United States Patent

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[54] **METERED MECHANICAL TAPPET**
9 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **123/90.35,** 123/90.48, 184/6
[51] **Int. Cl.** **F01l 1/14,** F01m 9/10
[50] **Field of Search** ..... 123/90.35, 90.48, 90.55, 90.56, 90.59, 90.63; 184/6, 6 T

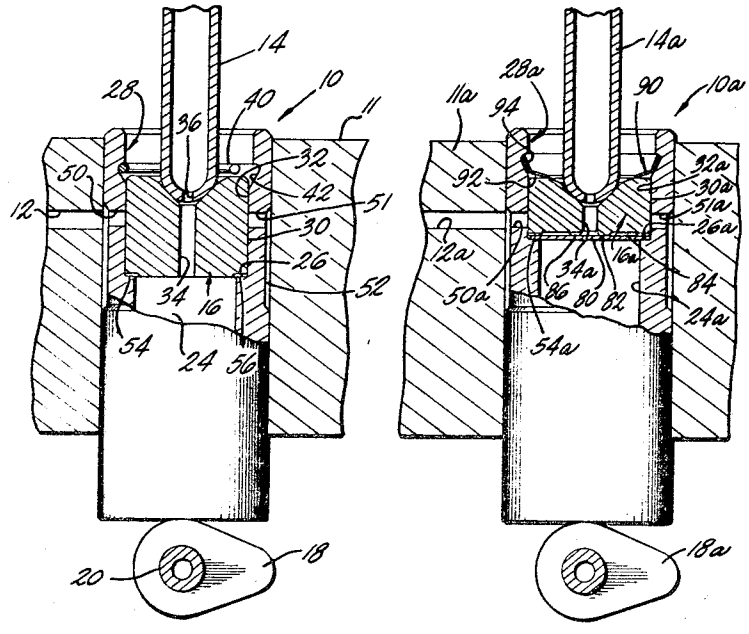
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ABSTRACT: A mechanical metering tappet which controls the oil pressure in the hollow push rod for supplying oil to overhead oiling systems of internal combustion engines by restricting the flow of the oil to the push rod. In one embodiment, this is accomplished by utilizing the diametral clearance of the push rod seat within its supporting cavity as the passageway for the oil from the crankcase to the reservoir. In another embodiment, the diametral clearance of the push rod seat is utilized to permit flow of oil but a metering disc used in conjunction with a specially configurated bottom surface of the seat provides the metering function. In both embodiments, the oil inlet hole in the tappet body is positioned above the tappet support shoulder for the push rod seat.



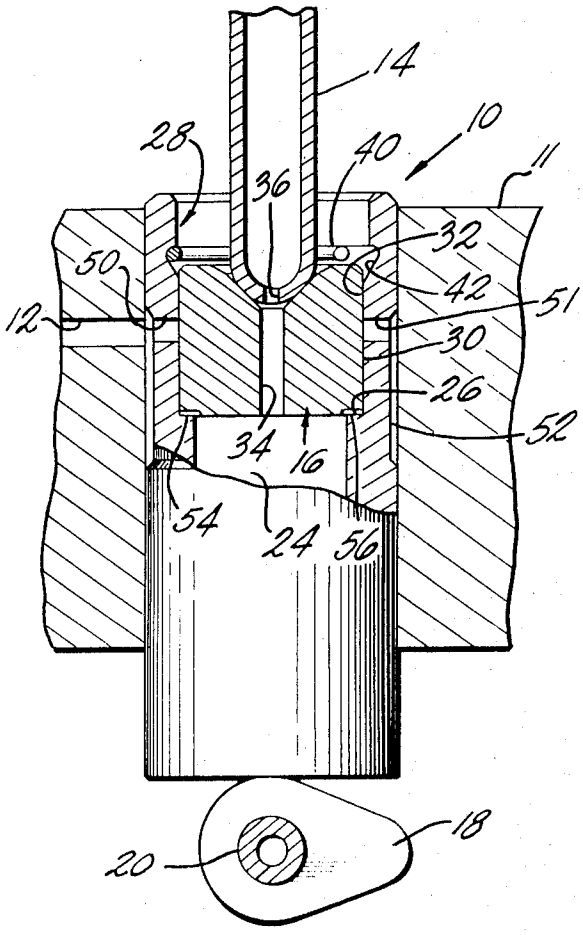


FIG. 1

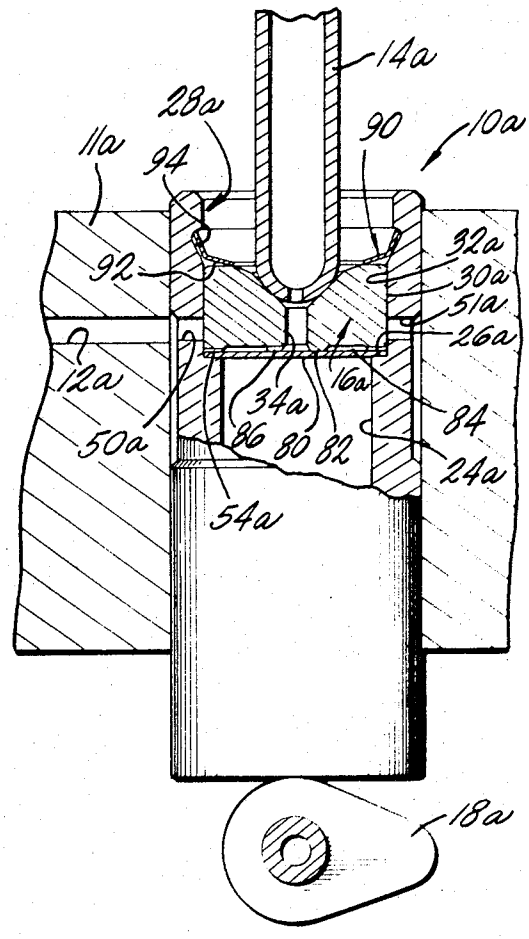


FIG. 3

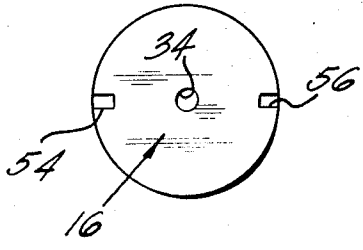


FIG. 2

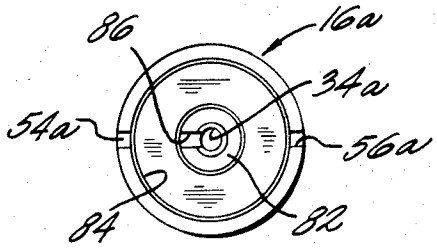


FIG. 4

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METERED MECHANICAL TAPPET

BACKGROUND OF THE INVENTION

Although mechanical tappets do not require hydraulic fluid for their operation in contrast with the hydraulic tappets, nevertheless in an overhead oiling system oil must be supplied to the rocker arms for lubrication thereof. A conventional way of accomplishing this is by supplying the oil through the push rod. Most prior constructions so utilizing the push rod have resulted in improper control of the flow of the oil through the push rod, and attempts to meter the flow have not overcome come the problem of blockage due to foreign particles while at the same time not wasting oil by utilizing too much metering.

Satisfactory metering devices have been developed for use in mechanical tappets. However, to my knowledge these all involve high-pressure oil flow into the oil reservoir below the push rod seat, thus tending to result in an excess of oil flow on the base circle of the cam member for the tappet.

SUMMARY OF THE INVENTION

The invention provides a metering mechanical tappet which is constructed so as to supply only low pressure oil flow into the oil reservoir below the push rod seat. Specifically, the invention provides in a mechanical tappet adapted for operative connection to a push rod for reciprocation within a crankcase, a tappet which comprises a body, an oil inlet hole in the body, an oil reservoir in the body, a push rod seat, means for supporting the seat within the body above the reservoir, and metering means for metering oil from the oil inlet hole through the seat and into the rod; the improvement comprising restricting means positioned between the inlet hole and the reservoir for restricting oil flow, the pressure drop across the restricting means exceeding that occuring anywhere else in the tappet.

This construction preferably includes locating the oil inlet hole above the support for the push rod seat and providing the proper diametral clearance between the push rod seat and that portion of the body in which the seat is located. This provides a metering and restricting means which provides oil under low pressure in the reservoir insuring controlled oil flow to the overhead oiling system.

Accordingly, it is an object of the invention to provide a metering mechanical tappet constructed in such a way as to control the flow of oil on the base circle.

It is a further object of the invention to provide a tappet of the above character which is capable of providing metered flow of oil without blockage due to impurities.

It is another object of the invention to provide a tappet of the above character which is inexpensive to manufacture and assemble.

Other objects and advantages will become apparent upon reference to the following drawings and detailed discussion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary elevational view partially in section of a tappet constructed in accordance with the invention;

FIG. **2** is a bottom view of the push rod seat utilized in the device shown in FIG. **1**;

FIG. **3** is a fragmentary partially sectioned elevational view illustrating an alternate embodiment of the invention; and

FIG. **4** is a bottom view of the push rod seat shown in FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

This invention relates to an improved mechanical tappet **10** utilized in a conventional engine block having a crankcase **11** and a passageway **12** connecting the tappet **10** to an oil gallery. The tappet conventionally seats a push rod **14** by means of a generally cylindrical push rod seat **16**, the entire combination being reciprocated in a conventional fashion by a cam **18** on a cam shaft **20**. The push rod seat **16** is positioned above an oil reservoir **24** by means of an annular shoulder **26** formed by an internal push rod seat cavity **28** which is larger in diameter than the diameter of the oil reservoir **24**. In the device shown in FIG. **1**, the push rod seat **16** rests upon the shoulder **26**. In one of my embodiments as illustrated by FIG. **1**, the metering of the oil into the push rod seat is accomplished by a predetermined diametral clearance formed by the diameter of the exterior wall **30** of the push rod seat and the diameter of the interior wall **32** forming the push rod seat cavity **28**. This clearance and this clearance alone controls the rate of oil flow into the push rod **14** from the push rod seat **16** inasmuch as the central opening **34** in the push rod seat and the bottom opening **36** in the push rod are formed with a considerably larger dimension than the diametral clearance. I have found that a clearance of 0.001/0.0035 inch between the walls for a push rod seat having a diameter of 0.500/0.700 inch has worked satisfactorily.

Also, the push rod seat **16** is conventionally prevented from axial expulsion out of the tappet body by means of a retainer **40**, the wall **32** of the cavity **28** having a groove **42** formed therein for holding the retainer snapped in place, thereby restraining the retainer from axially moving within the cavity **28**.

In accordance with the invention, to restrict the oil flow coming out of the passageway **12** into the oil reservoir **24** to that the pressure drop prior to the entrance into the oil reservoir exceeds that occurring anywhere else in the tappet, (thereby insuring a low pressure supply of oil to the reservoir **24**), the oil inlet hole **50** in the wall of the tappet **10** is located above the annular shoulder **26** so that oil must flow downwardly away from the push rod **14** through the diametral clearance described above in order to enter the oil reservoir **24**. It will be readily appreciated that the low pressure oil in the reservoir **24** thus reduces the possibility of spurts of excess oil.

To insure that the push rod seat in contacting shoulder **26** does not shut off the flow of oil into the reservoir **24** after reaching the bottom of the diametral clearance, so-called nonmetering passageways **54** and **56** are formed extending from the exterior wall **30** of the push rod seat **16** radially inward to a point in communication with the reservoir **24**. These passageways are called nonmetering because of their size in comparison to the diametral clearance. To insure that oil flow is not blocked due to the shifting of the push rod seat **16** to one side, these passageways **54** and **56**, in addition to oil hole inlets **50** and **51**, are positioned 180° apart on the circumference of the push rod seat and push rod seat cavity **28** (see FIGS. **1** and **2**).

Operation of the embodiment of FIGS. **1** and **2** should be quite evident. The oil from the gallery flowing under high pressure from passageway **12** enters oil inlet holes **50** and **51** from the recess **52**. It is forced between the diametral clearance between push rod seat wall **30** and wall **32** of the push rod seat cavity **28**. This diametral clearance provides a metering and restricting function. The oil flows downwardly to the shoulder **26** and then crosses through the nonmetering slots **54** and **56** at the lower surface of the push rod seat, filling the reservoir **24**. The oil under low pressure made possible by the metering and restricting function of the diametral clearance, flows into the center push rod seat hole **34**, through opening **36** of the push rod, and up the hollow push rod to the rocker arm (not shown).

FIGS. **3** and **4** illustrate another embodiment of the invention, wherein the metering is not accomplished by the diametral clearance of the exterior wall of the push rod seat within the cavity. Parts which are similar to those described in the previous embodiment bear the same reference numeral to which the distinguishing suffix *a* has been added. Thus, as shown in FIG. **3**, a tappet **10***a* is operated by a cam **18***a* within a crankcase **11***a*, the oil flowing from a passageway **12***a* to a central opening **34***a* in a push rod seat **16***a* and thence into the push rod **14***a*. Like the previous embodiment, the inlet hole **50***a* is located above the annular shoulder **26***a* formed by the cavity **28***a* whose diameter exceeds that of the bore **24***a*. However, as distinguished from the embodiment of FIG. **1**, the

diameter of the exterior wall **30***a* of the push rod seat **16***a* is chosen to provide a diametral clearance without any metering or restricting function or effect.

Instead, the oil flows down past a nondiametral clearance and crosses through nonmetering slots to a metering means formed by the lower configuration of the push rod seat and a metering disc **80**.

Specifically, disc **80** is positioned on the annular shoulder **26***a* and cooperates with a specially formed lower surface **82** of the push rod seat **16***a* in the following manner. That is, surface **82** is a land surface surrounding central opening **34***a* and shaped by a cylindrical valley or groove **84** (FIG. **4**) concentrically positioned with respect to the central opening **34***a*. Still another groove or valley **86** is cut radially through the land surface **82** so that it extends from the central opening **34***a* to the valley **84**. It is by means of the metering valley **86** that additional metering is provided from the oil in the valley **84** to the central opening **34***a*. To allow the oil to flow from the diametral clearance into the valley **84**, two 180° opposed nonmetering slots **54***a*, **56***a* are provided on the circumference of the bottom surface of the push rod seat in a manner identical with the previous embodiment. The push rod seat **16***a* thus rests upon the disc **80** by means of the land surface **82**, the disc in turn being supported by the annular shoulder **26***a*, so that the disc provides both a supporting function as well as a metering function.

In this particular embodiment, it is necessary to bias the push rod seat **16***a* to prevent any axial movement which would cause separation of the seat from the disc **80**. Thus, an annular flexible retainer ring **90** is snapped into position within the cavity **28***a*, the surface **92** of the ring bearing against the top surface of the push rod seat **16***a*. To restrain the retainer ring **90** from axial movement within the cavity **28***a*, a groove **94** is provided in the wall of the cavity **28***a*. Or, optionally, the groove **94** can be omitted so as to rely solely on the press fit of the retainer ring **90** within the cavity to prevent any axial movement. By these means, the push rod seat **16***a* is prevented from separating from the disc **80** such as under the conditions of lash.

The operation of this embodiment of FIGS. **3** and **4** is as follows: high pressure oil flows from passageways **12***a* into oil hole inlets **50***a* and **51***a* and down past the nonmetering diametral clearance between walls **30***a* and **32***a*. It then crosses through nonmetering slots **54***a* and **56***a* to the recessed circular area or valley **84** (FIG. **4**). From thence it flows around to the valley or slot **86** into push rod seat opening or hole **34***a*. This tortuous route provides sufficient metering and restriction to insure controlled oil flow to the overhead oiling system.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a mechanical tappet adapted to be operatively connected to a push rod for reciprocation within a crankcase, said tappet comprising a tappet body having an upper and lower cavity portion therein, an oil inlet hole means through the wall of said body and communicating with said cavity, a push rod seat positioned in said upper cavity portion, said push rod seat having an opening for supplying oil to a hollow push rod, support means for supporting said seat within said body above said lower cavity portion, said support means being fixed with relation to said tappet body, the improvement comprising: locating said oil inlet hole means above said support means; and means defining a constant restricted passageway between said oil inlet hole and said opening in said push rod seat for metering and restricting oil flow through said push rod seat opening.

2. The improved tappet as defined in claim **1**, wherein said lower cavity portion defines an oil reservoir, and said means defining a restricted passageway includes a predetermined diametral clearance between the exterior wall of said seat and that portion of the interior wall of said cavity in which said seat is located, said diametral clearance providing a passageway between said inlet and said reservoir.

3. The improved tappet as defined in claim **2**, wherein a nonmetering passageway means is provided in conjunction with the said push rod seat and said means for supporting said push rod seat whereby oil flows therethrough into said reservoir from said diametral clearance.

4. The improved tappet as defined in claim **3**, in which the nonmetering passageway means includes two nonmetering passageways positioned 180° apart.

5. The improved tappet as defined in claim **1**, wherein said means defining a restricted passageway includes a disc positioned on said seat support between said seat and said seat support, and a metering slot means is provided on the surface of said seat in contact with said disc.

6. The improved tappet as defined in claim **5**, and further including at least on nonmetering passageway extending inwardly from said exterior seat wall to said metering slot.

7. The improved tappet as defined in claim **5**, and further including biasing means for constantly biasing said seat surface against said disc to prevent separation, such as caused by lash, of said seat from said disc.

8. The improved tappet as defined in claim **7**, wherein said biasing means includes a resilient retainer, and said cavity includes means for restraining said retainer from axial movement.

9. The improved tappet as defined in claim **8**, wherein said restraining means includes a groove in said cavity interior wall into which said retainer is snapped, whereby said retainer prevents separation of said seat from said disc.

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