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- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
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(54) Title: SPINDLE AND MAGNET SYSTEM FOR SPEEDOMETERS

(57) Abstract: The present invention relates to an improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles comprising cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and bush sintered (8) having reduced bore length to ease friction with the spindle (4).

SPINDLE AND MAGNET SYSTEM FOR SPEEDOMETERS**FIELD OF THE INVENTION**

5 The present invention relates to an improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles comprising cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and bush sintered (8) having reduced bore length to ease friction with the spindle (4).

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

10 Figure 1 shows Spindle (4) and Magnet (2) assembly in Speedo movement of existing component.

Figure 2 shows assembly sequence of Spindle (4) and Magnet (2) assembly of figure 1.

15 Figure 3 shows improved (proposed) Spindle (4) and Magnet (2) assembly in Speedo movement.

Figure 4 shows novel assembly sequence of Spindle (4) and Magnet (2) assembly of figure 3.

BACKGROUND OF THE INVENTION AND PRIOR ART

20 The rotary motion from the hub drive / front wheel is transmitted to Speedo movement through flexible cable. One end of the cable is connected to hub drive in front wheel & the other end of cable connected to Speedo movement through Bearing block (7).

25 The rotary motion from cable is transmitted to magnet (2) through spindle (4) in Speedo movement.

The 3 degrees of freedom (Translation along X, Y & Z axis) & 2 degrees of freedom (Rotation along X & Z axis) are arrested in spindle (4) assembly by below indicated components which is known in prior art.

30 The Spindle (4) assembly is shown in figure 1 contains the following components which rotates / transmits motion.

1. Spindle (4)
- 35 2. Holder (5)

3. Upper washer (3)
4. Lower washer (6)
5. Worm (9)
6. Magnet (2)
- 5 7. Compensator (1)

The stationary components are Bearing block (7) & Bush sintered (8).

10 Bush sintered (8) acts as bearing for Spindle (4) assembly that reduces friction with rotating components.

The assembly sequence as shown in figure 2 is as follows below.

1. Press fitting of Bush sintered (8) with Bearing block (7)
- 15 2. Crimping Bearing block (7) to arrest upward movement of Bush sintered (8).
3. Insertion of spindle (4) and upper washer (3) into Bush sintered (8) in which the Step in Spindle (4) arrests the down ward movement of Spindle (4) against the Bush sintered (8).
4. Insertion of Lower washer (6) & Holder (5) into Spindle (4)
- 20 5. Flaring of Spindle (4) at Holder (5) end to arrest the Spindle (4) movement in upward direction.
6. Insertion of Worm (9), Magnet (2) & Compensator (1) into spindle (4).
7. Flaring of Spindle (4) at magnet (2) end to arrest the magnet (2) and worm (9) movement in upward direction.

25

Limitations in Existing Method:

1. Less clearance between Holder (5) (Rotating component) and Bearing block (7) (Stationary component). Hence during Holder (5) & Spindle (4) rotation,
30 vacuum gets created at clearance area that sucks in the grease and dust (Foreign particle) into bearing area resulting in spindle (4) jam.
2. No provision for cable stopper (10) in Bearing block (7) to prevent the cable get loading on spindle (4) during rotation.
3. Increased Bore length in Bush sintered (8). Hence manufacturing difficulty in
35 maintaining the bore size.

4. The increased bearing length increases friction with spindle (4).
 5. No space in Speedo movement for grease / dust (Foreign particle) accumulation in Speedo movement.
- 5 The above disadvantages in-turn reduces the life and reliability of Speedo movement. Hence the novel method and device is explained in the present invention which helps in over coming the potential limitations of the existing system and method of assembly.

OBJECTS OF THE INVENTION

- 10 The primary object of the present invention is to overcome the aforementioned limitations by providing novel assembly method and device.

Yet another object of the present invention is to provide an improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles which in-turn increases the
15 life and reliability of Speedo movement.

Still another object of the present invention is to provide Cable stopper (10) in bearing block (7) to prevent the cable get loading on spindle (4) during rotation and also to prevent dust or grease (Foreign particle) entry.

20 Still another object of the present invention is to provide increased clearance area between spindle (4) and the bearing block (7) by eliminating holder (5) from the assembly to prevent creation of vacuum at the clearance area.

STATEMENT OF INVENTION

Accordingly, the present invention provides for an improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said assembly comprises cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and bush sintered (8) having reduced bore length to ease friction with the
30 spindle (4) and also,

a method of assembling spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said method comprising steps of inserting lower washer (6) into spindle (4) and thereafter said spindle (4) into bearing block (7); press fitting bush sintered (8) with the bearing block (7) by guiding the bush sintered (8) bore with the spindle (4);
35 crimping the bearing block (7) to arrest upward movement of bush sintered (8); and

inserting worm (9), magnet (2) and compensator (1) into the spindle (4) and thereafter flaring the spindle (4) at the magnet (2) end to arrest upward movement of the magnet (2) and worm (9) and downward movement of the spindle (4) to obtain the assembly.

5 DETAILED DESCRIPTION OF THE INVENTION

The primary embodiment of the present invention is an improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said assembly comprises cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and bush sintered (8) having reduced bore length to ease
10 friction with the spindle (4).

In yet another embodiment of the present invention, the reduction in bore length is ranging from 30% to 60%.

15 In still another embodiment of the present invention, the assembly comprises compensator (1), magnet (2) and worm (9) resided inside the spindle (4); and lower washer (6) placed between the bush sintered (8) and the spindle (4) and upper washer (3) located above the bush sintered (8).

20 In still another embodiment of the present invention, the bush sintered (8) acts as bearing for the spindle (4) assembly to reduce friction between stationary and rotating components.

In still another embodiment of the present invention, the assembly provides increased
25 clearance area between spindle (4) and the bearing block (7) which prevents creation of vacuum at the clearance area and thereby prevents sucking of foreign particles comprising grease and dust particles into the bearing area.

In still another embodiment of the present invention is a method of assembling spindle
30 (4) and magnet (2) assembly of Speedo movement for automobiles, said method comprising steps of inserting lower washer (6) into spindle (4) and thereafter said spindle (4) into bearing block (7); press fitting bush sintered (8) with the bearing block (7) by guiding the bush sintered (8) bore with the spindle (4); crimping the bearing block (7) to arrest upward movement of bush sintered (8); and inserting worm (9),
35 magnet (2) and compensator (1) into the spindle (4) and thereafter flaring the spindle

(4) at the magnet (2) end to arrest upward movement of the magnet (2) and worm (9) and downward movement of the spindle (4) to obtain the assembly.

In still another embodiment of the present invention, the method provides increased clearance area between spindle (4) and the bearing block (7) by eliminating holder (5) from the assembly.

The Spindle (4) assembly contains as shown in figure 3 the following components which rotates / transmits motion.

10

1. Spindle (4)
2. Upper washer (3)
3. Lower washer (6)
4. Worm (9)
5. Magnet (2)
6. Compensator (1)

15

The stationary components are Bearing block (7) & Bush sintered (8).

20

Bush sintered (8) acts as bearing for Spindle (4) assembly, which reduces friction between stationary and rotating components.

The assembly sequence as shown in figure 4 is as follows below.

1. Insertion of Lower washer (6) into Spindle (4).
2. Insertion of Spindle (4) and Lower washer (6) into Bearing block (7)
3. Bush sintered (8) press fitted with Bearing block (7) by guiding Bush sintered (8)
5 bore with Spindle (4).
4. Crimping Bearing block (7) to arrest upward movement of Bush sintered (8). Hence
the Step in Spindle (4) arrests the upward movement of Spindle (4) against the Bush
sintered (8).
5. Insertion of Worm (9), Magnet (2) & Compensator (1) into Spindle (4).

10

Flaring of Spindle (4) at magnet (2) end to arrest the magnet (2) / worm (9) upward
movement and Spindle (4) down ward movement.

Advantages in proposed / new method:

- 15 1. Holder (5) eliminated. This results in increased clearance between Spindle (4)
(Rotating component) and Bearing block (7) (Stationary component). Hence during
Spindle (4) rotation, no vacuum gets created at clearance area. This in-turn prevents
sucking of grease and dust particle (Foreign particle) into bearing area.
2. Cable stopper (10) provided in Bearing block (7) to prevent the cable get loading on
20 spindle (4) during rotation. This also prevents dust or grease (Foreign particle) entry
to some extend.
3. Reduced Bore length in Bush sintered (8). Hence Design for manufacturing is
ensured.
4. The reduced bearing length reduces friction with spindle (4).
- 25 5. Space available in Speedo movement at bearing block (7) area for grease / dust
(Foreign particle) accumulation if entered into Speedo movement.
6. Elimination of Holder (5). Hence parts count reduction in Speedo movement and
elimination of one assembly station.

30 The above advantages in-turn increases the life and reliability of Speedo movement.
Hence the cost of Speedo movement is reduced.

We claim:

1. An improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said assembly comprises,
 - 5 a. cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and
 - b. bush sintered (8) having reduced bore length to ease friction with the spindle (4).
- 10 2. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the reduction in bore length is ranging from 30% to 60%.
3. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the assembly comprises;
 - 15 a. compensator (1), magnet (2) and worm (9) resided inside the spindle (4); and
 - b. lower washer (6) placed between the bush sintered (8) and the spindle (4) and upper washer (3) located above the bush sintered (8).
- 20 4. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the bush sintered (8) acts as bearing for the spindle (4) assembly to reduce friction between stationary and rotating components.
5. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the assembly provides increased clearance area between spindle (4) and the bearing block (7) which prevents creation of vacuum at the clearance area and thereby prevents sucking of foreign particles comprising grease and dust particles into the bearing area.
- 25 6. A method of assembling spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said method comprising steps of
 - 30 a. inserting lower washer (6) into spindle (4) and thereafter said spindle (4) into bearing block (7);
 - b. press fitting bush sintered (8) with the bearing block (7) by guiding the bush sintered (8) bore with the spindle (4);
- 35

- c. crimping the bearing block (7) to arrest upward movement of bush sintered (8); and
 - d. inserting worm (9), magnet (2) and compensator (1) into the spindle (4) and thereafter flaring the spindle (4) at the magnet (2) end to arrest upward
5 movement of the magnet (2) and worm (9) and downward movement of the spindle (4) to obtain the assembly.
7. The method as claimed in claim 6, wherein the method provides increased
clearance area between spindle (4) and the bearing block (7) by eliminating holder
10 (5) from the assembly.

AMENDED CLAIMS

**Received by the International Bureau on 12 February 2008 (12.02.08)
original claim 2 amended remaining claims unchanged.**

1. An improved spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said assembly comprises,
 - 5 a. cable stopper (10) provided in bearing block (7) to prevent cable get loaded onto spindle (4) during rotation; and
 - b. bush sintered (8) having reduced bore length to ease friction with the spindle (4).
- 10 2. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the reduction in bore length is ranging from 30% to 60% as compared to bore length of bush of known assembly.
- 15 3. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the assembly comprises;
 - a. compensator (1), magnet (2) and worm (9) resided inside the spindle (4); and
 - b. lower washer (6) placed between the bush sintered (8) and the spindle (4) and upper washer (3) located above the bush sintered (8).
- 20 4. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the bush sintered (8) acts as bearing for the spindle (4) assembly to reduce friction between stationary and rotating components.
- 25 5. The spindle (4) and magnet (2) assembly as claimed in claim 1, wherein the assembly provides increased clearance area between spindle (4) and the bearing block (7) which prevents creation of vacuum at the clearance area and thereby prevents sucking of foreign particles comprising grease and dust particles into the bearing area.
- 30 6. A method of assembling spindle (4) and magnet (2) assembly of Speedo movement for automobiles, said method comprising steps of
 - a. inserting lower washer (6) into spindle (4) and thereafter said spindle (4) into bearing block (7);

- b. press fitting bush sintered (8) with the bearing block (7) by guiding the bush sintered (8) bore with the spindle (4);
 - c. crimping the bearing block (7) to arrest upward movement of bush sintered (8); and
 - 5 d. inserting worm (9), magnet (2) and compensator (1) into the spindle (4) and thereafter flaring the spindle (4) at the magnet (2) end to arrest upward movement of the magnet (2) and worm (9) and downward movement of the spindle (4) to obtain the assembly.
- 10 7. The method as claimed in claim 6, wherein the method provides increased clearance area between spindle (4) and the bearing block (7) by eliminating holder (5) from the assembly.

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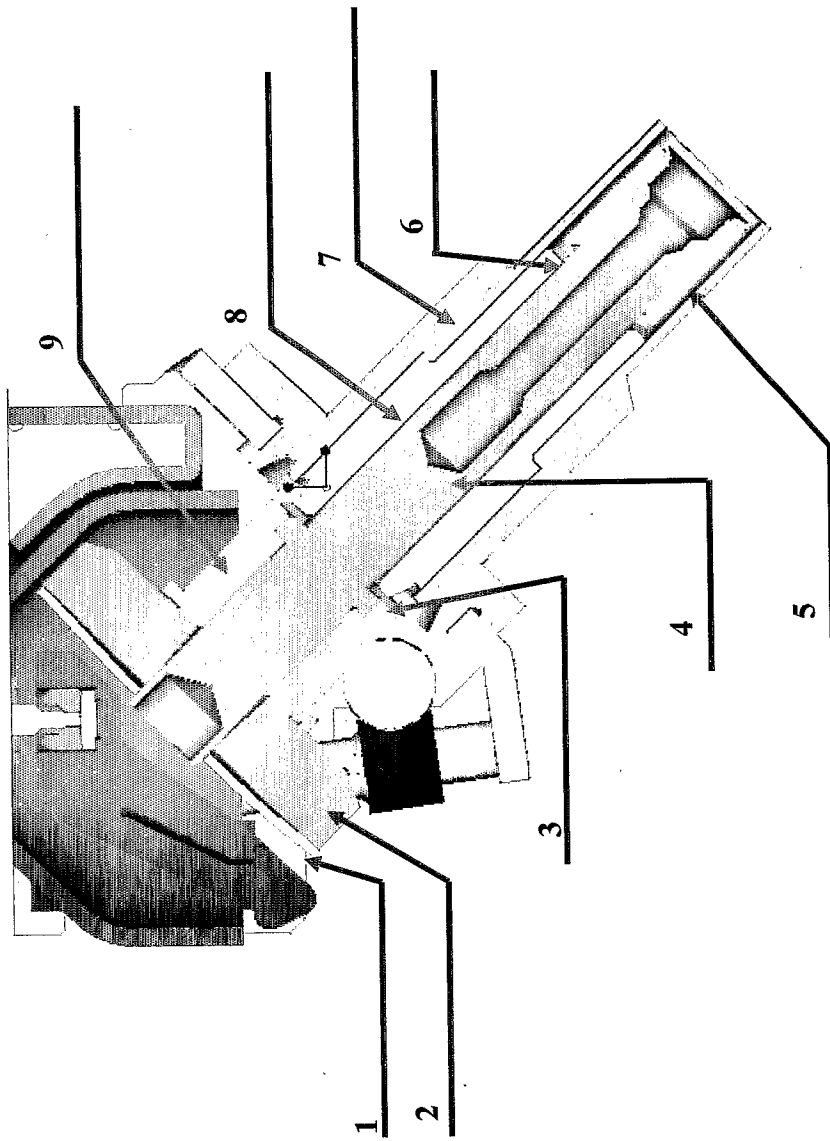


Figure 1

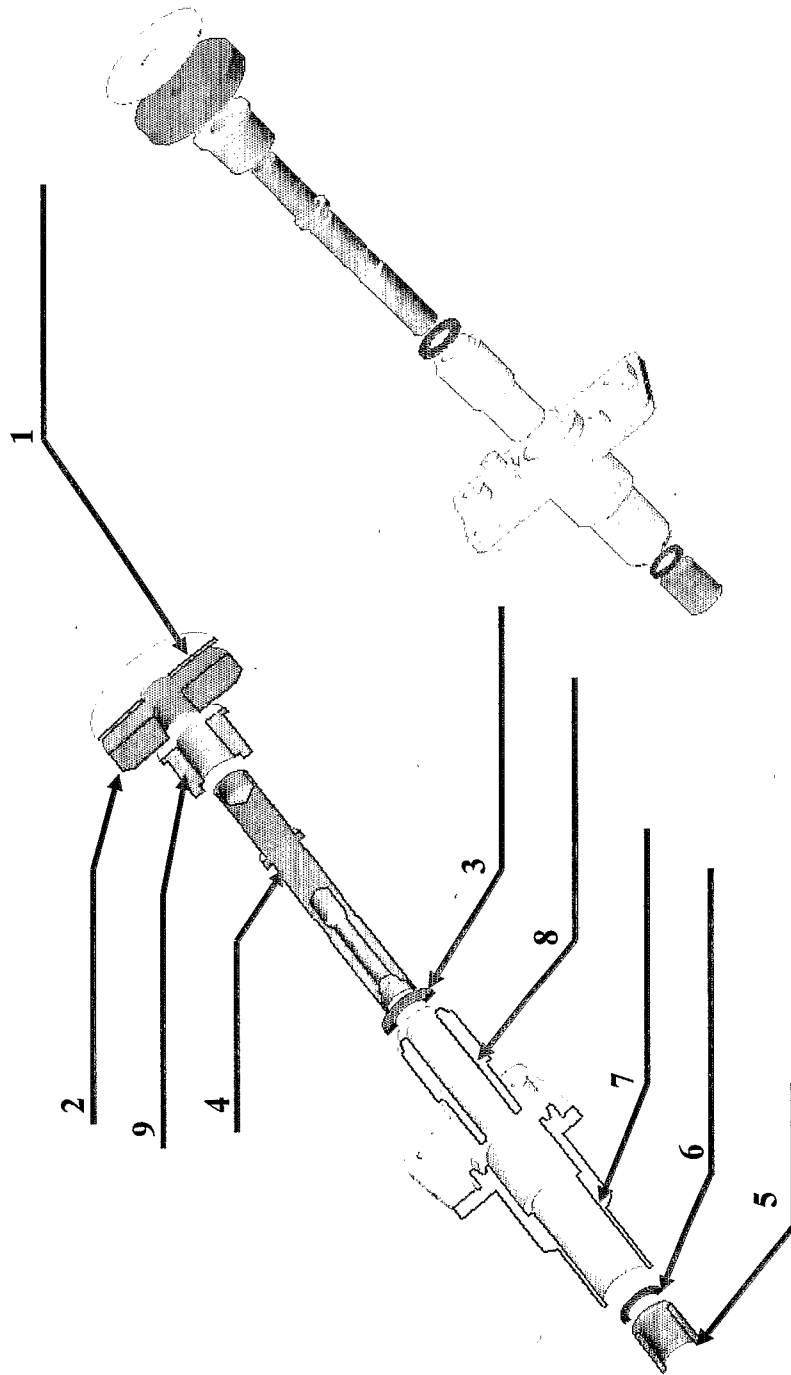


Figure 2

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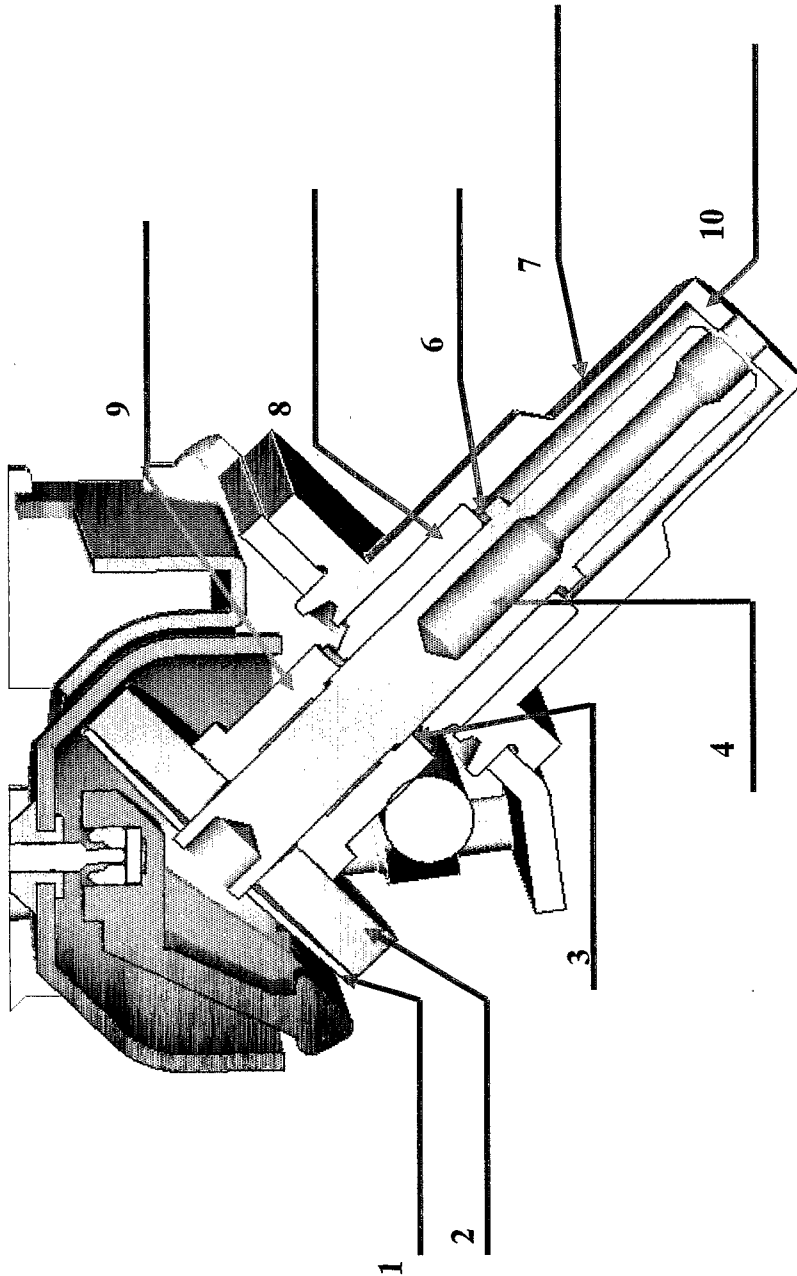


Figure 3

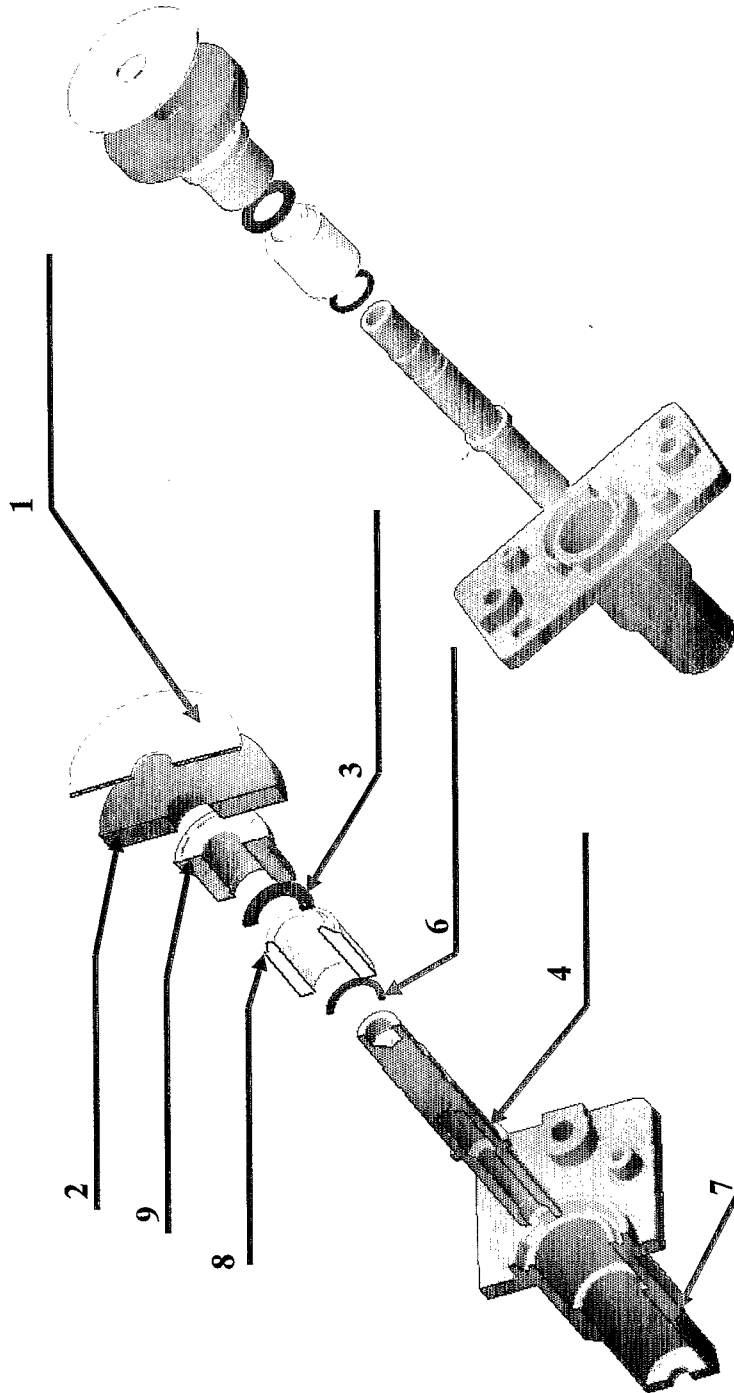


Figure 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN 2007/000362

A. CLASSIFICATION OF SUBJECT MATTER

IPC⁸: **G01P 1/04** (2006.01); **B60K 35/00** (2006.01)

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)

IPC⁸: G01P, B60K

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

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

EPOQUE Fulltext, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,575,356 A (MUROHUSHI et al.); 11 March 1986 (11.03.1986) <i>column 2, line 44 - column 3, line 16; fig. 3 - 5</i>	1, 3 - 7
	--	
A	GB 2 123 558 A (EATON SA); 1 February 1984 (01.02.1984) <i>page 1, lines 84 - 119; fig. 1, 2</i>	1, 3 - 7
	--	
A	JP 08-233112 A (YAZAKI CORP); 1 September 1996 (01.09.1996) (abstract) World Patents Index [online]. Thomson Publications [retrieved on 17/12/2007]. Retrieved from: EPOQUE Database. DW199646, Accession No. 1996-462527 <i>abstract</i>	1, 3 - 7

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

* Special categories of cited documents:

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
18 December 2007 (18.12.2007)Date of mailing of the international search report
28 January 2008 (28.01.2008)Name and mailing address of the ISA/ AT
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/IN2007/000362

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US A 4575356		US A 4575356	1986-03-11
		EP A1 0064767	1982-11-17
		DE D1 3273118D	1986-10-16
		AU A 8363782	1982-11-18
		AU B2 548055B	1985-11-21
		JP A 57186612	1982-11-17
GB A 2123558		CA A1 1195859	1985-10-29
		GB A 2123558	1984-02-01
JP A 8233112		JP A 8233112	1996-09-10