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(54) **INTERNALLY CURVED LOW-SPEED HIGH-TORQUE HYDRAULIC MOTOR WITH TORQUE BEING OUTPUT BY MEANS OF ROTATION OF HOUSING**

INTERN GEKRÜMMTER HYDRAULIKMOTOR MIT GERINGER DREHZAHL UND HOHEM DREHMOMENT MIT DREHMOMENTABGABE MITTELS ROTATION DES GEHÄUSES

MOTEUR HYDRAULIQUE À COUPLE ÉLEVÉ À FAIBLE VITESSE À COURBURE INTERNE, AVEC SORTIE DE COUPLE PAR ROTATION DE BOÎTIER

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Description

Technical Field

[0001] The present invention relates to a low-speed high-torque hydraulic motor in the field of hydraulic motors, in particular to an internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing.

Background Art

[0002] With the fierce competition in the engineering vehicle market, how to reduce costs, improve vehicle performance and occupy the market is crucial. At present, the wheel drive hydraulic motor used in the engineering vehicle has two structures: one structure is a planetary reduction gearbox with a plunger hydraulic motor for driving the rotation of a housing; and the other is an internally curved hydraulic motor with a rotatable cylinder body (spindle) and a fixed motor housing. The first structure is not conducive to market competition due to its complicated structure, low efficiency, low speed crawling, and high failure rate; the second structure is an internally curved hydraulic motor with a rotatable cylinder body (spindle) and a fixed motor housing, thereby occupying a large space and having limited application in engineering vehicles. Therefore, how to increase the efficiency, decrease the failure rate, reduce the occupancy space and make the layout of the main machine more reasonable by improving the structure on the basis of ensuring the driving performance of the vehicle is a very meaningful subject in the art.

[0003] In the industries of ships, lifting equipment, and the like, a Viking motor is commonly used. The Viking motor also has the structure of a rotatable housing, but it has a different oil distribution mode in comparison with the internally curved motor with a rotatable housing. The Viking motor uses a radial oil distribution mode. During use, the oil distribution shaft seal ring or clearance seal may be worn out, thus causing failure of compensation after the clearance is large, and causing internal leakage and failure of normal operation. In the case of the same displacement and torque, the rated speed is low, and the internally curved hydraulic motor with a rotatable housing can be widely used in industries such as travelling construction machinery, ships, lifting equipment, etc.

[0004] German patent publication DE 20 04 773 A1 discloses a hydraulic motor with two rows of radially arranged pistons and a guide which is designed so that the dimensions of the hydraulic motor are significantly reduced and its structure can be simplified. Leakage of fluid will increase when wear and tear of the distributor and the cylinder of the hydraulic motor occur after long-term use. How to avoid or reduce leakages is not discussed in this publication.

Summary of the Invention

[0005] The main object of the present invention, which is defined by the appended claims, is to overcome the defects of the existing planetary reduction gearbox with a plunger hydraulic motor for driving the rotation of a housing, such as low efficiency, low-speed crawling, heavy weight, large size, and the like, and to overcome the defects of the internally curved hydraulic motor with a rotatable cylinder body spindle for outputting and a fixed housing, such as occupying a large space and having limited application. The present invention provides a novel structure of an internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing. The technical problem to be solved is to improve the structure so as to easily implement the technical performance required for the wheel driving of the engineering vehicle, thereby reducing defects and deficiencies caused by the structure of the wheel-driving traveling hydraulic motor in the existing engineering vehicle, which is quite suitable for practical use.

[0006] The following technical solutions are used for achieving the object of the present invention and solving the technical problem thereof. An internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing is provided according to the present invention, composed of a left bearing block, a right end cover, a spacer ring, a cylinder body, an internally curved cam ring, an axial oil distribution pan and a plurality of radially arranged plunger assemblies, wherein the internally curved cam ring, the left bearing block, the spacer ring and the right end cover form a motor housing; the motor housing with a split structure is formed by connecting the internally curved cam ring, the left bearing block, the spacer ring and the right end cover in series via high-strength bolts; the motor as a whole is combined by the fixed cylinder body and the rotatable motor housing; the motor housing rotates around the cylinder body, while the cylinder body is fixed; the axial oil distribution pan is axially arranged on one side of the cylinder body, and connected to an oil passage of the cylinder body through an oil passage. Plunger holes of the cylinder body are arranged in a single row or a plurality of rows depending on the magnitude of output torque, and the plurality of plunger assemblies are uniformly arranged in the plunger holes in a radial direction around the cylinder body.

[0007] The plurality of plunger assemblies are uniformly arranged in a radial direction around the cylinder body.

[0008] An internally curved low-speed high-torque hydraulic motor with output by means of the rotation of a housing is described above, wherein the axial oil distribution pan is provided therein with a spring and a balancing plunger, the balancing plunger is cup-shaped, the spring is against a cup bottom of the balancing plunger, and an outer surface of the cup bottom of the balancing plunger is in tight fit with the right end cover; under the action of acting forces and reacting forces, acting forces

of the spring and the balancing plunger cause contact surfaces between the axial oil distribution pan and the cylinder body to be in close contact; when pressurized oil enters, the axial oil distribution pan relies on the acting forces of the spring and the balancing plunger together with the action of the pressurized oil to cause the contact surfaces between the axial oil distribution pan and the cylinder body to be always in tight fit; in the case of wear, the acting forces of the spring and the balancing plunger can be used to cause the contact surfaces between the axial oil distribution pan and the cylinder body to maintain close contact, thereby compensating for the wear, compensating for the wear of the axial oil distribution pan, reducing internal leakage of the motor and prolonging the service life of the motor.

[0009] Compared with the prior art, the present invention has obvious advantages and beneficial effects. The present invention has at least the following advantages:

1. An internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing according to the present invention, due to the use of the structure of a rotatable housing, provides an effective approach to the application of the internally curved hydraulic motor to the engineering vehicle. Furthermore, the present invention also provides a new solution for the wheel driving mode of the engineering vehicle.

2. An internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing according to the present invention, due to the use of the structure of a rotatable housing, has the advantages of simpler structure, higher efficiency, higher stability at low speed, lighter weight, smaller size, easier manufacturing process, and lower failure rate than the planetary reduction gearbox of plunger hydraulic motor driving; and it has the advantages of smaller occupancy space, more beneficial layout of the main machine, and the like compared with the internally curved travelling hydraulic motor with a rotatable cylinder body and a fixed housing.

3. An internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing according to the present invention mainly differs from the Viking motor in the oil distribution mode. The Viking motor uses a radial oil distribution mode, but the disadvantage is that the oil distribution shaft seal ring or clearance seal may be worn out after a long time, and internal leakage may occur, thereby affecting the output torque of the motor and causing failure of normal use. The oil distribution mode of the present invention is an axial oil distribution mode, and has the spring, the balancing plunger and oil pressure in the axial oil distribution pan to compensate wear so that the service life of the motor is long.

[0010] The above description is only an overview of the technical solutions of the present invention. In order to have a clearer understanding of the technical means of the present invention, the present invention can be implemented in accordance with the contents of the description. In order to make the above and other objects, features and advantages of the present invention more obvious and understandable, preferred embodiments will be described in detail below with reference to the drawings.

Brief Description of the Drawings

[0011] In the present invention:
Fig. 1 is a structural schematic diagram of an internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing according to the present invention.
Fig. 2 is a left view of Fig. 1.
In which:

1: left bearing block 2: internally curved cam ring
3: spacer ring 4: cylinder body
5: plunger assembly
6: axial oil distribution pan
6-1: spring 6-2: balancing plunger
7: right end cover

Fig. 3 is a partial enlarged diagram of Fig. 1.

Detailed Description of Preferred Embodiments

[0012] In order to further illustrate the technical means and effects of the present invention for achieving the predetermined inventive object, the specific embodiments, structures, features and effects of an internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing provided according to the present invention will be described in detail below with reference to the drawings and preferred embodiments.

[0013] Referring to Figs. 1-3, an internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing according to preferred embodiments of the present invention is mainly composed of a cylinder body 4, a left bearing block 1, an internally curved cam ring 2, a spacer ring 3, an axial oil distribution pan 6, a right end cover 7, and a plurality of radially arranged plunger assemblies 5, wherein the internally curved cam ring 2, the left bearing block 1, the spacer ring 3 and the right end cover 7 form a motor housing; the motor housing with a split structure is formed by connecting the internally curved cam ring 2, the left bearing block 1, the spacer ring 3 and the right end cover 7 in series via high-strength bolts. The motor as a whole

is combined by the fixed cylinder body 4 and the rotatable motor housing; the motor housing rotates around the cylinder body 4, while the cylinder body 4 is fixed. Plunger holes of the cylinder body 4 may be designed in a single row or a plurality of rows depending on the magnitude of output torque, and the plurality of plunger assemblies 5 are uniformly arranged in the plunger holes in a radial direction around the cylinder body 4. Referring to Fig. 3, the axial oil distribution pan 6 is axially arranged on one side of the cylinder body 4, and connected to an oil passage of the cylinder body 4 through an oil passage. The axial oil distribution pan 6 is provided therein with a spring 6-1 and a balancing plunger 6-2, wherein the balancing plunger 6-2 is cup-shaped, the spring 6-1 is against a cup bottom of the balancing plunger 6-2, and an outer surface of the cup bottom of the balancing plunger 6-2 is in tight fit with the right end cover 7, thus under the action of acting forces and reacting forces, the spring force of the spring 6-1 can be used to cause the contact surfaces between the axial oil distribution pan 6 and the cylinder body 4 to be always in tight fit.

[0014] Referring to Figs. 1-3, both an oil inlet hole and an oil return hole are arranged on one end of the cylinder body 4; oil enters the axial oil distribution pan 6 from the center of the cylinder body 4 in the direction shown in the figures, and is distributed to the working chambers of the plunger assemblies 5 which are radially uniformly arranged in the cylinder body 4, and pushes the plunger assemblies 5 to move linearly. Under the action of pressure, the plunger assemblies 5 push the motor housing, which is composed of the internally curved cam ring 2, the left bearing block 1, the spacer ring 3 and the right end cover 7, to rotate. Under initial pressure, the axial oil distribution pan 6 relies on the acting forces of the spring 6-1 and the balancing plunger 6-2 to cause the contact surfaces between the axial oil distribution pan 6 and the cylinder body 4 to be always in tight fit; when pressurized oil enters, the axial oil distribution pan 6 relies on the joint action of the spring 6-1, the balancing plunger 6-2 and the pressurized oil to cause the contact surfaces between the axial oil distribution pan 6 and the cylinder body 4 to be in tight fit; in the case where wear occurs on the contact surfaces between the axial oil distribution pan 6 and the cylinder body 4, the acting forces of the spring 6-1 and the balancing plunger 6-2 are used to cause the axial oil distribution pan 6 and the cylinder body 4 to maintain close contact, thereby compensating for the wear, compensating for the wear of the axial oil distribution pan 6, reducing internal leakage of the motor and prolonging the service life of the motor.

[0015] Only preferred embodiments of the present invention are described above, and the present invention is not limited thereto in any way.

Claims

1. An internally curved low-speed high-torque hydraulic motor with torque being output by means of the rotation of a housing, comprising: a left bearing block (1), a right end cover (7), a cylinder body (4), an internally curved cam ring (2), a spacer ring (3), an axial oil distribution pan (6), and a plurality of radially arranged plunger assemblies (5), wherein

the internally curved cam ring (2), the left bearing block (1), the spacer ring (3) and the right end cover (7) form a motor housing; the motor housing with a split structure is formed by connecting the internally curved cam ring (2), the left bearing block (1), the spacer ring (3) and the right end cover (7) in series via high-strength bolts; the motor as a whole is combined by the fixed cylinder body (4) and the rotatable motor housing; the motor housing rotates around the cylinder body (4), while the cylinder body (4) is fixed; the axial oil distribution pan (6) is axially arranged on one side of the cylinder body (4), and connected to an oil passage of the cylinder body (4) through an oil passage; plunger holes of the cylinder body (4) are designed in a single row or a plurality of rows depending on the magnitude of output torque, and the plurality of plunger assemblies (5) are uniformly arranged in the plunger holes in a radial direction around the cylinder body (4);

characterized in that the axial oil distribution pan (6) further comprises:

a spring (6-1) configured in the axial oil distribution pan, and

a balancing plunger (6-2) configured in the axial oil distribution pan, wherein the balancing plunger (6-2) is cup-shaped, wherein

the spring (6-1) is against a cup bottom of the balancing plunger (6-2), and an outer surface of the cup bottom of the balancing plunger (6-2) tightly fits the right end cover (7); under the action of acting forces and reacting forces, acting forces of the spring (6-1) and the balancing plunger (6-2) cause contact surfaces between the axial oil distribution pan (6) and the cylinder body (4) to be always in tight fit; when pressurized oil enters,

the axial oil distribution pan (6) relies on the joint action of the spring (6-1), the balancing plunger (6-2) and the pressurized oil to cause the contact surfaces between the axial oil distribution pan (6) and the cylinder body (4) to be always in tight fit; in the case where wear occurs, the acting forces of the spring (6-1) and the balancing plunger (6-2) are used to cause the contact surfaces between the axial oil distribution pan (6) and the cylinder body (4) to maintain close contact, thereby compensating for the wear,

compensating for the wear and tear of the axial oil distribution pan (6), reducing leakages in the internal of the motor.

Patentansprüche

1. Intern gekrümmter Hydraulikmotor mit geringer Drehzahl und hohem Drehmoment, bei dem das Drehmoment durch die Rotation eines Gehäuses abgegeben wird, umfassend: einen linken Lagerblock (1), eine rechte Endabdeckung (7), einen Zylinderkörper (4), einen intern gekrümmten Nockenring (2), einen Abstandsring (3), eine axiale Ölverteilungswanne (6), und eine Vielzahl von radial angeordneten Kolbenbaugruppen (5), wobei
der intern gekrümmte Nockenring (2), der linke Lagerblock (1), der Abstandsring (3) und die rechte Endabdeckung (7) ein Motorgehäuse bilden; das Motorgehäuse mit geteilter Struktur gebildet wird, indem der intern gekrümmte Nockenring (2), der linke Lagerblock (1), der Abstandsring (3) und die rechte Endabdeckung (7) über hochfeste Bolzen in Reihe verbunden sind; der Motor als Ganzes durch den feststehenden Zylinderkörper (4) und das rotierbare Motorgehäuse zusammengefügt ist; das Motorgehäuse um den Zylinderkörper (4) rotiert, während der Zylinderkörper (4) feststeht; die axiale Ölverteilungswanne (6) axial auf einer Seite des Zylinderkörpers (4) angeordnet und durch einen Ölkanal mit einem Ölkanal des Zylinderkörpers (4) verbunden ist; Kolbenbohrungen des Zylinderkörpers (4) in einer einzelnen Reihe oder einer Vielzahl von Reihen in Abhängigkeit von der Größe des Ausgangsdrehmoments ausgebildet sind, und die Vielzahl von Kolbenbaugruppen (5) gleichförmig in den Kolbenbohrungen in einer radialen Richtung um den Zylinderkörper (4) herum angeordnet sind;
dadurch gekennzeichnet, dass die axiale Ölverteilerwanne (6) ferner umfasst:

eine Feder (6-1), die in der axialen Ölverteilerwanne konfiguriert ist, und
einen Ausgleichskolben (6-2), der in der axialen Ölverteilerwanne konfiguriert ist, wobei der Ausgleichskolben (6-2) becherförmig ist, wobei
die Feder (6-1) gegen einen Becherboden des Ausgleichskolbens (6-2) anliegt, und eine Außenfläche des Becherbodens des Ausgleichskolbens (6-2) eng an der rechten Endabdeckung (7) anliegt; unter der Wirkung von Wirkkräften und Reaktionskräften Wirkkräfte der Feder (6-1) und des Ausgleichskolbens (6-2) bewirken, dass die Kontaktflächen zwischen der axialen Ölverteilerwanne (6) und dem Zylinderkörper (4) immer eng anliegend sind; wenn Drucköl eintritt, die axiale Ölverteilerwanne (6) sich auf die gemeinsame Wirkung der Feder (6-1), des Ausgleichskolbens (6-2) und des Drucköls stützt, um zu bewirken, dass die Kontaktflächen zwischen der axialen Ölverteilerwanne (6) und dem Zylinderkörper (4) immer eng anliegend sind; und in dem Fall, in dem Verschleiß auftritt, die Wirkkräfte der Feder (6-1) und des Ausgleichskolbens (6-2) verwendet werden, um zu bewirken, dass die Kontaktflächen zwischen der axialen Ölverteilerwanne (6) und dem Zylinderkörper (4) in engem Kontakt bleiben, wodurch der Verschleiß kompensiert wird, wodurch der Verschleiß und Einriss der axialen Ölverteilerwanne (6) kompensiert wird, wobei Leckagen im Inneren des Motors reduziert werden.

Revendications

1. Moteur hydraulique à couple élevé à faible vitesse à courbure interne avec sortie de couple par rotation d'un boîtier, comprenant : un bloc de palier gauche (1), un couvercle d'extrémité droit (7), un corps de cylindre (4), un anneau de came à courbure interne (2), une bague-entretoise (3), un carter de distribution d'huile axial (6), et une pluralité d'ensembles pistons (5) agencés radialement, dans lequel
l'anneau de came à courbure interne (2), le bloc de palier gauche (1), la bague-entretoise (3) et le couvercle d'extrémité droit (7) forment un boîtier de moteur ; le boîtier de moteur avec une structure fendue est formé en reliant l'anneau de came à courbure interne (2), le bloc de palier gauche (1), la bague-entretoise (3) et le couvercle d'extrémité droit (7) en série via des boulons à haute résistance ; le moteur dans son ensemble est combiné par le corps de cylindre (4) fixe et le boîtier de moteur rotatif ; le boîtier de moteur tourne autour du corps de cylindre (4), tandis que le corps de cylindre (4) est fixe ; le carter de distribution d'huile axial (6) est agencé axialement sur un côté du corps de cylindre (4), et relié à un passage d'huile du corps de cylindre (4) par l'intermédiaire d'un passage d'huile ; des trous de pistons du corps de cylindre (4) sont conçus en une seule rangée ou une pluralité de rangées suivant l'amplitude d'un couple de sortie, et la pluralité d'ensembles pistons (5) sont agencés uniformément dans les trous de pistons dans une direction radiale autour du corps de cylindre (4) ;
caractérisé en ce que le carter de distribution d'huile axial (6) comprend en outre :

un ressort (6-1) configuré dans le carter de distribution d'huile axial, et
un piston d'équilibrage (6-2) configuré dans le carter de distribution d'huile axial, dans lequel le piston d'équilibrage (6-2) est cupuliforme, dans lequel
le ressort (6-1) est contre un fond de coupe du piston d'équilibrage (6-2), et une surface extérieure du fond de coupe du piston d'équilibrage (6-2) s'ajuste de manière serrée sur le couvercle d'extrémité droit (7) ; sous l'action de forces d'action et de forces de réaction, des forces

d'action du ressort (6-1) et du piston d'équilibrage (6-2) amènent des surfaces de contact entre le carter de distribution d'huile axial (6) et le corps de cylindre (4) à être toujours en ajustement serré ; lorsque de l'huile sous pression entre, le carter de distribution d'huile axial (6) s'appuie sur l'action conjointe du ressort (6-1), du piston d'équilibrage (6-2) et de l'huile sous pression pour amener les surfaces de contact entre le carter de distribution d'huile axial (6) et le corps de cylindre (4) à être toujours en ajustement serré ; dans le cas où de l'usure apparaît, les forces d'action du ressort (6-1) et du piston d'équilibrage (6-2) sont utilisées pour amener les surfaces de contact entre le carter de distribution d'huile axial (6) et le corps de cylindre (4) à maintenir un contact étroit, compensant ainsi l'usure, compensant l'usure et la déchirure du carter de distribution d'huile axial (6), réduisant des fuites à l'intérieur du moteur.

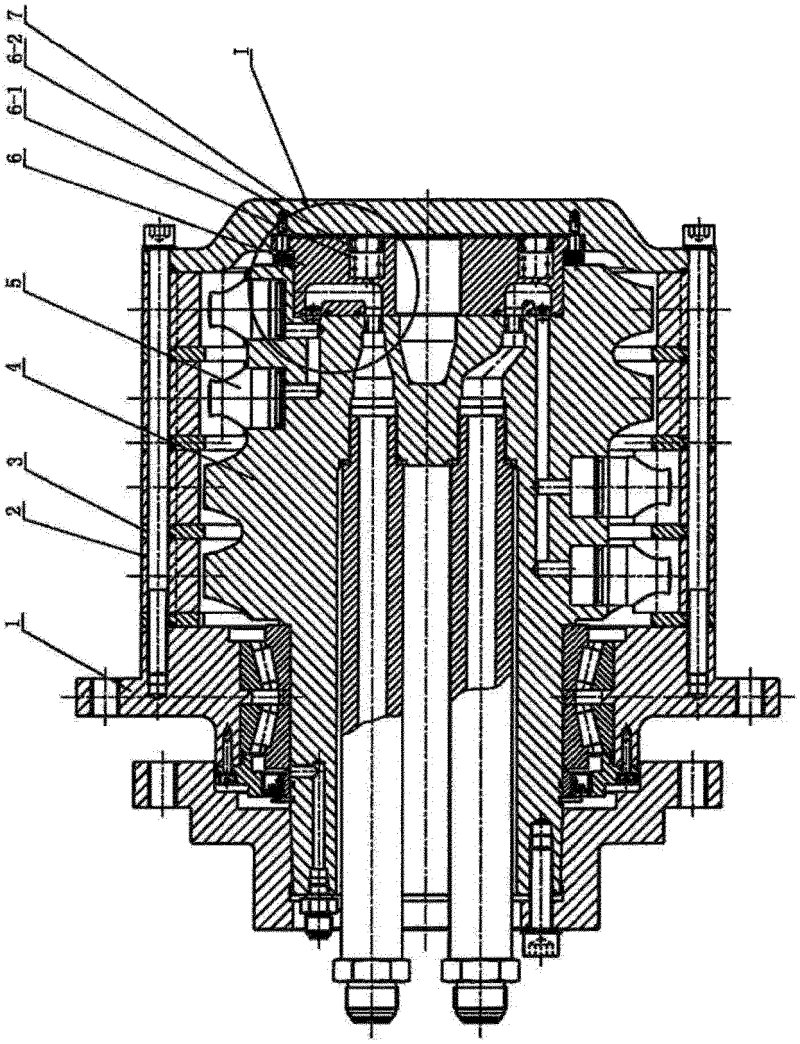

Fig. 1

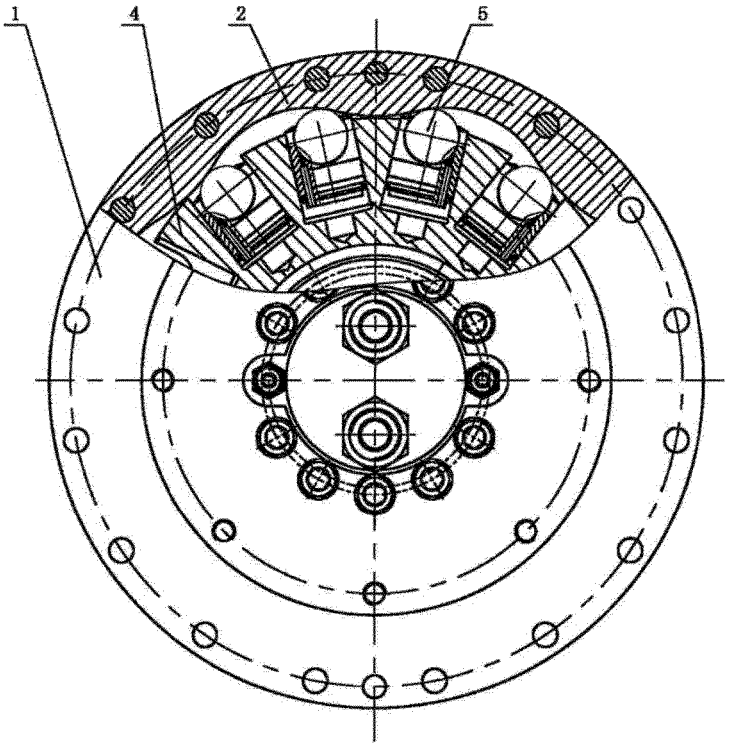

Fig. 2

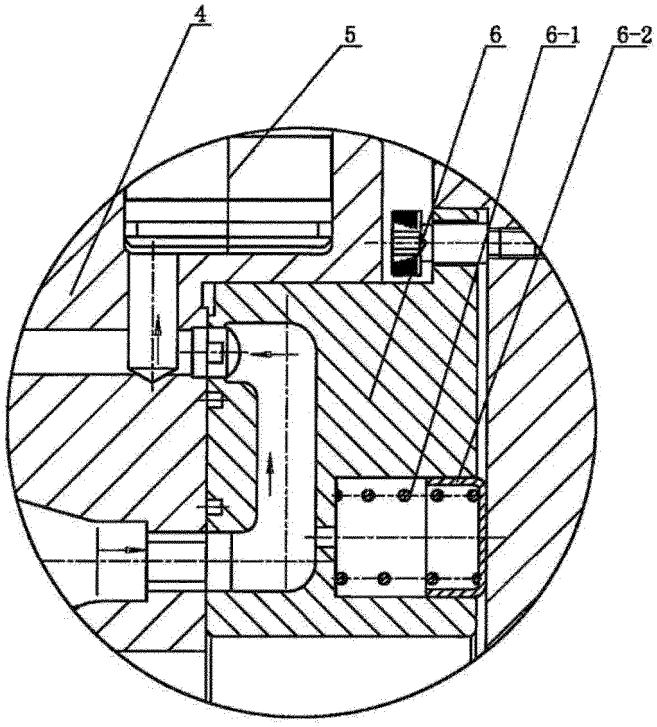

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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