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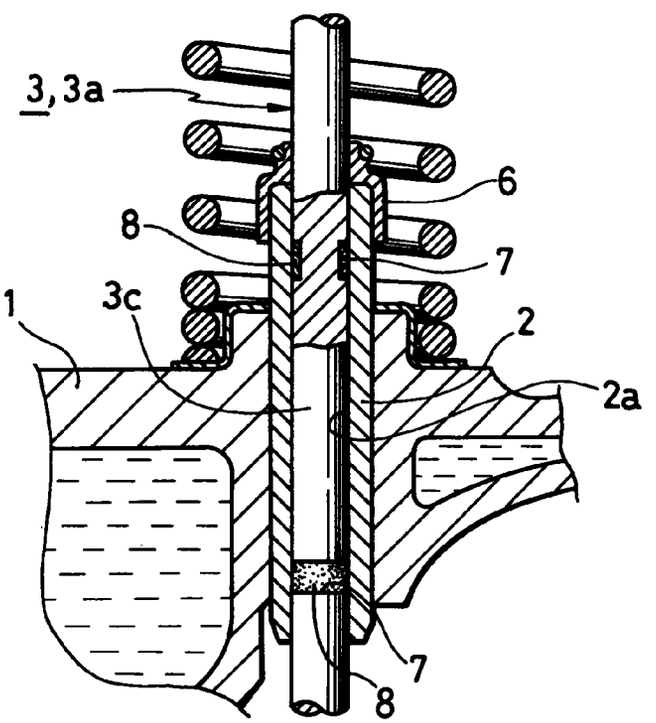
(54) Poppet valve device

(57) A poppet valve is used in an internal combustion engine, and comprises a valve stem and valve head. The valve stem is surrounded by a valve guide and slidably engaged therein. On one of the outer circumferential surface of the valve stem and the inner circumferential surface of the valve guide, there is formed an annular or spiral groove, in which porous material is engaged, the material having oil keeping capability, thereby supplying oil uniformly onto the contacting surface between the valve stem and the valve guide. Thus, local wear is prevented.

FIG.1



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Description

BACKGROUND OF THE INVENTION

The present invention relates to a poppet valve device, and especially to a poppet valve device to increase oil keeping capability of the contacting surface between the valve and a valve guide, thereby decreasing wear of the surface.

Fig. 5 illustrates a conventional poppet valve device, in which a valve stem 23a of a poppet valve 23 is fitted to be axially slidable in a cylindrical valve guide 22 which is in a press fit with a cylinder head 21 of an internal combustion engine.

A valve head 23b of the poppet valve 23 is engaged on a valve seat 24 which is in a press fit with the lower end of the cylinder head 21. The poppet valve 23 is reciprocated in an axial direction by a rocker arm 25 which is engaged on the upper end of the valve stem 23a, thereby supplying and exhausting a gas. 26 denotes a lip seal which is attached on the upper end of the valve guide 22, so that excessive oil is not flowed into the contacting surface between the valve stem 23a and the valve guide 22.

In the conventional valve device, sufficient oil is supplied into the contacting surface through a gap between the valve stem 23a and the lip seal 26 which is attached to the upper end of the valve guide 22 so as to prevent wear of the contacting surface, thereby assuring smooth reciprocating motion of the poppet valve 23.

However, in the conventional valve device, supply of oil is changeable, so that oil is not uniformly spread over the valve stem 23a in a circumferential direction, or supplied oil is likely to flow out through the lower end of the valve guide 22. Thus, local wear occurs on the inner circumferential surface 22a of the valve guide 22 or the outer circumferential surface 23c of the valve stem 23a where oil is not sufficiently supplied. local wear causes noise during reciprocating motion of the valve 23 or concentrates oil to the portion of wear to solidify oil adhered to the valve head 23b, thereby giving the engine bad effect.

To solve the disadvantages, there is provided a groove on the outer circumferential surface 23c of the valve stem 23a or the inner circumferential surface 22a of the valve guide 22 to increase oil keeping capability, but such a groove decreases the strength and rigidity of the valve stem 23a.

SUMMARY OF THE INVENTION

To overcome the disadvantages, it is an object of the present invention to provide a valve device in which oil is uniformly supplied over the whole contacting surface between a valve stem and a valve guide in proper quantities, thereby preventing local wear of the surface.

According to the present invention, there is provided a poppet valve device comprising a valve which comprises a valve stem and a valve head; and a valve guide which is in a press fit with a cylinder head, the valve stem being slidably engaged in the valve guide, the valve being axially reciprocated by feeding and exhausting a gas in an internal combustion engine, on one of the outer circumferential surface of the valve stem and the inner circumferential surface of the valve guide, an annular or spiral groove being formed, porous material which has oil keeping capability being engaged in the groove.

The porous material is provided in the annular or spiral groove on the valve stem or the valve guide, thereby maintaining oil which is flowed in through a gap between the valve stem and the valve guide. Owing to reciprocating motion of the poppet valve, maintained oil is uniformly supplied to the contacting surface between the valve guide and the valve stem in proper quantities. Thus, no local wear occurs on the outer circumferential surface of the valve stem or the inner circumferential surface of the valve guide, and no noise occurs during reciprocating motion of the valve. Also, it is prevented for oil to go down since oil is maintained. The porous material in the annular or spiral groove does not decrease strength and rigidity of the valve stem or valve guide.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will become more apparent based on the following description with respect to accompanying drawings wherein:

Fig. 1 is a longitudinal sectional front view of the first embodiment of a valve device according to the present invention;
Fig. 2 is a perspective view of one embodiment of porous material;
Fig. 3 is a perspective view of another embodiment of the porous material;
Fig. 4 is a longitudinal sectional front view of the second embodiment of the present invention; and
Fig. 5 is a longitudinal sectional front view of a conventional valve device.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

As illustrated in Fig. 1, there are formed two annular grooves 7 at the ends of the outer circumferential surface of a valve stem 3a of a valve 3, the outer circumferential surface of the valve stem 3a being slidably engaged in a valve guide 2. On the annular grooves 7, ring-shaped porous materials 8 partially cut out are tightly engaged, as shown in Fig. 2, the materials having oil keeping capability and elasticity.

To attach the porous materials 8, the porous materials 8 elastically expanded may be engaged around the annular grooves 7 before the valve 3 is inserted in the valve guide 2. After engagement, the outer diameter of

the porous material 8 may be roughly equal to the outer diameter of the valve stem 3a.

As the porous material 8, for example, powder metallurgical material, metal fiber felt, foamed metal and hard foam resin are suitable.

To provide the porous material 8 around the annular groove 7, integral molding may be made, and the surface of the porous material 8 may be made to be equal to the outer diameter of the valve stem 3a by mechanical processing after molding. The porous material used in molding may include foam resin and porous ceramics.

By the construction as above, the porous material 8 always maintains oil which comes through a gap between the lip seal and the valve stem 3a, and owing to reciprocating motion of the valve 3, maintained oil may be uniformly supplied onto the whole contacting surface between the valve stem 3a and the valve guide 2 in proper quantities.

It is not likely to cause local wear of the outer circumferential surface 3c of the valve stem 3a or the inner circumferential surface 2a of the valve guide 2, and it is possible to reduce the amount of oil which is flowed out through the lower end of the valve guide 2. Also, the porous materials 8 engaged on the annular grooves 7 does not decrease the strength and rigidity of the valve stem 3a.

Fig. 3 illustrates an embodiment in which a hard porous plate 10 which has low specific gravity is fixed or engaged around the outer circumferential surface of an annular thin plate 9 made of spring steel etc. to form a porous material 11, thereby reducing weight of the porous material 11, so that increase in weight of the valve may be at minimum.

Without providing the hard porous thin plate 10 having low specific gravity as above, porous material may be coated or porous phosphate or sulfuric acid coating may be formed on the outer circumferential surface of the annular thin plate 9. A number of pores may be formed in the annular thin plate 9.

The second embodiment will be described with respect to Fig. 4. The same numerals are allotted to the same members as those in the first embodiment, and its detailed description will be omitted. In the second embodiment, in the middle of the outer circumferential surface of a valve stem 3a of a valve 3 which is slidably engaged in a valve guide 2, there is formed a spiral groove 12 on which spiral porous material 8 or 11 as mentioned above are tightly engaged. In the embodiment, similar advantages to the first embodiment is achieved.

In the first and second embodiments, there are formed the annular groove 7 or spiral groove 12 on which the porous material 8 or 11 are attached, but there may be formed a groove or grooves on the inner circumferential surface of the valve guide 2 on which porous material is attached.

The foregoings merely relate to embodiments of the present invention. Various modifications and changes may be made by person skilled in the art without scope of claims wherein:

Claims

1. A poppet valve device comprising:

   a valve which comprises a valve stem and a valve head; and
   a valve guide which is in a press fit with a cylinder head, the valve stem being slidably engaged in the valve guide, a gas being supplied and exhausted by reciprocating the valve axially in an internal combustion engine,
   on one of an outer circumferential surface of the valve stem and an inner circumferential surface of the valve guide, an annular or spiral groove being formed, porous material which has oil keeping capability being engaged in the groove.

2. A poppet valve device as defined in claim 1 wherein the porous material is made of powder metallurgical material, metal fiber felt, foamed metal or hard foam resin.

3. A poppet valve device as defined in claim 1 wherein the annular groove is formed on the outer circumferential surface of the valve stem.

4. A poppet valve device as defined in claim 3 wherein the two annular grooves are formed adjacent to ends of the valve stem respectively on the outer circumferential surface of the valve stem.

5. A poppet valve device as defined in claim 1 wherein the spiral groove is formed on the outer circumferential surface of the valve stem.

FIG.1

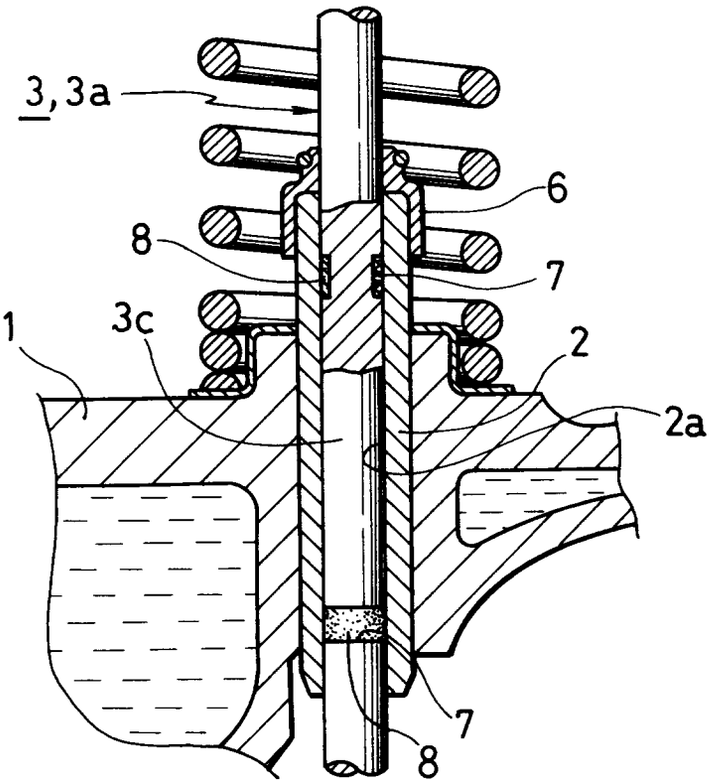


FIG.2

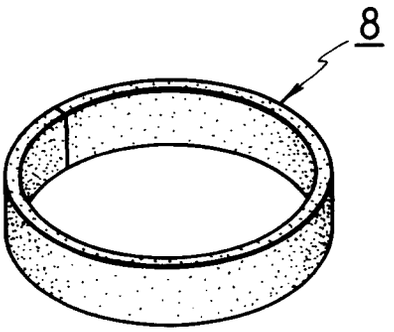


FIG.3

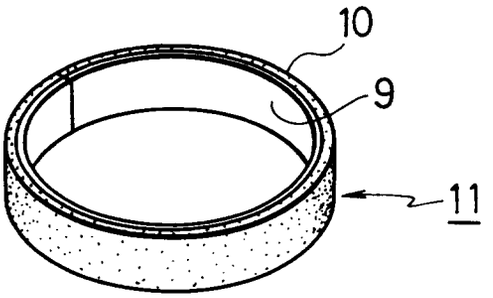


FIG.4

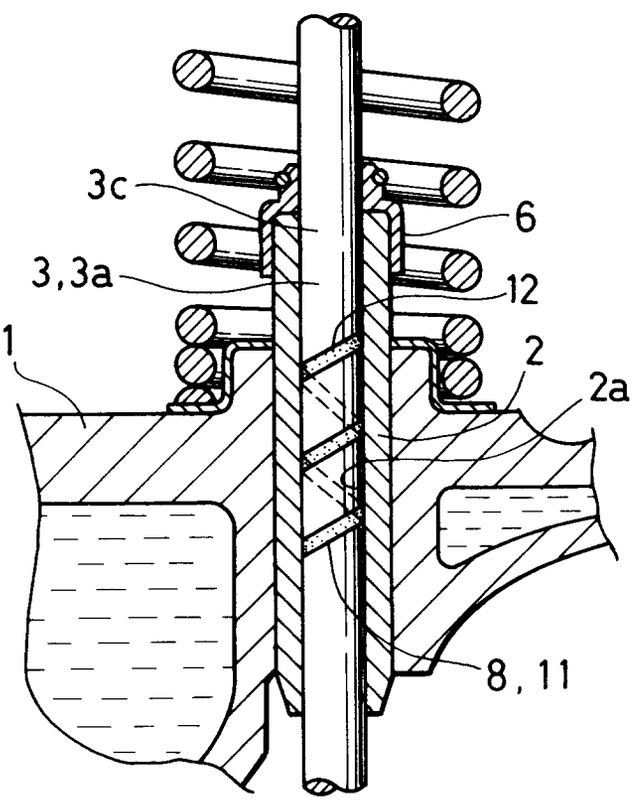
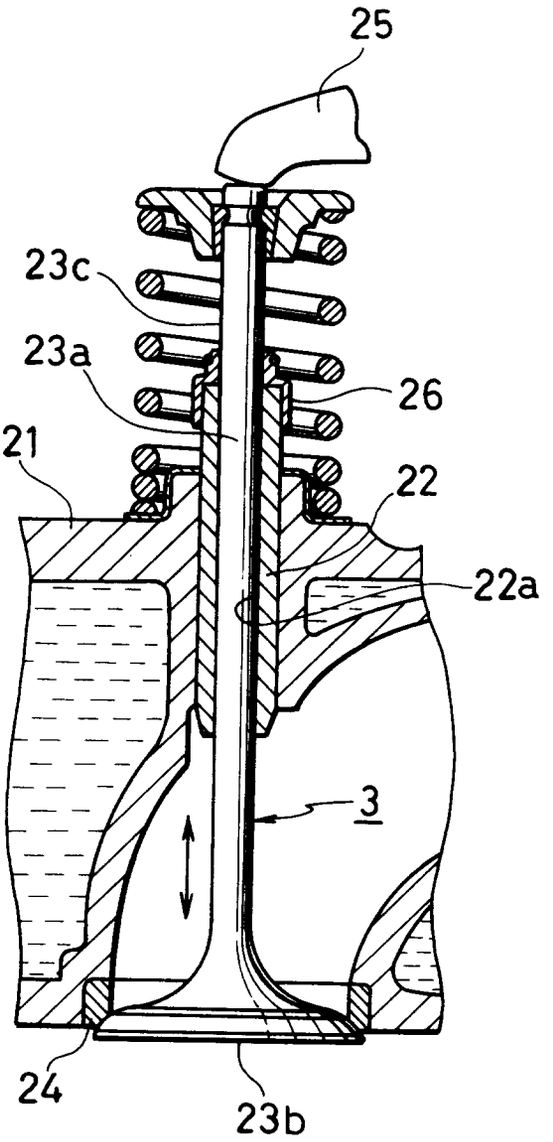


FIG.5



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EUROPEAN SEARCH REPORT

Application Number
EP 95 40 1006

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-5 062 397 (EATON CORPORATION) * the whole document *	1,3	F01L3/08 F01L3/20
A	GB-A-1 076 545 (BRICO ENGINEERING LIMITED) * page 1, line 63 - line 83 *	1	
A	GB-A-205 849 (LAWRIE) * figure 1 *	1,5	
A	EP-A-0 481 763 (HITACHI POWERED METALS CO LTD) * page 11, line 9-24 *	1	
A	US-A-2 775 024 (THOMPSON PRODUCTS INC)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F01L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 September 1995	Klinger, T

CATEGORY OF CITED DOCUMENTS

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