrust flange 17, and a swash plate 20 is connected to the thrust flange 17 through a link mechanism 19.

[0029] The swash plate 20 is attached so as to move in a tilting manner around a hinge ball 21 provided so as to slide freely on the drive shaft 7, which rotates together with the thrust flange 17 in synchronization with the rotation of the thrust flange 17 through the link mechanism 19. The engaging portions 16b of the single-head pistons 16 are engaged at a peripheral edge portion of the swash plate 20 through pairs of shoes 22 arranged in front and

rear sides.

[0030] Therefore, when the drive shaft 7 rotates, the swash plate 20 rotates accordingly, and the rotary motion of the swash plate 20 is converted into a reciprocating straight-line motion of the single-head piston 16, which changes a capacity of a compression chamber 23 formed between the single-head piston 16 and the valve plate 2 in the cylinder bore.

[0031] 24 denotes a suction port formed in the valve plate 2 which allows a suction chamber 25 formed in the rear head 3 to communicate with the compression chamber 23 through a not-shown suction valve, and 26 denotes a discharge port formed in the valve plate 2 which allows a discharge chamber 27 formed in the rear head 3 to communicate with the compression chamber 23 through a not-shown discharge valve. 28 denotes a pressure control valve which controls a communicating state between the discharge chamber 27 and the crank chamber 6 and adjusts the tilt angle of the swash plate 20 by adjusting a crank chamber pressure.

[0032] Incidentally, as shown in Fig. 2, the shaft sealing member 10 and the radial bearing 11 are arranged at an interval in the axial direction, and an annular sealed space 30 is formed by being sectioned by the shaft sealing member 10 and the radial bearing 11 between an inner surface of the front head 4 and an peripheral surface of the drive shaft 7.

[0033] That is, the sealed space 30 is demarcated by being surrounded by the radial bearing 11, the shaft sealing member 10, an inner surface of a boss part 41 of the front head 4 and the peripheral surface of the drive shaft 7. In the example, the inner surface of the boss part 41 of the front head 4 which demarcates the sealed space 30 is formed into a conical surface 30a an inner diameter of which is gradually increased from the radial bearing 11 toward the shaft sealing member 10 and a cylindrical surface 30b continued from the conical surface 30a.

[0034] In the front head 4, a guide groove 31 for guiding lubricating oil is extended downward at a bearing surface receiving the thrust bearing 18 on the inner wall surface 4a positioned above the drive shaft 7, more specifically, at a portion receiving a thrust race 18b in the front head 4 in the case where the thrust bearing 18 is formed by including a needle roller 18a and the thrust race 18b which holds the needle roller 18a as shown in the drawing.

[0035] The guide groove 31 and the sealed space 30 are connected by an oil supply passage 32 drilled in the front head 4 at a given angle with respect to an axial line of the drive shaft 7, and the lubricating oil introduced into the guide groove 31 is supplied to the sealed space 30 through the oil supply passage 32. Here, the oil supply passage 32 opens just under the guide groove 31 so that lubricating oil descending along the guide groove 31 can be received, and most of the lubricating oil descending along the guide groove 31 can be introduced.

[0036] The other end of the oil supply passage 32 is connected to the sealed space 30 only at a portion of the

conical surface 30a and opens at a position where the introduced oil does not directly abut on the shaft sealing member 10. That is, the conical surface 30a does not exist at a position overlapping with the shaft sealing member 10 in the axial direction and is formed to be displaced at a portion closer to the radial bearing 11 than the position of the shaft sealing member 10 by a given dimension. The position of introducing oil to be supplied from the oil supply passage 32 to the sealed space is set to the given position closer to the radial bearing side than the position of the shaft sealing member 10 by adjusting the position of forming the conical surface.

[0037] In the example, an angle made by the conical surface 30a and the axis of the drive shaft 7 is set to approximately 25 degrees and an angle made by the oil supply passage 32 and the axis of the drive shaft 7 is set to approximately 30 to 35 degrees, therefore, an angle made by the conical surface 30a and the oil supply passage 32 is set to 55 to 60 degrees.

[0038] As the oil supply passage 32 is connected to the sealed space 30 only at the portion of the conical surface 30a, an entry angle of a drill in the oil supply passage 32 with respect to the conical surface 30a can be increased even when the hole is formed by the drill from the inside toward the outside of the conical surface 30a of the sealed space 30 at the time of drilling the oil supply passage 32, which can reduce an inconvenience of generating burrs on a periphery of the drilled hole.

[0039] In the front head 4, an oil discharge passage 34 one end of which communicates with the sealed space 30 and the other end of which communicates with the crank chamber 6 is further formed. In the example, the oil discharge passage 34 is formed in parallel to the drive shaft 7, and an inflow port 34a (one end of the oil discharge passage 34) opening in the sealed space 30 opens so that one part or the entire part extends to an area of the conical surface 30a and opens to a position on an upper side of the lowest position at which the drive shaft 7 is in contact with the sealed member as well as on a horizontal surface including an axial center "O" of the drive shaft 7 or on a lower side of the horizontal surface (a range indicated by " α " in Fig. 2(b)).

[0040] Furthermore, the other end of the oil discharge passage 34 opens to the inner wall surface 4a of the front head 4 on an inner side (in the drive shaft side) of the thrust bearing 18, thereby allowing lubricating oil flowing from the oil discharge passage 34 to pass through a clearance of the thrust bearing 18 and to be returned to the crank chamber 6.

[0041] In the above structure, when lubricating oil adhered to the inner wall surface of the front head 4 flows downward along the first guide groove 31, almost all of the oil is introduced into the oil supply passage 32, and guided to the sealed space 30 along the oil supply passage 32.

[0042] The inner peripheral surface of the sealed space 30 is formed into the conical surface 30a extending toward the shaft sealing member 10, therefore, the oil

guided to the sealed space 30 is guided to a lower side of the drive shaft along the periphery of the drive shaft 7 and the inner surface of the boss part 41 of the front head 4 before coming to the shaft sealing member 10 as shown in Fig. 3 (a), after that, the oil is guided to the shaft sealing member 10 along the conical surface 30a.

[0043] Accordingly, as almost all the lubricating oil supplied to the sealed space 30 along the oil supply passage 32 can be supplied to the shaft sealing member 10, good lubrication of the shaft sealing member 10 can be guaranteed. That is, even in the case where the amount of oil guided to the sealed space 30 through the oil supply passage 32 is small, the inner surface of the sealed space 30 is formed into the conical surface 30a, therefore, the capacity of the sealed space 30 is not larger than necessary, and the oil can be positively moved toward the shaft sealing member 10, which can supply oil to the shaft sealing member 10 effectively and can secure the lubrication between the shaft sealing member 10 and the drive shaft 7.

[0044] The oil discharge passage 34 opens to the conical surface 30a at the position on the upper side of the lowest position at which the drive shaft 7 is in contact with the sealed member 10 as well as on the horizontal surface including the axial center "O" of the drive shaft 7 or on the lower side of the horizontal surface. Therefore, when a liquid level of the oil accumulated in the sealed space 30 does not reach the shaft sealing member 10, the oil inside the sealed space 30 is not discharged. After the liquid level of the oil accumulated in the sealed space 30 reaches the shaft sealing member 10, the oil inside the sealed space 30 is discharged to the crank chamber 6 through the oil discharge passage 34 as shown in Fig. 3(b), therefore, the necessary minimum amount of oil is accumulated in the sealed space 30, which can promote replacement of lubricating oil supplied to the shaft sealing member 10. Accordingly, it is possible to prevent the oil stagnated in the sealed space 30 from becoming sludge due to stirring of oil or heat generation by sliding and to prevent oil leakage from the shaft sealing member 10 due to the sludge, as a result, a lifetime of the shaft sealing member 10 can be extended.

[0045] When the inventors measured temperatures in the actual sealed space in a compressor endurance test, a temperature at a high-speed intermittent operation was 157°C and a temperature at a high-speed continuous operation with the minimum discharge capacity was also 157°C in the related-art structure not provided with the oil discharge passage 34, whereas in the structure according to the present invention which is provided with the oil discharge passage 34, a temperature at the high-speed intermittent operation was 148°C and a temperature at the high-speed continuous operation with the minimum discharge capacity was 136°C, therefore, it was proved that the temperature in the sealed space is reduced by improving the stagnation of oil in the sealed space.

[0046] Although the example in which the oil discharge

passage 34 is formed in parallel to the drive shaft 7 is shown in the above structure example, the oil discharge passage 34 may be formed to be inclined to the drive shaft 7 so as to communicate with the crank chamber 6 at a position lower than an opening end of the sealed space 30 as shown in Fig. 4.

[0047] Also in the above structure, the opening end of the oil discharge passage 34 with respect to the crank chamber 6 is preferably positioned at a place where lubricating oil flowing out from the oil discharge passage 34 passes through the clearance in the thrust bearing 18 and is returned to the crank chamber 6.

[0048] In the above structure example, excessive oil in the sealed space 30 is guided into the crank chamber 6 through the oil discharge passage 34 due to the action of gravity in addition to a back pressure, therefore, the liquid level of the oil in the sealed space 30 can be easily managed.

[0049] Also in the above structure example, the example in which only one oil discharge passage 34 is provided in the front head 4 is shown, however, plural oil discharge passages 34-1, 34-2 may be provided as shown in Fig. 5. Also in this structure, it is necessary in each of the oil discharge passages 34-1, 34-2 that each inflow port opening to the sealed space 30 opens to the position on the upper side of the lowest position at which the drive shaft 7 is in contact with the sealed member 10 as well as on the same position as the horizontal surface including the axial center "O" of the drive shaft 7 or on the lower side of the horizontal surface (in this example, the inflow port of one oil discharge passage 34-1 opens to the same position as the horizontal surface including the axial center "O" of the drive shaft 7 and the inflow port of the other oil discharge passage 34-2 opens to the position on the upper side of the lowest position at which the drive shaft 7 is in contact with the sealed member 10 as well as on the lower side of the horizontal surface including the axial center of the drive shaft 7). The respective oil discharge passages 34-1, 34-2 may be parallel to the drive shaft 7 and may be inclined so that the crank chamber's side is positioned downward.

Reference Signs List

[0050]

4	front head
6	crank chamber
7	drive shaft
10	shaft sealing member
11, 12	radial bearing
30	sealed space
30a	conical surface
32	oil supply passage
34	oil discharge passage
34-1, 34-2	oil discharge passage

Claims

1. A compressor comprising:

a housing (1,4) which demarcates a crank chamber (6); 5
 a drive shaft (7) rotatably supported in the housing (1, 4) so as to penetrate the crank chamber (6) through a radial bearing (11, 12), one end of which protrudes from the housing (4); 10
 a shaft sealing member (10) arranged at a position closer to the one end side of the drive shaft (7) than a position of the radial bearing (11) and sealing between the drive shaft (7) and the housing (4); 15
 an oil supply passage (32) formed in the housing (4), one end of which communicates with the crank chamber (6) and the other end of which communicates with a sealed space (30) formed between the radial bearing (11) and the shaft sealing member (10); and 20
 an oil discharge passage (34) one end of which communicates with the sealed space (30) and the other end of which communicates with the crank chamber (6), 25
 wherein an inflow port (34a) of the oil discharge passage (34) opening to the sealed space (30) opens to a position on an upper side of the lowest position at which the drive shaft (7) is in contact with the shaft sealing member (10) as well as 30
 on the same position as a horizontal surface including an axial center of the drive shaft (7) or on a lower side of the horizontal surface.

2. The compressor according to claim 1, 35
 wherein the sealed space (30) is surrounded and demarcated by the radial bearing (11), the shaft sealing member (10), an inner surface of the housing (4) and a peripheral surface of the drive shaft (7), and the inner surface of the housing (4) which demar- 40
 cates the sealed space (30) has a conical surface (30a) an inner diameter of which is increased toward the shaft sealing member (10).

3. The compressor according to claim 2, 45
 wherein the other end of the oil supply passage (32) is connected to the sealed space (30) at a portion of the conical surface (30a).

4. The compressor according to claim 3, 50
 wherein the other end of the oil supply passage (32) opens to a position where an introduced oil does not directly abut on the shaft sealing member (10).

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Fig. 1

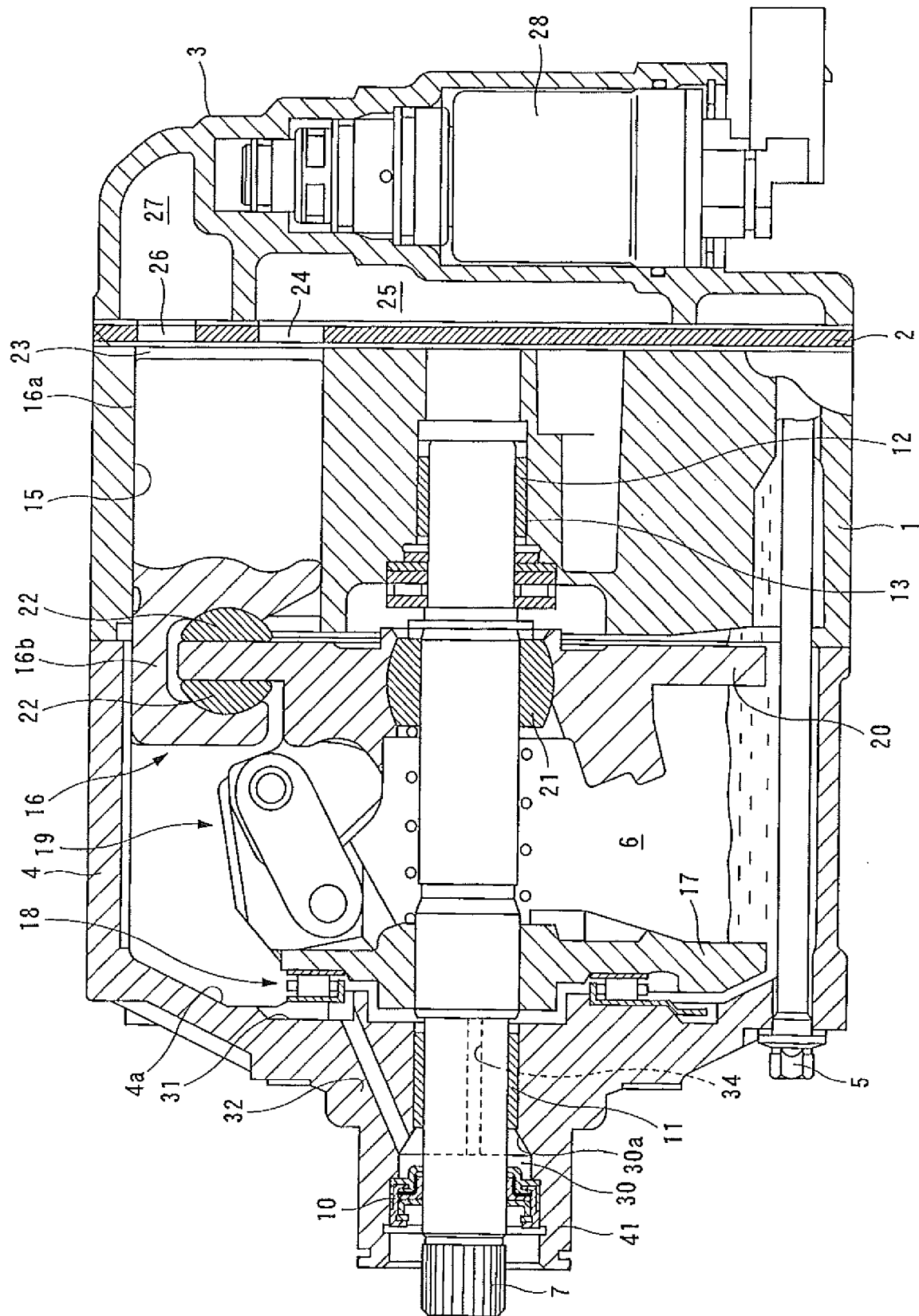


Fig. 2

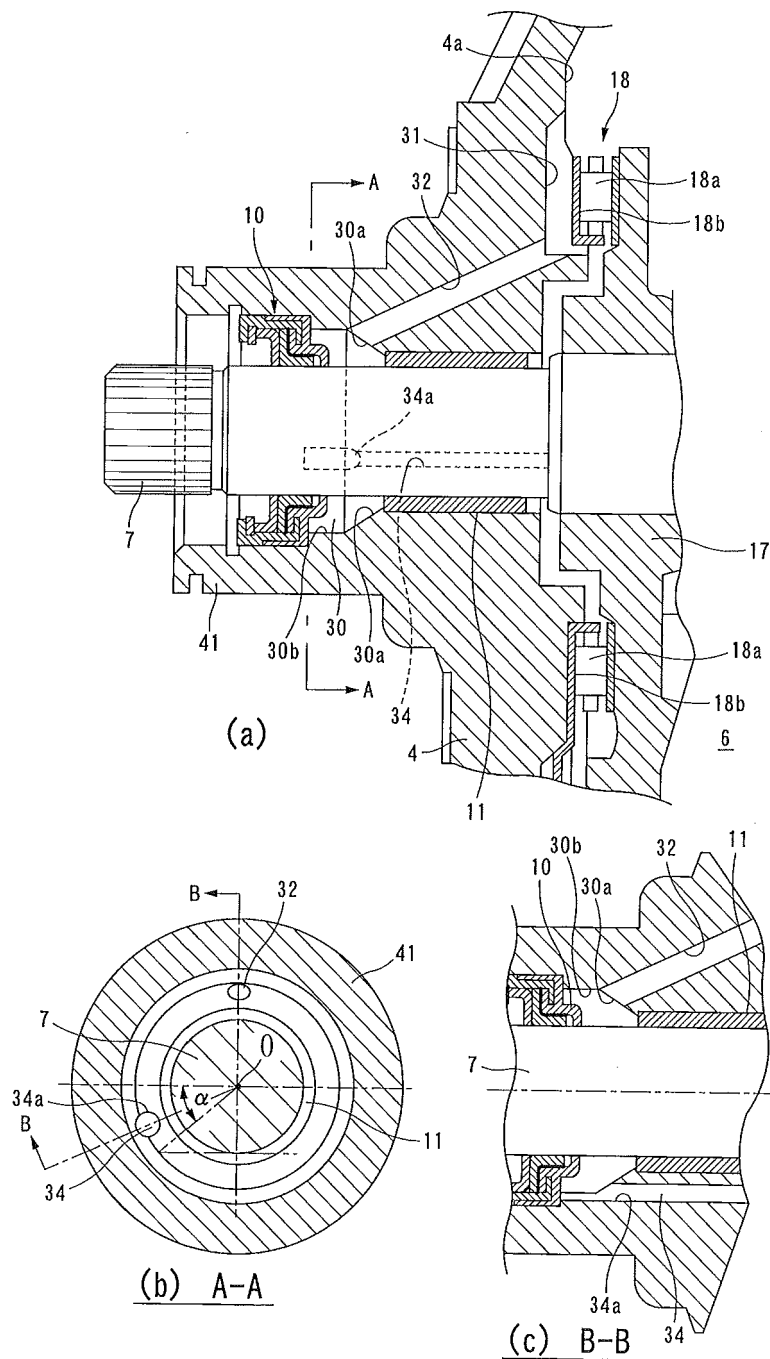
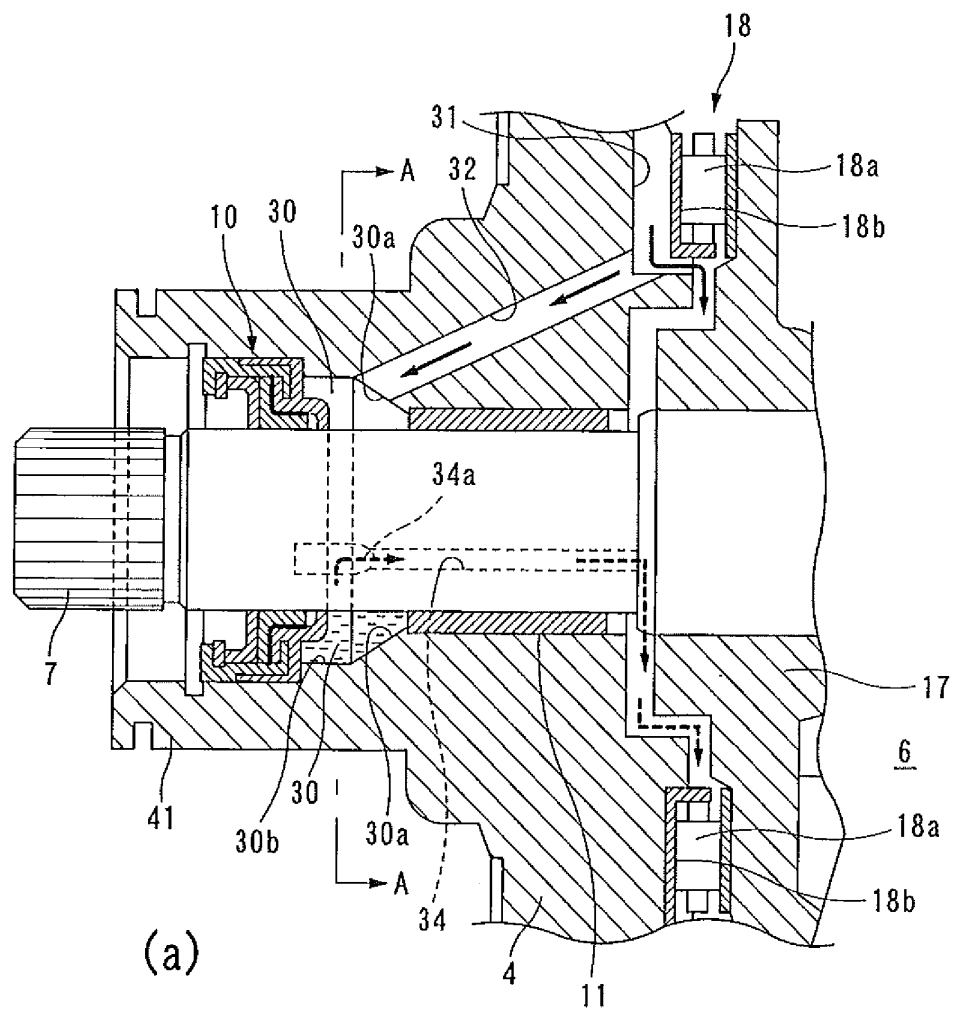
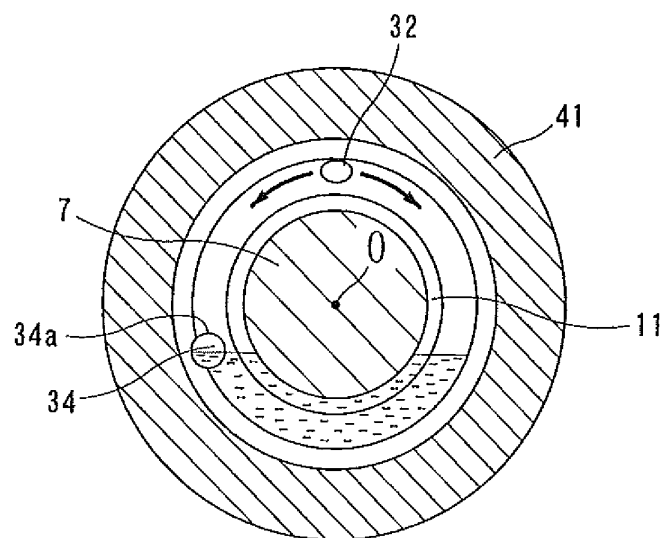


Fig. 3



(a)



(b) A-A

Fig. 4

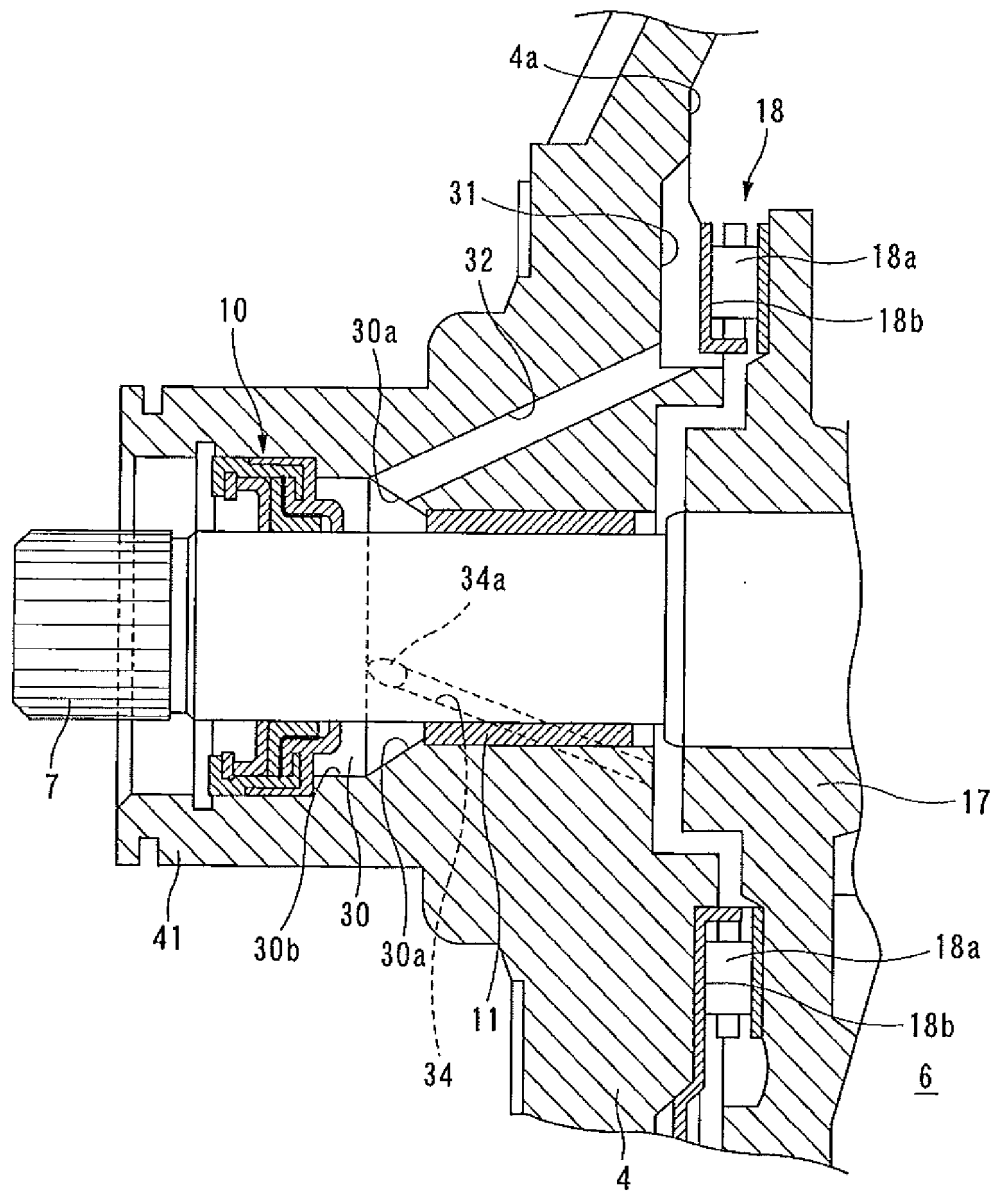
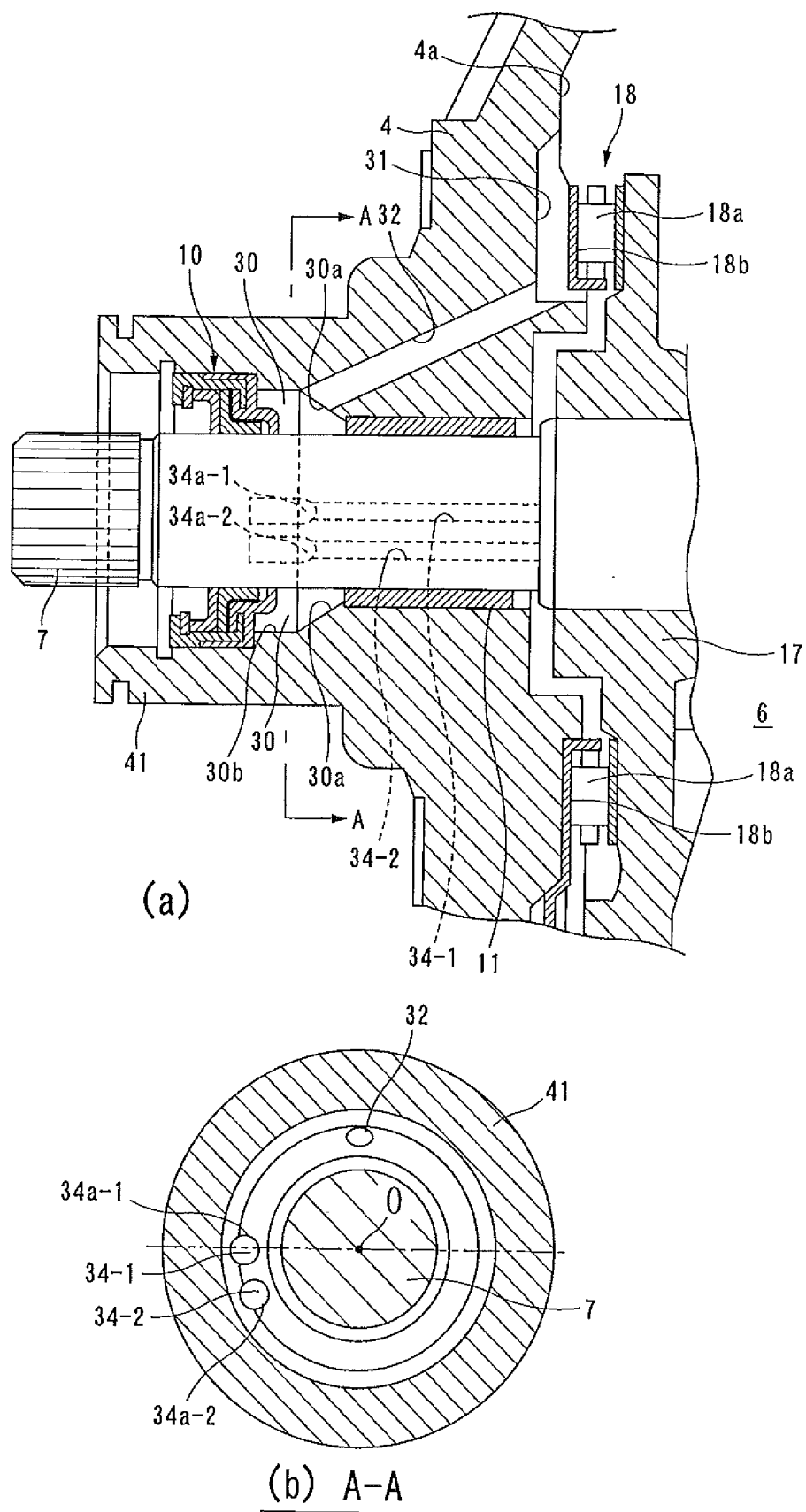


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/076702

A. CLASSIFICATION OF SUBJECT MATTER

F04B39/02(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)

F04B39/02

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015

Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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22 December 2015 (22.12.15)Name and mailing address of the ISA/
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