

Description

TECHNICAL FIELD

[0001] The present invention relates to a swash plate compressor comprising a rotational drive member that is housed inside a crankcase and is caused to rotate as a shaft rotates and a piston that is held at the peripheral edge of the rotational drive member and is caused to reciprocally slide inside a cylinder as the rotational drive member rotates, which controls the delivery displacement by adjusting the angle of inclination of the rotational drive member. More specifically, it relates to a compressor with its shaft and rotational drive member linked via a link mechanism.

BACKGROUND ART

[0002] Compressors of similar types known in the related art include the swash plate compressor adopting the structure described in patent reference literature 1. To explain this swash plate compressor in reference to FIGS. 5 through 7, the compressor comprises a cylinder block 1, a rear head 3 mounted on the rear side (the left side in FIG. 5) of the cylinder block 1 via a valve plate 2 and a front head 5 mounted so as to close off the front side (the left side in FIG. 5) of the cylinder block 1, thereby defining a crankcase 4, as shown in FIG. 5. The front head 5, the cylinder block 1, the valve plate 2 and the rear head 3 constitute a housing.

[0003] In the crankcase 4 defined by the front head 5 and the cylinder block 1, a shaft 6 with one end thereof projecting out of the front head 5 and locked with a motive power communicating member such as a pulley (not shown) is housed. The one end of the shaft 6 extends so as to pass through a boss portion 5a of the front head 5 projecting outward at the center thereof. The one end of the shaft 6 is rotatably supported via a radial bearing 7 and a shaft seal 8 disposed over the inner surface of the boss portion 5a and also via a thrust bearing 9 disposed over the inner surface of the front head 5. The other end of the shaft 6 is rotatably supported at an indented portion 10 formed at the center of the cylinder block 1 via a radial bearing 11 and a thrust bearing 12.

[0004] At the cylinder block 1, the indented portion 10 at which the shaft 6 is inserted and a plurality of cylinders 13 disposed over equal intervals on the circumference of a circle centering around the indented portion 10 are formed. A single-ended piston 14 is inserted at each cylinder 13 so as to reciprocally slide therein.

[0005] As shown in FIGS. 6 and 7, a rotational drive member (annular disk) 16 is tiltably connected to the shaft 6 via a link pin (driver) 15, and the tail end 14a of the piston 14 projecting out into the crankcase 4 is held at the peripheral edge of the rotational drive member 16 via a pair of shoes 17. Thus, as the shaft 6 rotates, the rotational drive member 16 also rotates in synchronization, the rotational motion of the rotational drive member is

then converted to a reciprocal linear motion of the piston 14 via the shoes 17, and as the piston 14 moves reciprocally, the volumetric capacity of a compression space formed inside the cylinder 13 between the piston 14 and the valve plate 2 is altered.

[0006] The link pin 15 is disposed at a middle portion 6a of the shaft 6 facing the crankcase 4. At the middle portion 6a, which is formed by increasing the diameter of the shaft 6, a flange portion 6b formed at the end thereof on the front side is rotatably supported at the inner surface of the front head 5 via the thrust bearing 9. In addition, the end of the middle portion 6a on the rear side, too, is rotatably supported at the opposite surface at the cylinder block 1 via the thrust bearing 12.

[0007] The link pin 15, which is fixed onto the flat surface containing the axial center of the shaft 6, includes a base portion 15a fixed in an insertion hole 6c formed at the middle portion 6a through press-fitting or the like, a small diameter portion 15b continuous from the base portion 15a and a head 15c assuming a spherical shape at a free end continuous from the small diameter portion 15b. The annular disk 16 includes an engaging hole 16a opening inward along the radial direction, and with the head 15c of the link pin 15 engaged at the engaging hole 16a the drive force from the shaft 6 is communicated via the link pin 15.

[0008] In addition, a sliding sleeve 20 is externally fitted on the shaft so as to slide freely along the axial direction. The sliding sleeve 20 includes arms 20a extending in the radial direction, which bridge across the annular disk 16 like spokes via supporting pins 21. A longitudinal hole 20b, at which the link pin 15 is inserted without inhibiting the sliding motion of the shaft 6 along the axial direction is formed at the sliding sleeve 20.

[0009] Thus, as the shaft 6 rotates, the head 15c of the link pin 15 rotating together with the shaft 6 presses against the inner surface of the engaging hole 16a at the annular disk 16, and the rotational motive power from the shaft 6 is communicated to the annular disk 16 via the link pin 15. Then, as the annular disk 16 rotates around the supporting pins 21, the sleeve 20 moves along the axis of the shaft 6 and the contact position at which the head 15c of the link pin 15 contacts moves along the axis of the engaging hole 16a.

[0010] Patent reference literature 1: Patent Publication No. 3188716

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0011] However, it is difficult to assure the desired level of durability for the rotational drive member used in the structure described above in which the rotational motive power from the shaft 6 is communicated by setting the head 15c of the link pin 15 in contact with the inner surface of the engaging hole 16a, creating an extremely high contact pressure over the contact area where the head 15c

and the inner surface of the engaging hole 16a contact, which, in turn, hastens the process of the inner surface of the engaging hole 16a becoming caved through wear.

[0012] Also, when the rotational drive member 16 rotates around the shaft 6, another point of application is actually present in the structure described above in addition to the head 15c of the link pin 15. The point of application is considered to be present over the areas where the inner circumferential surface of the rotational drive member 16 and the end surfaces of the arms 20a of the sliding sleeve 20 come into contact with each other or over the areas where the supporting pins come into contact with the inner surfaces of support holes 20c formed at the arms 20c and support holes 16c formed at the annular disk 16. The inner circumferential surface of the annular disk 16 and the end surfaces of the arms 20a of the sliding sleeve 20 need to be formed as flat surfaces over the contact areas so as to avoid inhibiting the tilting motion of the annular disk 16. In addition, when the supporting pins 21 each bridging between a supporting hole 16c at the annular disk 16 and a supporting hole 20c at the sliding sleeve 20 are press-fitted inside the supporting holes on both sides, the tilting motion of the annular disk 16 is inhibited, whereas if the supporting pins are loosely inserted at the supporting holes on both sides, the supporting pins 21 may become misaligned or fall out.

[0013] Accordingly, a main object of the present invention, which has been completed by addressing the problems discussed above, is to improve the durability over an area where a link pin is engaged in a swash plate compressor having a shaft and a rotational drive member linked via the link pin. Another object of the present invention is to achieve a smooth tilting motion of the rotational drive member.

MEANS FOR SOLVING THE PROBLEMS

[0014] The objects described above are achieved in the swash plate compressor according to the present invention, comprising a shaft passing through a crankcase and rotatably supported at a housing, a rotational drive member having an opening through which the shaft is inserted and disposed in the crankcase to rotate synchronously as the shaft rotates and a piston held at the peripheral edge of the rotational drive member, which reciprocally slides inside a cylinder formed at the housing as the rotational drive member rotates, with the piston stroke varied by adjusting the angle of inclination of the rotational drive member, and characterized in that the rotational drive member is tiltably linked to the shaft via a link pin and that the rotational motive power of the shaft is communicated via a portion other than the head of the link pin.

[0015] As the shaft rotates, the rotational motive power is communicated to the rotational drive member via a portion other than the head of the link pin. As a result, the rotational drive member is allowed to rotate without having to press the head of the link pin against the rota-

tional drive member, lowering the extent of wear over the engaging area facing the head.

[0016] More specifically, the swash plate compressor may adopt a structure in which an engaging hole with one end thereof opening at the opening and the other end thereof opening toward the outer circumference is formed at the rotational drive member, the head of the link pin is slidably inserted at the engaging hole so as to allow a tilting motion of the rotational drive member, a sleeve is externally fitted at the shaft so as to allow the sleeve to slide freely, a pass hole through which the link pin is inserted is formed at the sleeve, the rotational drive member is tiltably supported at the sleeve via a supporting pin and the clearance formed between the inner surface of the pass hole at the sleeve and a base of the link pin is set smaller than the clearance formed along the shaft rotating direction between the inner surface of the engaging hole and the head of the link pin.

[0017] Since the clearance formed along the rotating direction between the inner surface of the pass hole at the sleeve and the base of the link pin is set smaller than the clearance formed along the rotating direction between the inner surface of the engaging hole and the head of the link pin, the base of the link pin comes into contact with the sleeve as the shaft rotates, allowing the rotational motive power to be communicated from the sleeve to the rotational drive member via the supporting pin. In other words, the rotational drive member can rotate without the head of the link pin pressed against the rotational drive member along the shaft rotating direction.

[0018] Alternatively, the swash plate compressor may adopt a structure in which an engaging hole with one end thereof opening at the opening and the other end thereof opening toward the outer circumference is formed at the rotational drive member, the head of the link pin is slidably inserted at the engaging hole so as to allow a tilting motion of the rotational drive member, a sleeve is externally fitted at the shaft so as to allow the sleeve to slide freely, a pass hole through which the link pin is inserted is formed at the sleeve, the rotational drive member is tiltably supported at the sleeve via a supporting pin passing through a pass hole formed at the shaft and the clearance formed between the inner surface of the pass hole at the shaft and the supporting pin is set smaller than the clearance formed along the shaft rotating direction between the inner surface of the engaging hole and the head of the link pin.

[0019] Since the clearance formed along the rotating direction between the inner surface of the pass hole at the shaft and the supporting pin is set smaller than the clearance formed along the same direction between the inner surface of the engaging hole and the head of the link pin, the rotational motive power is directly communicated from the shaft to the rotational drive member via the supporting pin. In other words, the rotational drive member can rotate without the head or the base of the link pin pressed against the rotational drive member or the sleeve along the shaft rotating direction.

[0020] It is to be noted that the engaging hole in the structure described above may have a circular section or an elliptical section and that the rotational drive member and the sleeve may be simply linked via the supporting pin without actually contacting each other. In addition, the supporting pin may be press-fitted and fixed at either the rotational drive member or the sleeve in order to assure a smooth tilting motion of the rotational drive member. It is desirable that the clearance between the side of the supporting pin where it is press-fitted and the insertion area on the opposite side be set smaller than the clearance formed along the rotating direction between the inner surface of the engaging hole and the head of the link pin.

EFFECT OF THE INVENTION

[0021] As explained above, in the swash plate compressor according to the present invention, the shaft is linked to the rotational drive member via a link pin so as to allow the rotational drive member to engage in a tilting motion and the rotational motive power of the shaft is communicated to the rotational drive member via a portion other than the head of the link pin. In other words, the head of the link pin is not pressed against the inner surface of the engaging hole, thereby preventing the link pin head from wearing the inner surface of the engaging hole.

[0022] In particular, by adopting the structure in which an engaging hole with one end thereof opening at the opening and the other end thereof opening toward the outer circumference is formed at the rotational drive member, the head of the link pin is slidably inserted at the engaging hole so as to allow a tilting motion of the rotational drive member, a sleeve is externally fitted at the shaft so as to allow the sleeve to slide freely, a pass hole through which the link pin is inserted is formed at the sleeve, the rotational drive member is tiltably supported at the sleeve via a supporting pin and the clearance formed between the inner surface of the pass hole at the sleeve and the base of the link pin is set smaller than the clearance formed along the shaft rotating direction between the inner surface of the engaging hole and the head of the link pin, the rotational motive power of the shaft can be communicated to the rotational drive member via the link pin base and the supporting pin, while avoiding contact between the link pin head and the inner surface of the engaging portion along the shaft rotating direction, which, in turn, improves the durability of the rotational drive member.

[0023] Alternatively, by adopting a structure in which an engaging hole with one end thereof opening at the opening and the other end thereof opening toward the outer circumference is formed at the rotational drive member, the head of the link pin is slidably inserted at the engaging hole so as to allow a tilting motion of the rotational drive member, a sleeve is externally fitted at the shaft so as to allow the sleeve to slide freely, a pass

hole through which the link pin is inserted is formed at the sleeve, the rotational drive member is tiltably supported at the sleeve via a supporting pin passing through a pass hole formed at the shaft and the clearance formed between the inner surface of the pass hole at the shaft and a base of the supporting pin is set smaller than the clearance formed along the shaft rotating direction between the inner surface of the engaging hole and the head of the link pin, the rotational motive power of the shaft can be communicated to the rotational drive member via the supporting pin alone, thereby avoiding contact between the link pin head and the inner surface of the engaging portion and contact between the link pin base and the inner surface of the pass hole at the sleeve along the shaft rotating direction, which, in turn, improves the durability of the sleeve as well as the durability of the rotational drive member.

[0024] In addition, by linking the rotational drive member and the sleeve in a non-contact method, a smooth tilting motion of the rotational drive member is assured. It is also possible to assure a smooth tilting motion of the rotational drive member by press-fitting and fixing the supporting pin only either at the rotational drive member or the sleeve.

[0025] By adopting the structure having the supporting pin press-fitted and fixed only at either the rotational drive member or the sleeve, the clearance between the side where the supporting pin is press-fitted and the insertion area on the opposite side may be set smaller than the clearance formed along the rotating direction between the inner surface of the engaging hole and the link pin head so as to communicate the rotational motive power reliably via the supporting pin while preventing contact between the link pin head and the inner surface of the engaging hole with a higher level of reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

FIG. 1 presents a structural example that may be adopted in the swash plate compressor according to the present invention, illustrating the links through which the shaft, the sleeve and the rotational drive member are connected in a sectional view taken along a direction perpendicular to the axial center of the shaft;

FIG. 2 presents an example of a variation that may be adopted in the swash plate compressor according to the present invention, illustrating the links through which the shaft, the sleeve and the rotational drive member are connected in a sectional view of the compressor from a direction perpendicular to the axial center of the shaft;

FIG. 3 presents another structural example that may be adopted in the swash plate compressor according to the present invention, illustrating the links through which the shaft, the sleeve and the rotational drive

member are connected in a sectional view taken along a direction perpendicular to the axial center of the shaft through line III-III in FIG. 4;

FIG. 4 is a sectional view taken through line IV-IV in FIG. 3;

FIG. 5 is a sectional view, showing the overall structure of a swash plate compressor;

FIG. 6 is a perspective showing the links through which the shaft, the sleeve and the rotational drive member are connected in the swash plate compressor in FIG. 5;

FIG. 7 shows the structure adopted in a swash plate compressor in the related art, showing the links through which the shaft, the sleeve and the rotational drive member are connected in a sectional view of the compressor from a direction perpendicular to the axial center of the shaft; and

FIG. 8 is a sectional view taken through line VIII-VIII in FIG. 7.

Explanation of Reference Numerals

[0027]

1	cylinder block
2	valve plate
3	rear head
4	crankcase
5	front head
6	shaft
13	cylinder
14	piston
15	link pin
15a	base
15c	head
16	rotational drive member
16a	engaging hole
20	sleeve
20a	arm
20b, 20d	longitudinal hole
21	supporting pin
30	pass hole

BEST MODE FOR CARRYING OUT THE INVENTION

[0028] The following is an explanation of the preferred embodiments of the present invention, given in reference to the attached drawings.

[0029] FIG. 1 shows the structure adopted in a motive power communicating mechanism for a rotational drive member 16 used in the swash plate compressor described earlier. The rotational drive member 16 in the figure is tiltably linked to a shaft 6 via a link pin 15 locked onto the shaft 6 and assumes a ring-shape with an opening 22 through which the shaft 6 is inserted formed at the center thereof. At the rotational drive member 16, an engaging hole 16a with one end thereof opening at the opening 22 and the other end thereof opening toward the

outer circumference is formed. The link pin 15 is slidably inserted at the engaging hole 16a so as to allow the rotational drive member 16 to tilt. Namely, the link pin 15, which includes a base 15a fixed at an insertion hole 6c formed at the shaft 6 through press-fitting or screwing, a small-diameter portion 15b formed continuous to the base 15a and a head 15c assuming a spherical shape at a free end continuous to the small diameter portion 15b tolerates the tilting motion of the rotational drive member 16 with the head 15c engaged at the engaging hole 16a formed at the rotational drive member 16.

[0030] Arms 20a projecting along the radial direction on the two sides of the shaft 6, are formed as integrated parts of a sleeve 20, which is slidably fitted over the exterior of the shaft 6. The arms 20a do not extend far enough to come into contact with the inner surface of the rotational drive member 16 and are linked with the rotational drive member 16 via supporting pins 21 each bridging between a supporting hole 20c formed at an arm 20a and a supporting hole 16c formed at the rotational drive member 16 at a position facing opposite the arm 20a so as to be allowed to rotate relative to the rotational drive member 16. Namely, the rotational drive member 16 is linked to the sleeve so that it is allowed to tilt around the supporting pins.

[0031] The supporting pins 21 are each press-fitted either in the supporting hole 20c at the arm 20a or in the supporting hole 16c at the rotational drive member 16 and are each loosely inserted at the other supporting hole. Thus, the supporting pins 21 do not fall out or become misaligned, while assuring a smooth tilting motion of the rotational drive member 16.

[0032] The clearance L1 between a longitudinal hole 20b at the sleeve 20 and the base of the link pin 15 ranging along the direction in which the shaft 6 rotates is set smaller than the clearance L2 between the head 15c of the link pin 15 and the inner surface of the engaging hole 16a facing the head 15c along the rotating direction, and thus, the base of the link pin 15 is allowed to come into contact with the sleeve 20 readily as the shaft 6 rotates. It is to be noted that a sliding layer constituted with a solid lubricating agent such as PTFE may be formed at least either of the contact surfaces, i.e., either the inner surface of the longitudinal hole 20b or the surface at the base of the link pin 15. In a structure that includes such a sliding layer, the clearance between the sliding layer and the portion facing the sliding layer is equivalent to the clearance L1 described earlier.

[0033] Such a structure may be achieved by forming the engaging hole 16a so as to achieve a circular section with a greater diameter than the diameter of the head, as in this example. Alternatively, the engaging hole 16a may be formed so as to have an elliptical section elongated along the rotating direction, thereby forming a non-contact area along the rotating direction as illustrated in the upper right insert in FIG. 1. In addition, it is desirable that the inner surface of the engaging hole in the structure described above achieve a surface hardness equal to or

greater than HRC 58 and a hard layer depth of 0.2 mm or greater.

[0034] In addition, the clearance L3, formed along the rotating direction on the side (the side toward the rotational drive member in this example) opposite from the side where the supporting pins 21 are press-fitted is set smaller than the clearance L2 formed between the head of the link pin and the inner surface of the engaging hole 16a facing the head along the direction in which the shaft 6 rotates and also, the sum $L1 + L3$ is smaller than L2 in the structure described above. As a result, as the shaft 6 rotates, the supporting pins are made to come into contact with the inner surfaces of the supporting holes before the head of the link pin comes into contact with the inner surface of the engaging hole 16a, thereby preventing the head 15c of the link pin 15 from coming into contact with the inner surface of the engaging hole facing the head 15c along the rotating direction.

[0035] Thus, as the shaft 6 rotates, the base 15a of the link pin 15 comes into contact with the inner surface of the longitudinal hole 20b at the sleeve 20, the supporting pins 21 come into contact with the inner surfaces along the rotating direction of either the supporting holes 16c at the rotational drive member 16 or the supporting holes 20c at the sleeve 20 where the supporting pins 21 are loosely held, and the rotational motive power is communicated to the rotational drive member 16 via the link pin 15 and the supporting pins 21.

[0036] As a result, the head 15c of the link pin 15 is not pressed against the inner surface of the engaging hole 16a at the rotational drive member 16 even when the shaft 6 rotates, thereby eliminating the problem of significant wear at the inner surface of the engaging hole 16a caused by the head 15c of the link pin 15 and improving the durability of the rotational drive member 16.

[0037] It is to be noted that the link pin 15 described above may be mounted by embedding the tip of the base 15a in the shaft 6 as shown in FIG. 5, or it may be mounted as shown in FIG. 2 by inserting the end of the link pin passing through the shaft 6 and projecting beyond the shaft 6 at a longitudinal hole 20d formed on the side opposite from the longitudinal hole 20b at the sleeve 20, setting the clearance L1 formed along the rotational direction between the inner surfaces of the longitudinal holes 20b and 20d and the base 15a of the link pin 15 smaller than the clearance L2 between the head 15c of the link pin 15 and the inner surface of the engaging hole 16a facing the head 15c along the rotational direction and allowing the base 15a of the link pin 15 to come into contact with the sleeve 20 at the two positions as the shaft rotates.

[0038] In the structure, the rotational load of the link pin 15 is borne at the two positions of the sleeve 20, and thus, an improvement in the durability at the contact areas is achieved by reducing the extent of wear.

[0039] FIGS. 3 and 4 present another structural example that may be adopted when linking the rotational drive member 16 to the sleeve 20. In this example, a pass hole

30 with an elliptical section, which extends along a direction running perpendicular to the axial center of the shaft 6 and ranges over a predetermined length along the axial direction is formed at the shaft 6, an engaging hole 20c with a circular section is formed at the arms 20a of the sleeve 20 so as to align with the pass hole 30 and a supporting pin 21 longer than the diameter of the opening 22 is inserted so as to pass through the pass hole 30 at the shaft 6 and the engaging hole 20c at the sleeve 20. Then, the supporting pin 21 is inserted at the supporting holes 16c at the rotational drive member 16 so as to tiltably hold the rotational drive member at the sleeve.

[0040] The supporting pin 21 in the structure is press-fitted either at the sleeve 20 or at the rotational drive member 16 and is loosely held at the other member. The clearance (the clearance over the area enclosed with the dotted line in FIG. 3) L4 formed along the rotating direction over the area where the supporting pin 21 passes through the pass hole 30 at the shaft 6 is set smaller than the clearance L2 formed between the head 15a of the link pin 15 and the inner surface of the engaging hole 16a facing the head along the rotating direction or the clearance L1 formed along the rotating direction between the longitudinal hole 20b at the sleeve 20 and the base 15a of the link pin 15. In addition, the clearance (the clearance formed on the side toward the rotational drive member in this example) L3 over the area on the side where the supporting pin 21 is not pressed-fitted is set smaller than the clearance L2 between the head 15c of the link pin 15 and the inner surface of the engaging hole 16a facing the head along the direction in which the shaft 6 rotates, and the sum $L1 + L3$ is smaller than L2. The overall structure ensures that as the shaft 6 rotates, the head 15c of the link pin 15 does not come into contact with the inner surface of the engaging hole 16a along the rotating direction.

[0041] Other structural features are identical to those in the previous example and accordingly, the same reference numerals are assigned to the identical structural features to preclude the necessity for a repeated explanation thereof.

[0042] As the shaft 6 rotates in the swash plate compressor structured as described above, the rotational motive power of the shaft 6 is communicated to the rotational drive member 16 via the supporting pin 21 alone without the link pin 15 ever coming into contact with the rotational drive member 16 or the sleeve 20 along the rotating direction. As a result, the inner surface of the engaging hole 16a or the sleeve 20 over the longitudinal hole does not become worn, which assures an improvement in the durability of the sleeve 20 as well as the durability of the rotational drive member 16.

Claims

1. A swash plate compressor, comprising:

a shaft (6) passing through a crankcase (4) and rotatably supported at a housing;

a rotational drive member (16) having an opening through which said shaft (6) is inserted and disposed in said crankcase (4) to rotate synchronously as said shaft (6) rotates; and
 a piston (14) held at a peripheral edge of said rotational drive member (16), which reciprocally slides inside a cylinder (13) formed at said housing as said rotational drive member (16) rotates, with the piston (14) stroke varied by adjusting the angle of inclination of said rotational drive member (16) said rotational drive member tiltably linked to said shaft (6) via a link pin (15) and that said rotational motive power of said shaft (6) communicated via a portion (14) other than a head (15c) of said link pin (15);
characterized in:

that an engaging hole (16a) with one end thereof opening at said opening and another end thereof opening toward the outer circumference, is formed at said rotational drive member (16);
that the head of said link pin (15) is slidably inserted at said engaging hole (16a) so as to allow a tilting motion of said rotational drive member (16);
that a sleeve (20) is externally fitted at said shaft (6) so as to allow said sleeve (20) to slide freely;
that a pass hole (30) through which said link pin (15) is inserted is formed at said sleeve (20);
that said rotational drive member (16) is tiltably supported at said sleeve (20) via a supporting pin (21); and
that a clearance formed between the inner surface of said pass hole (30) at said sleeve and a base of said link pin (15) is set smaller than a clearance formed along the shaft (6) rotating direction between the inner surface of said engaging hole (16a) and the head (15c) of said link pin (15).

2. A swash plate compressor, comprising:

a shaft (6) passing through a crankcase (4) and rotatably supported at a housing;

a rotational drive member (16) having an opening through which said shaft (6) is inserted and disposed in said crankcase (4)

to rotate synchronously as said shaft (6) rotates; and
 a piston (14) held at said peripheral edge of the rotational drive member (16), which reciprocally slides inside a cylinder (13) formed at said housing as said rotational drive member (16) rotates, with the piston (14) stroke varied by adjusting the angle of inclination of said rotational drive member (16); with said rotational drive member (16) tiltably linked to said shaft (6) via a link pin (15) and the rotational motive power of said shaft (6) communicated via a portion (14) other than a head (15c) of said link pin (15); categorized in:

that an engaging hole (16a) with one end thereof opening at said opening and another end thereof opening toward the outer circumference is formed at said rotational drive member (16);
 that the head of said link pin (15) is slidably inserted at said engaging hole (16a) so as to allow a tilting motion of said rotational drive member (16);
 that a sleeve (20) is externally fitted at said shaft (6) so as to allow said sleeve (20) to slide freely;
 that a pass hole (30) through which said link pin (15) is inserted is formed at said sleeve (20);
 that said rotational drive member (16) is tiltably supported at said sleeve (20) via a supporting pin (21) passing through a pass hole (30) formed at said shaft (6); and
 that a clearance formed between the inner surface of said pass hole (30) at said shaft (6) and said supporting pin (21) is set smaller than a clearance formed along the shaft (6) rotating direction between the inner surface of said engaging hole (16a) and the head (15c) of said link pin (15).

3. A swash plate compressor according to claim 1 or claim 2, **characterized in:**

that said engaging hole (16a) has a circular section or an elliptical section.

4. A swash plate compressor according to claim 1 or claim 2, **characterized in:**

that said rotational drive member (16) and said sleeve (20) are linked without contacting each other.

5. A swash plate compressor according to claim 1 or claim 2, **characterized in:**

that said supporting pin (21) is press-fitted and fixed at either said rotational drive member (16) or said sleeve (20). 5

6. A swash plate compressor according to claim 1 or claim 2, **characterized in:**

that a clearance formed over an insertion area on the side opposite from the side where said supporting pin (21) is press-fitted and fixed is set smaller than the clearance formed along the rotating direction between the inner surface of said engaging hole (16a) and the head (15c) of said link pin (15). 10 15

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FIG. 1

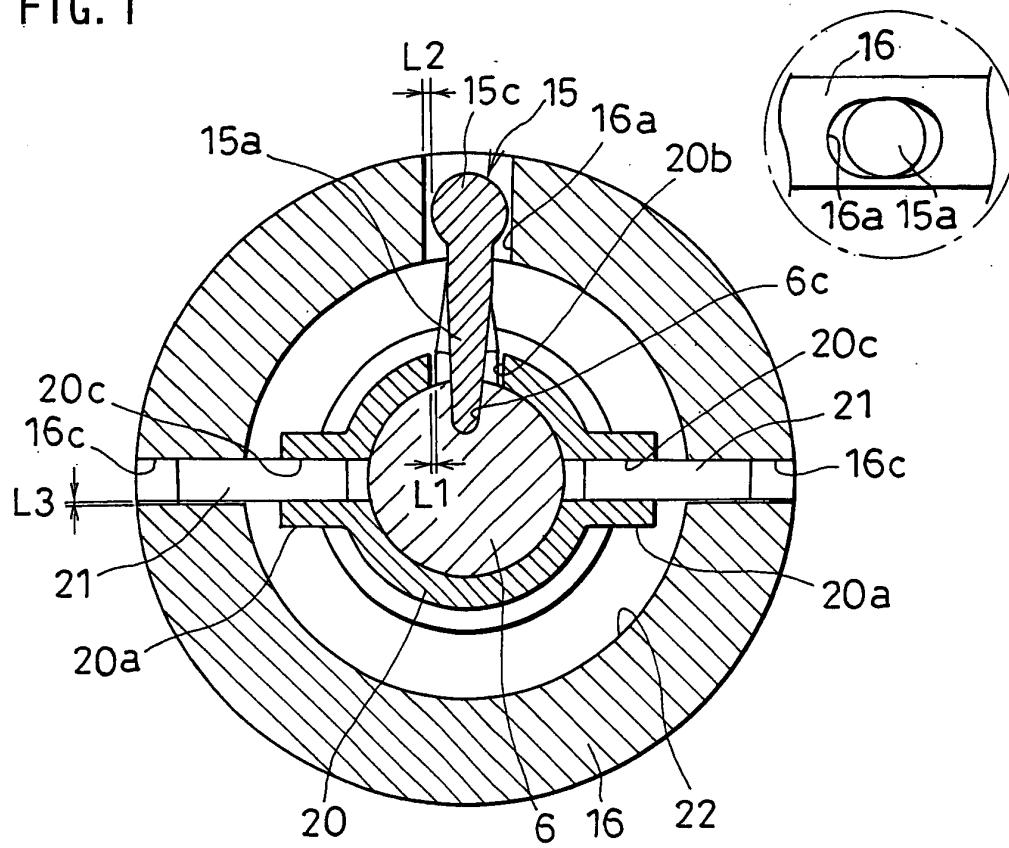


FIG. 2

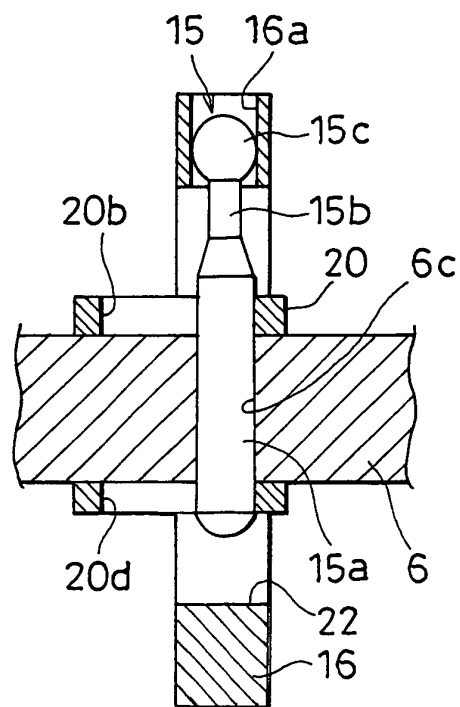


FIG. 3

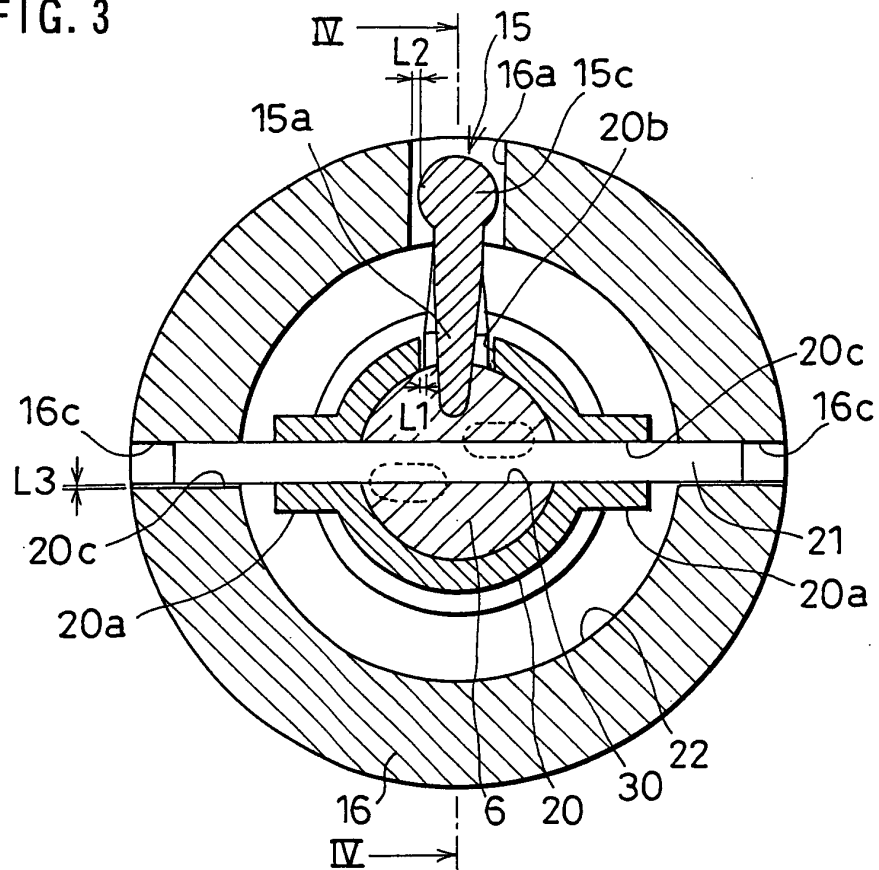


FIG. 4

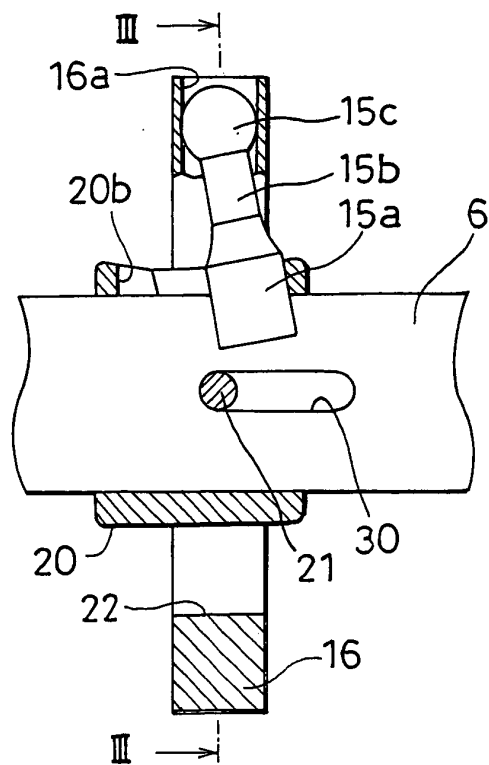


FIG. 5

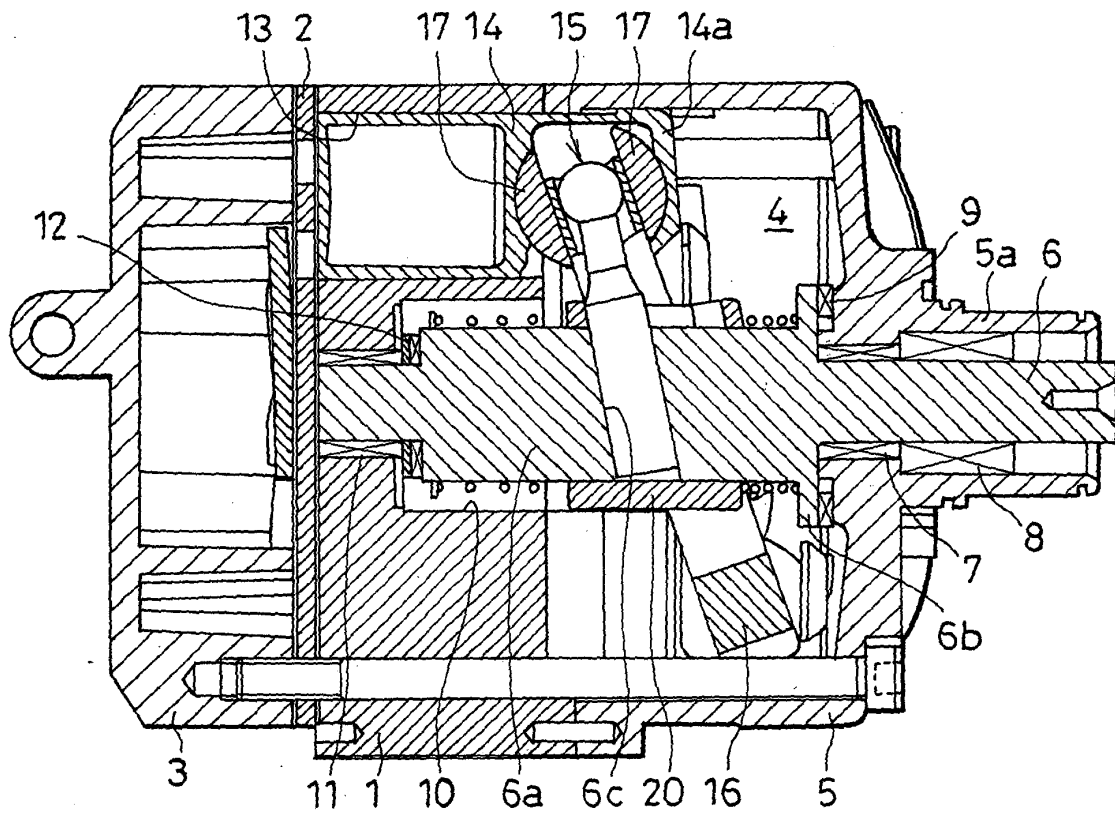


FIG. 6

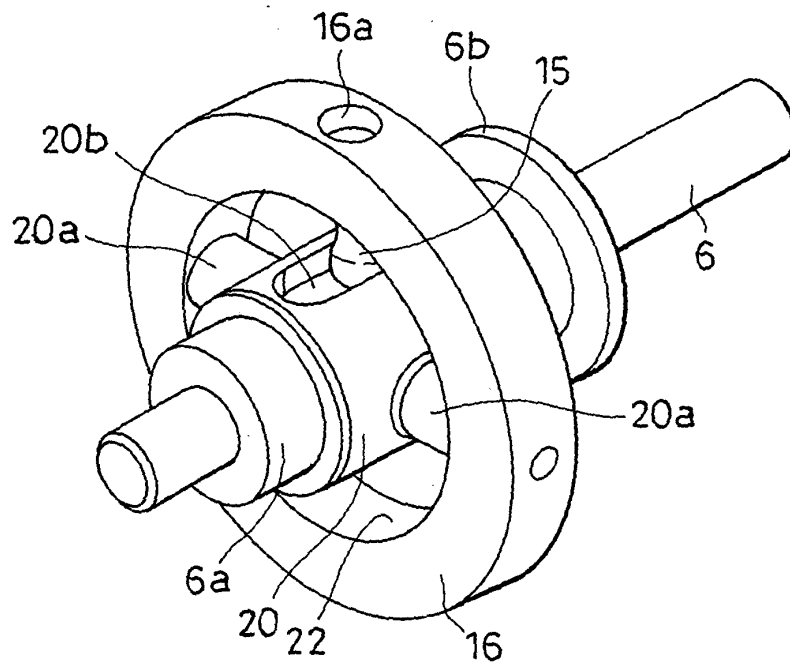


FIG. 7

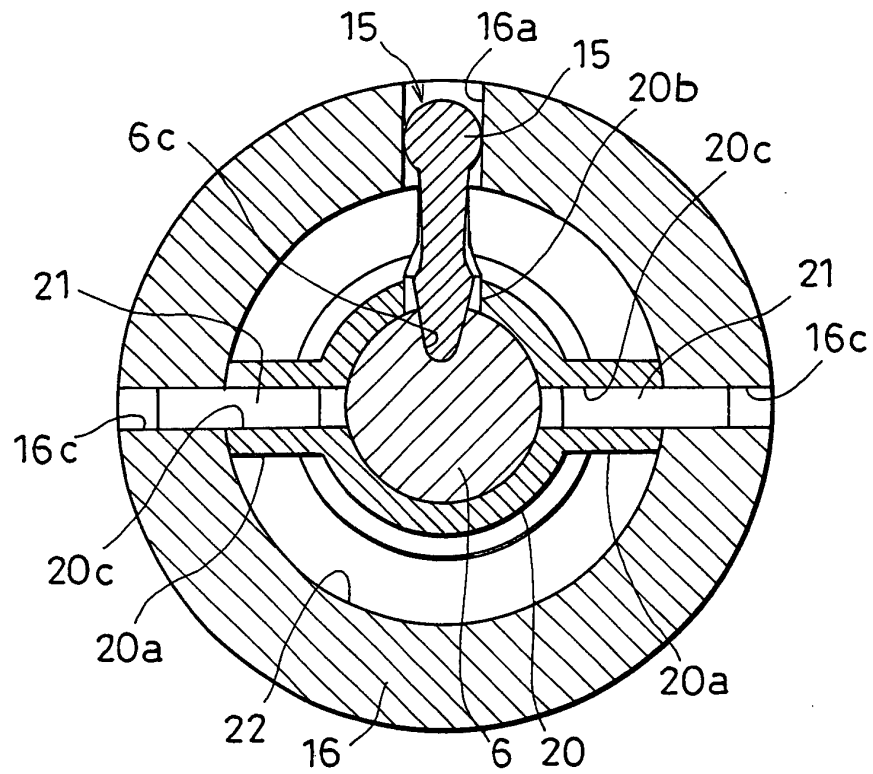
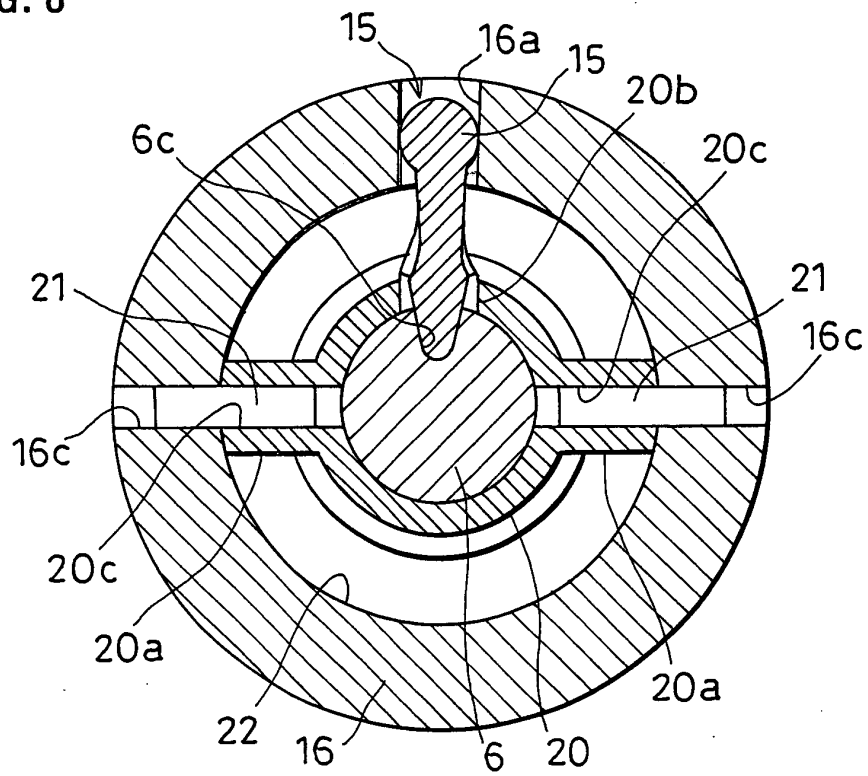


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/015012

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.⁷ F04B27/12

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl.⁷ F04B27/12Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004
Kokai Jitsuyo Shinan Koho 1971-2004 Jitsuyo Shinan Toroku Koho 1996-2004

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	DE 10010132 A1 (LUK FAHRZEUG-HYDRAULIK GMBH & Co. KG), 04 October, 2001 (04.10.01), Full text; Figs. 1 to 4 & AU 4229001 A & WO 2001/065071 A2	2-6 1
Y A	JP 2003-193966 A (Kanda Kucho Kabushiki Kaisha), 09 July, 2003 (09.07.03), Par. Nos. [0023] to [0025]; Figs. 1 to 6 & EP 1319834 A2 & US 2003/108433 A1	2-6 1
Y A	JP 6-249143 A (Sanden Corp.), 06 September, 1994 (06.09.94), Par. No. [0007]; Figs. 1 to 5 (Family: none)	2-6 1

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

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28 December, 2004 (28.12.04)Date of mailing of the international search report
08 March, 2005 (08.03.05)Name and mailing address of the ISA/
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2002/038959 A1 (LUK FAHRZEUG-HYDRAULIK GMBH & Co. KG), 16 May, 2002 (16.05.02), Description; page 6, lines 5 to 23; Fig. 4 & US 2004/7126 A1 & FR 2816670 A1	3
A	JP 2003-120525 A (Sanden Corp.), 23 April, 2003 (23.04.03), Column 2, lines 24 to 27; Figs. 5 to 6 (Family: none)	1-6
A	JP 2003-269328 A (Sanden Corp.), 25 September, 2003 (25.09.03), Column 4, lines 32 to 35; Figs. 1 to 4 (Family: none)	1-6
A	JP 3188716 B2 (Obrist Engineering GmbH), 11 May, 2001 (11.05.01), Full text; Figs. 1 to 5 & EP 0964997 A1 & US 6164252 A & DE 19749727 A1 & EP 0964997 B1	1-6