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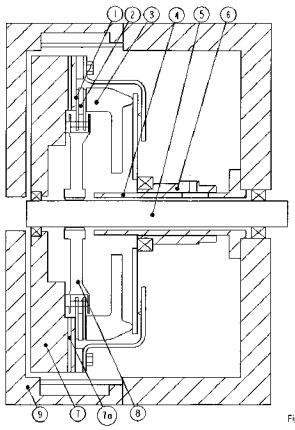

Fig. 2

(57) Abstract: The present invention relates to an oil management system for an integrated wet clutch and a torsional damper assembly of a transmission. The system provides an oil collection and circulation mechanism comprising, a clutch release sleeve, a guide tube, a plurality of paddles provided in the torsional damper and a baffle provided around the periphery of the flywheel and guiding elements inside the flywheel. The system provides an efficient and effective cooling system for better heat dissipation from the clutch assemblies, without excessive drag and without requirement of a separate pump for oil circulation.

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INTEGRATED WET CLUTCH AND DAMPER ASSEMBLY FOR A TRANSMISSION AND OIL MANAGEMENT SYSTEM THEREOF

FIELD OF THE INVENTION

This invention relates to transmission system of a vehicle and more particularly relates to integrated wet clutch and damper assembly with oil management system for said transmission.

BACKGROUND AND PRIOR ART OF THE INVENTION

Wet clutches are used in vehicles to have longer life as compared to dry clutches. This is achieved through proper cooling of the friction linings so as to limit the maximum temperature of the linings, thereby reducing the wear and increasing the life.

Typically, a wet clutch consists of a plurality of friction discs housed inside a drum which is mounted on a drive shaft and is located close to the transmission, so as to share the oil from the transmission sump. There is a separate torsional damper housed in a dry compartment and mounted on a flywheel.

It is conventional to actuate a wet clutch hydraulically. Hydraulic actuation, however, has its own disadvantages like the vehicle cannot be push started at the time when the hydraulic system is not working.

In wet clutch systems a consistent flow of oil, transmission fluid or other cooling fluid is required by the clutch. Oil flows via supply channels and clutch stacks while providing cooling to clutch disks and other moving parts. The existing wet clutch operations especially in which the clutch is directly or indirectly mounted on to the flywheel, experience the problem of excessive drag because of stored or dead volume of the oil in the system. Additionally it affects the fuel efficiency of the vehicle. These wet clutch systems also use high volume of lubricating oil

because of the storage or dead volume of lubricating oil. Apart from that, in order to have oil circulation into the complete assembly separate pump is required.

A proper cooling system or oil management system is needed for better heat dissipation from the clutch assemblies, without excessive drag and without requirement of a separate pump for the oil circulation.

SUMMARY OF THE INVENTION:

The main object of this invention is to provide integrated wet clutch and damper assembly and oil management system thereof for a transmission.

Yet another object of this invention is to provide an oil management system for a transmission with excellent heat dissipation without any excessive drag.

Yet another object of this invention is to provide an oil management system for a transmission with mechanical actuation for wet clutch assembly.

Yet another object of this invention is to provide an oil management system for a transmission without any requirement of a pumping means for oil.

Yet another object of this invention is to provide an oil management system for a transmission which is simple in construction and cost effective.

Integrated wet clutch and damper assembly for a transmission in accordance with this invention basically comprises of clutch pressure plate, torsional damper, a guide tube, clutch release sleeve and a clutch disc pack, which includes plurality of friction discs and separator plates. Said pressure plate is adapted to be fastened to flywheel. Said friction discs and separator plates are assembled intermittently to each other. The friction discs are fastened to the torsional damper. The separator plate is provided with engaging members to engage with guiding elements of the fly wheel. A guide tube is fastened to the clutch housing and a clutch release sleeve is slidingly connected to the guide tube. A clutch release bearing is mounted on said clutch release sleeve. Said pressure plate is provided with a biasing means. During operation said clutch release bearing actuates the biasing means. The

clutch release sleeve is provided with one or more ports to supply oil in to the gap between drive shaft and the guide tube. The torsional damper is provided with plurality of paddles to direct oil to the friction discs.

The clutch pressure plate provides the axial thrust to the friction linings attached to the friction discs, for transferring the torque. The torque is transferred from the flywheel, clutch pressure plate and separator plate to the friction discs and thereby to the drive shaft through the torsional damper.

According to another embodiment of the invention there is also provided an oil management system for an integrated wet clutch and a torsional damper assembly of a transmission.

According to one aspect of the invention there is provided an oil collection and circulation mechanism including, a clutch release sleeve, a guide tube, a plurality of paddles in the torsional damper and a baffle around the periphery of the flywheel in which the clutch release sleeve provides an inlet port to interpose the oil to the guide tube which in turn provides oil path from clutch release sleeve to the torsional damper and clutch assembly; the paddles provided in the torsional damper receive the oil from the guide tube and circulate it to friction linings of the wet clutch assembly; and a plurality of guiding elements provided in the flywheel receives the oil from friction linings of the wet clutch, a baffle provided around the flywheel, collects the oil coming through guiding elements in the flywheel, the flywheel housing is provided with plurality of guiding elements which collect the oil from the baffle and re-circulates it back to transmission.

According to another aspect of the invention there is provided an oil management system for an integrated wet clutch assembly and torsional damper of a transmission wherein the wet clutch assembly is mounted on the flywheel.

According to another aspect of the invention there is provided an oil management system for an integrated wet clutch assembly and a torsional damper of a transmission wherein the guiding elements in the flywheel are the cavities tailored in the flywheel.

According to another aspect of the invention there is provided an oil management system for an integrated wet clutch assembly and a torsional damper of a transmission wherein the guiding elements of the flywheel housing are cavities tailored in the flywheel housing.

BRIEF DESCRIPTION OF THE DRAWINGS:

A preferred embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a cross section perspective view of the integrated wet clutch assembly and torsional damper according to the present invention.

Figure 2 is a cross section perspective view of the integrated wet clutch assembly and torsional damper according to the present invention.

Figure 3 is a cross section view of the oil flow path in the wet clutch assembly and torsional damper according to the present invention.

Figure 4 is a rear view of oil flow in and around the flywheel and flywheel housing.

Figure 5 is a perspective view of the separator plate.

Figure 6 is a cross section view of the clutch pack.

Figure 7 is a cross section view of the torsional damper.

DETAILED DESCRIPTION OF THE INVENTION:

An integrated wet clutch and torsional damper assembly and oil management system thereof for a transmission according to the present invention is described herein below with reference to figures 1 through 9.

The integrated wet clutch and torsional damper assembly in accordance with the present invention is illustrated in figure 1. Said integrated wet clutch and torsional damper assembly includes; a pressure plate (1), a torsional damper (9), clutch release bearing (10), clutch release sleeve (6), a guide tube (7), and a clutch disc pack including friction discs (3) and separator plates (2).

The pressure plate (1) is adapted to be fastened to a flywheel (5), which generates an axial thrust on the clutch disc pack, placed between the pressure plate (1) and the flywheel (5). The clutch disc pack, as can be seen in figure 5, comprises of plurality of friction discs (3) and separator plates (2), which are assembled intermittently to each other. The friction discs (3) are rotatably mounted to the torsional damper (9) and are provided with friction linings (3a) which help in transferring the torque from the flywheel (5) to the torsional damper (9).

The flywheel (5) is provided with plurality of guiding elements (5a) customized to facilitate the oil circulation. And the separator plate (2), as best seen in figure 4, is provided with engaging members (2a) tailored to be engaged with the guiding elements (5a) provided in the flywheel (5).

A baffle (4) is provided around the periphery of the flywheel (5) to collect the oil coming out of the flywheel (5). Said baffle (4) is housed in a recess provided in the

flywheel housing (11). The transmission drive shaft (8) is rotatably connected to the torsional damper (9) and transmits the torque from engine to the transmission.

A guide tube (7) is mounted inside the clutch housing (12) while enveloping the transmission drive shaft (8) radially. The clutch release sleeve (6) is slidingly connected to the guide tube (7). The clutch release sleeve (6) is provided with one or more ports (6a) to supply oil into the gap between the drive shaft (8) and the guide tube (7). Alternatively, an internal oil passage can be created inside the clutch housing, from which oil can be supplied into the gap between the guide tube (7) and drive shaft (8).

A clutch release bearing (10), mounted on said clutch release sleeve (6), actuates the pressure plate (1) through a biasing means provided therein. The biasing means in accordance with the present invention can be a diaphragm spring or helical coil springs.

The torsional damper (9) is provided with plurality of paddles (9a) which help receiving oil from the guide tube (7) and direct it towards the friction discs (3) as illustrated in figure 6. Alternatively, a means can be provided to circulate oil to the friction discs, such as an independent plate fitted with plurality of paddles or vanes. This independent plate may be mounted, either on the drive shaft (8) or inside the pressure plate (1) and will help receiving oil from the guide tube (7) and direct it towards the friction discs (3).

The clutch pressure plate (1) exerts axial thrust on the friction linings (3a) attached to the friction discs (3), for transferring the torque. The torque is transferred from the flywheel (5), clutch pressure plate (1) and separator plate (2) to the friction discs (3) and thereby to the drive shaft (8) through the torsional damper (9).

An oil management system in accordance with the present invention is described herein with reference to figure 2 in which a preferred oil flow path is illustrated. Oil is introduced at a port (6a) which is provided on the clutch release sleeve (6). This port (6a) interposes the oil into the gap between the guide tube (7) and drive shaft (8) which in turn provides oil flow path to the torsional damper (9) and clutch disc pack, comprising friction discs (3) and separator plate (2), as seen in figure 5. The paddles (9a) provided on the torsional damper (9) receive the oil from the guide tube (7) and circulate it to friction linings (3a) attached to the friction discs (3). The oil goes through the friction linings (3a) and is guided out of the flywheel through the guiding elements (5a). This oil is then collected by the baffle (4) provided around the periphery of the flywheel (5). The baffle (4) facilitates recirculation of the oil back to the transmission via a guiding element (11a) provided in the flywheel housing (11) as shown in figure 3.

Alternatively oil can be introduced into the gap between the guide tube (7) and drive shaft (8) through an internal oil passage created inside the clutch housing (12), which may provide an oil flow path to the clutch assembly including the torsional damper and clutch pack. The paddles (9a) provided on the torsional damper (9) receive oil from the guide tube (7) and circulate it to the friction linings (3a). The oil goes through the friction linings (3a) attached to the friction discs and is guided out of the flywheel cavity by guiding elements (5a). This oil is then collected by the baffle (4) provided around the periphery of the flywheel (5). The baffle (4) facilitates recirculation of the oil back to the transmission via a guiding element (11a) provided in the flywheel housing (11) as illustrated in figure 3.

Oil collection and circulation in the flywheel (5) and flywheel housing (11) is separately illustrated in figure 3 while using the same reference numerals to represent the same elements as are discussed in figures 1 and 2. With reference to figure 3, the guiding elements (5a) and (11a) in the flywheel (5) and flywheel

housing (11) respectively are tailored cavities provided therein to assist in effective oil collection and re-circulation back to the transmission. Guiding elements (11a) provided in flywheel housing (11) receives the oil from the baffle (4) help re-circulation oil back to the transmission.

The oil flow through integrated wet clutch and damper assembly occurs when the clutch is in engaged position, whereas the oil flow shuts-off while the clutch is in disengaged position and hence reduces the clutch drag. Retainer plate of the torsional damper has a protrusion on the flywheel side which prevents the axial movement of the damper.

The present invention is not limited to the above-mentioned embodiments, and may be modified in a variety of ways as long as the modifications do not depart from the spirit and scope thereof.

We Claim:

1. An oil management system for an integrated unit consisting of a wet clutch assembly and a torsional damper, in a transmission of a vehicle comprising:

   an oil collection and circulation mechanism including, a clutch release means, a tube, and plurality of guiding elements provided inside flywheel and in flywheel housing;

   wherein, the clutch release means provides an inlet port to interpose oil, taken from the transmission of a vehicle, to the tube which provides oil path from clutch release means to the torsional damper;

   the torsional damper receives oil from the tube and circulates it to friction linings of the wet clutch;

   the guiding elements in the flywheel receive oil from friction linings of the wet clutch;

   and the guiding elements of the flywheel housing collects oil from the flywheel and circulate it back to the transmission.

2. The oil management system for an integrated unit consisting of a wet clutch assembly and a torsional damper, in a transmission of a vehicle as claimed in claim 1, wherein the wet clutch assembly is mounted on the flywheel.

3. The oil management system for an integrated unit consisting of a wet clutch assembly and a torsional damper, in a transmission of a vehicle in claim 1, wherein

the guiding elements provided in the flywheel and in the flywheel housing are tailored cavities.

4. Integrated wet clutch and torsional damper assembly for a transmission comprising; a clutch pressure plate, torsional damper, tube, clutch release sleeve and a clutch disc pack, which includes plurality of friction discs and separator plates; in which pressure plate is adapted to be fastened to flywheel, the clutch disc pack is placed between the pressure plate and the flywheel and the guide tube is mounted inside the clutch housing (12) enveloping the transmission drive shaft radially, and said clutch release sleeve (6) is slidingly connected to the guide tube (7), wherein, the friction discs are rotatably mounted to the torsional damper, and the clutch release sleeve is provided with one or more ports to supply oil into the gap between drive shaft and the guide tube.

5. Integrated wet clutch and torsional damper assembly for a transmission as claimed in claim 5 wherein said separator plate is further provided with engaging members to engage with guiding elements of the fly wheel.

6. Integrated wet clutch and torsional damper assembly for a transmission as claimed in claim 6 wherein said clutch release sleeve is further provided with a clutch release bearing to actuate the biasing means of pressure plate.

7. Integrated wet clutch and torsional damper assembly for a transmission as claimed in claim 7 wherein said biasing means of pressure plate is a diaphragm spring.

8. Integrated wet clutch and torsional damper assembly for a transmission and oil management system thereof substantially as herein described with reference to accompanying drawings.

9. Vehicle with Integrated wet clutch and torsional damper assembly for a transmission and oil management system thereof as claimed in claims 1 to 8.

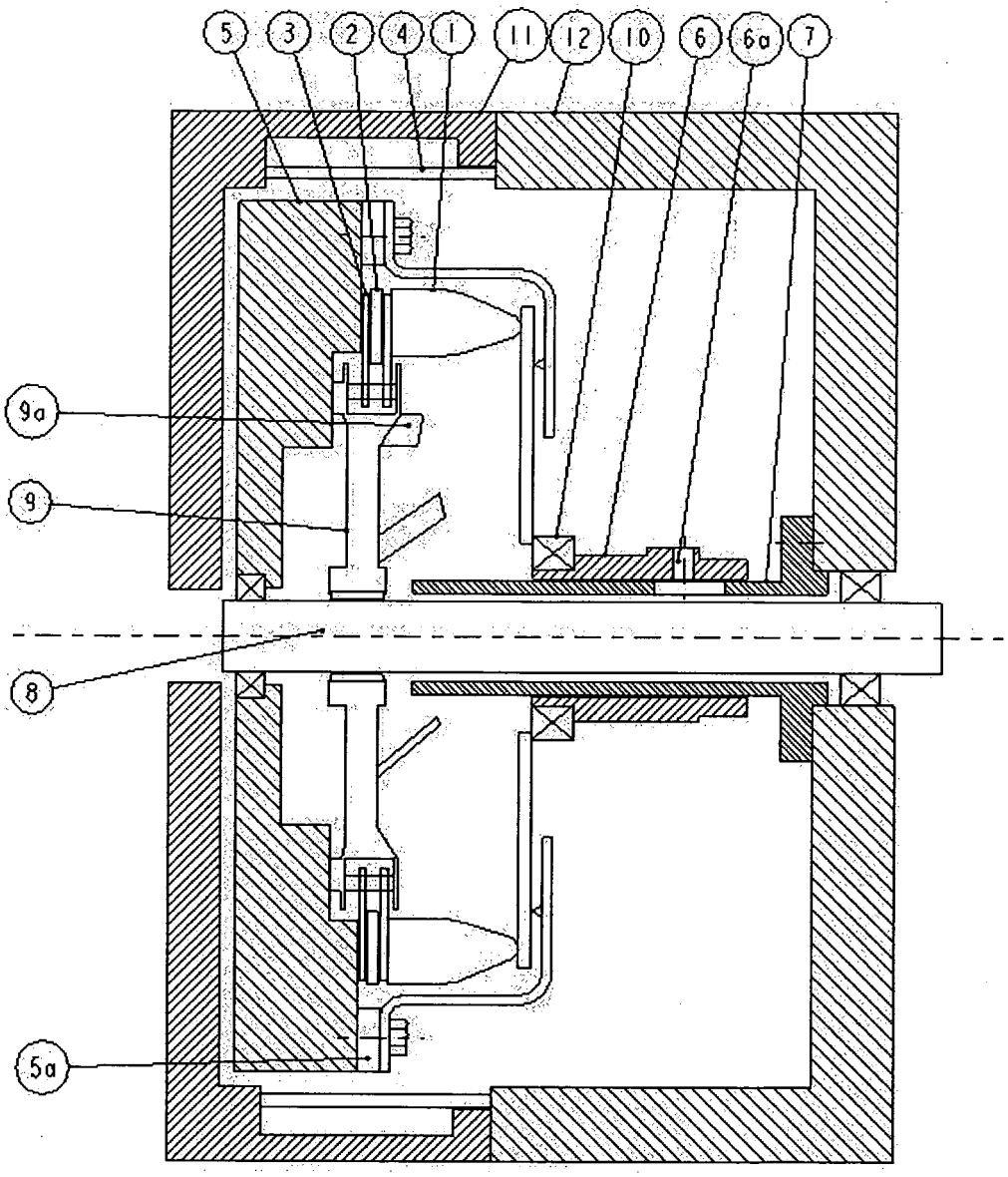

Fig. 1

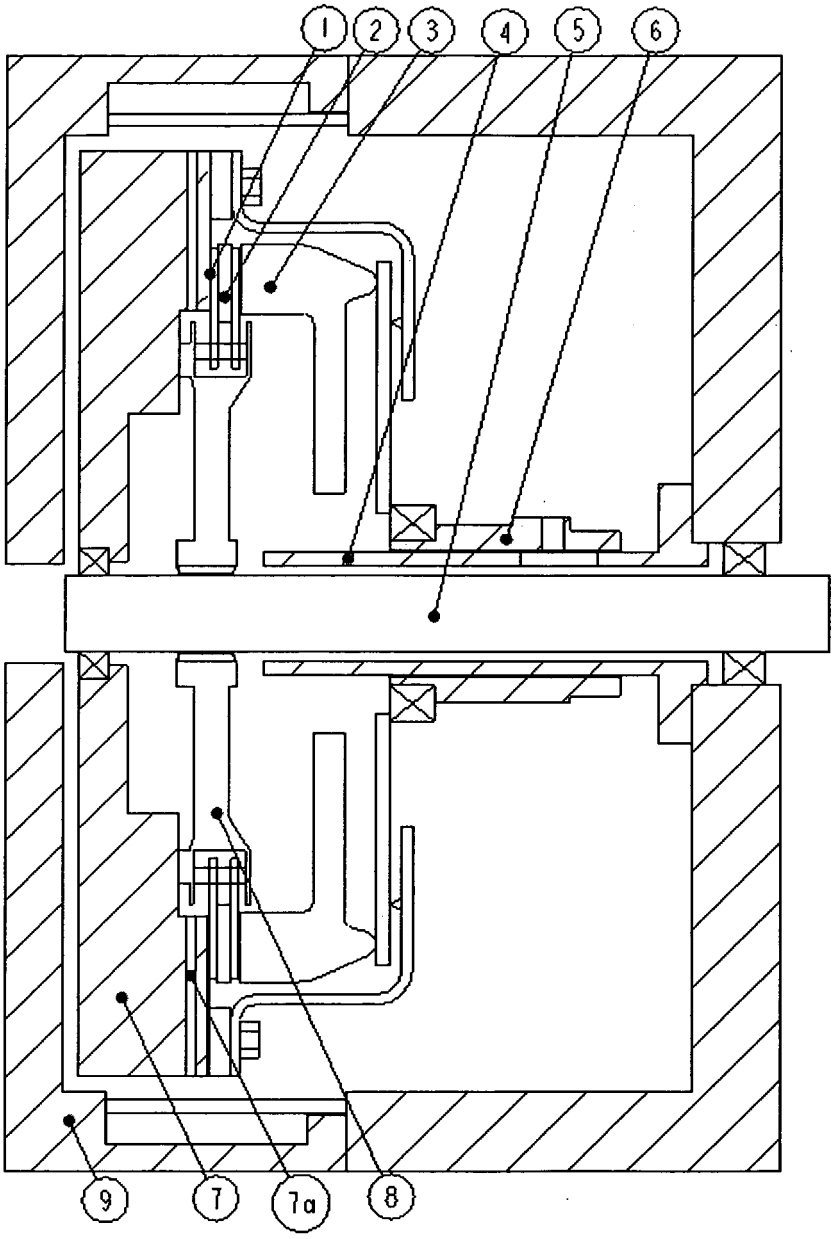

Fig. 2

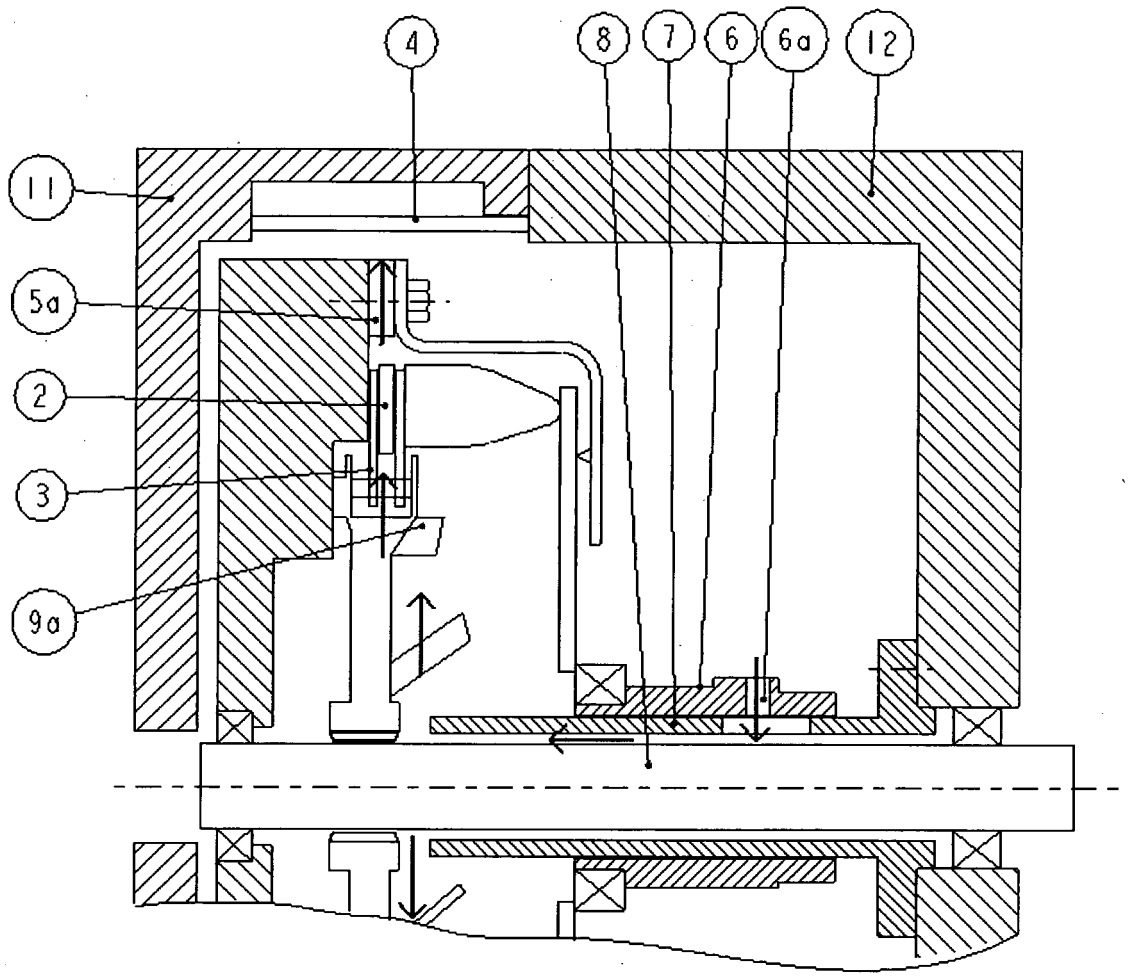

Fig. 3

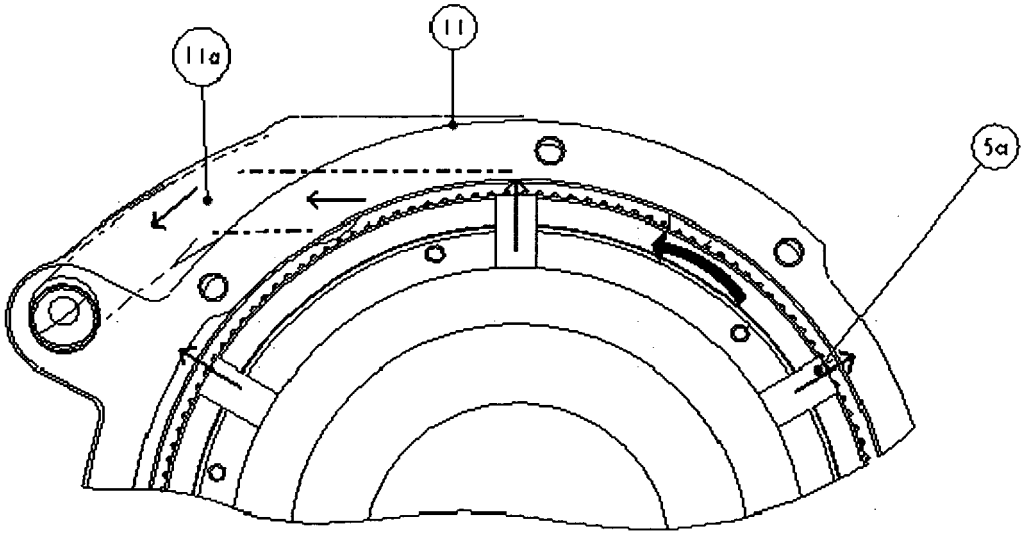

Fig. 4

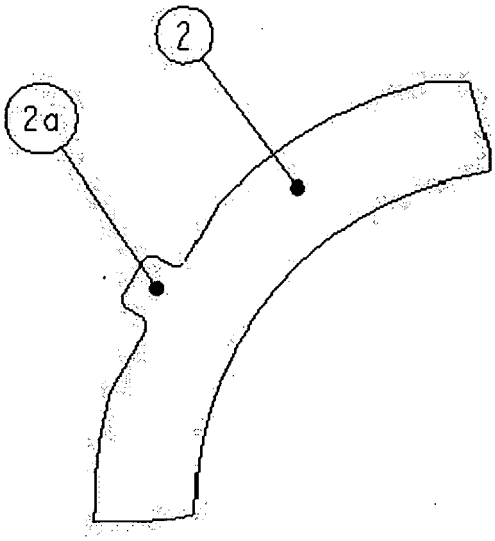

Fig. 5

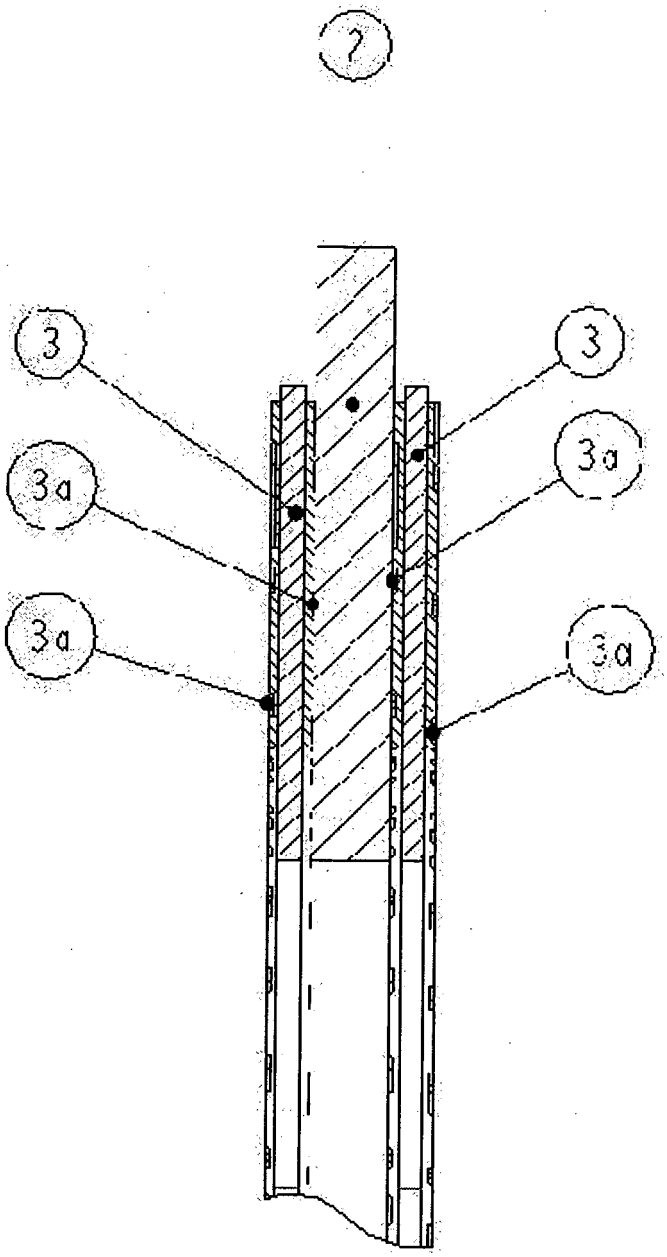

Fig. 6

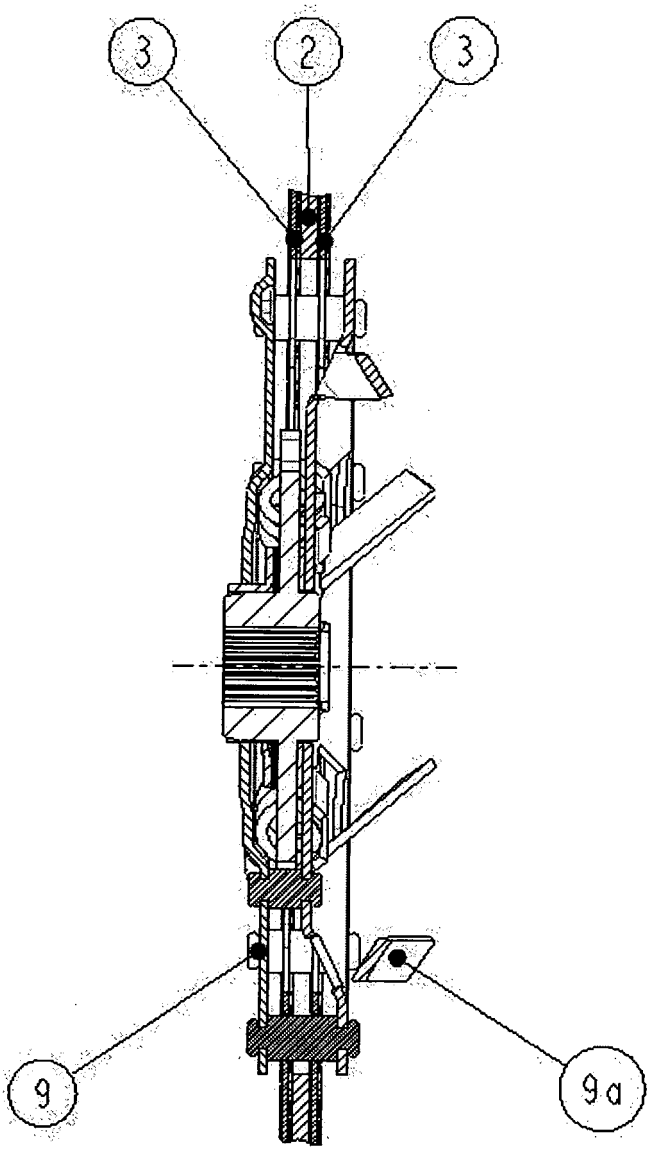

Fig. 7