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Cornell

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[54] **TAPPET PUSH ROD SEAT AND METER MEANS**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 29,915, April 20, 1970, Pat. No. 3,614,942.

[52] **U.S. Cl.** **123/90.35,** 123/90.46, 123/90.55

[51] **Int. Cl.**.....**F01m 9/10**

[58] **Field of Search**...123/90.35, 90.43, 90.46, 90.55

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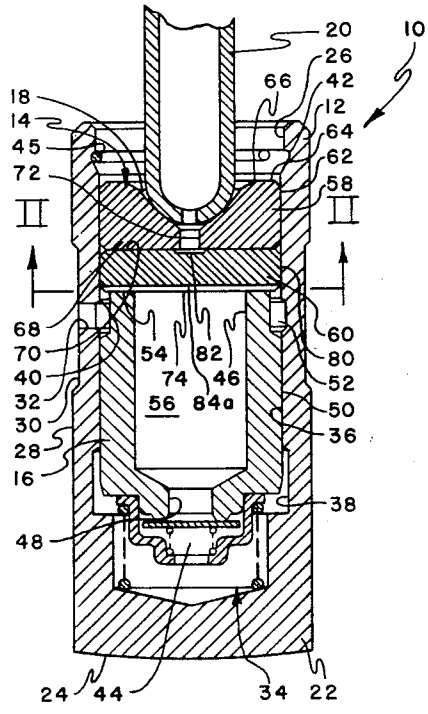
Primary Examiner—Al Lawrence Smith

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[57] **ABSTRACT**

In a push rod seat for use in a tappet adapted for metering oil to a push rod, the passageways for conducting the oil are formed by constructing the seat of upper and lower parts. At least one of the parts has grooves or slots formed therein which in cooperation with the other part forms the passageways. In one embodiment, the lower part in cooperation with the inner bore in which it is located determines the degree of metering by the size of its diameter and its thickness. In another embodiment the size and configuration of slots or grooves in one or both of the parts can provide and determine the degree of metering.

23 Claims, 6 Drawing Figures



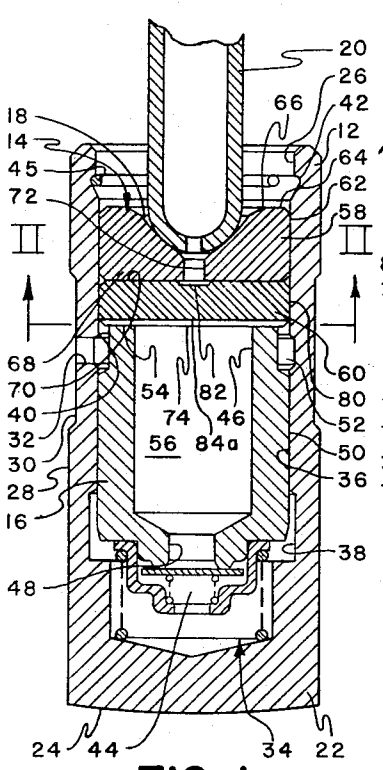


FIG. 1

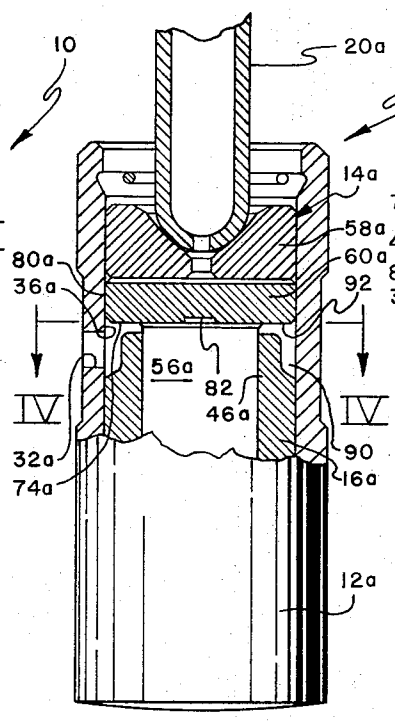


FIG. 3

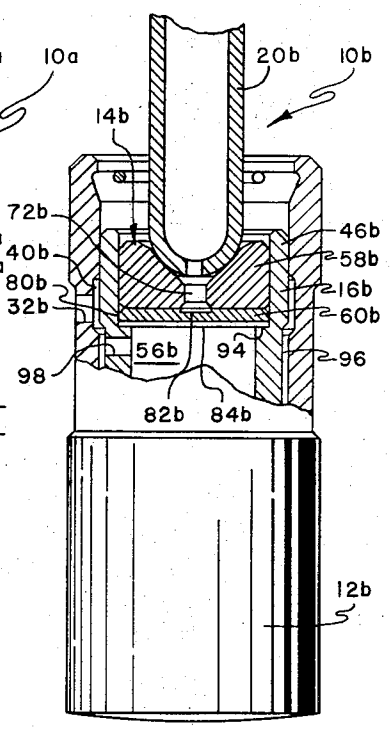


FIG. 5

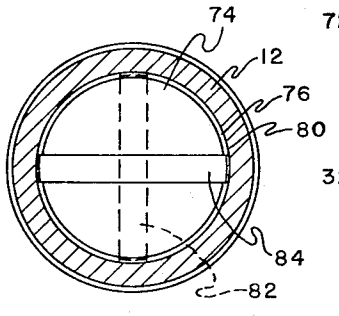


FIG. 2

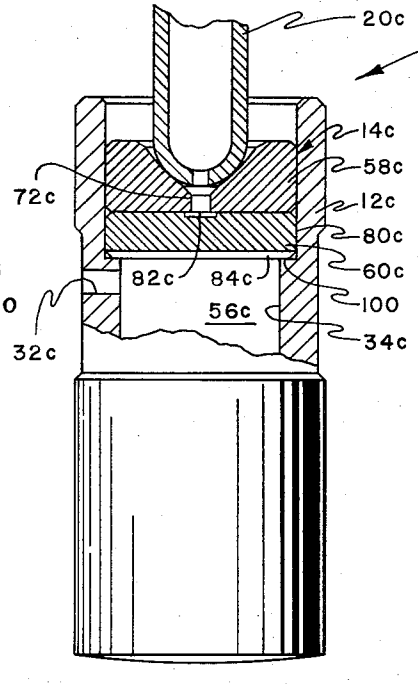


FIG. 6

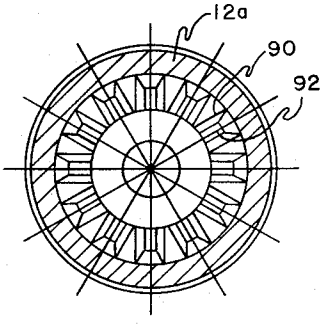


FIG. 4

TAPPET PUSH ROD SEAT AND METER MEANS

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation in part application of parent application Ser. No. 29,915, filed Apr. 20, 1970, now U.S. Pat. No. 3,614,942 and titled METERED MECHANICAL TAPPET WITH SLOTTED PUSH ROD SEAT.

BACKGROUND OF INVENTION

In present commercial practices, it is widely accepted to lubricate the rocker arms by oil forced from the tappet or galley through hollow push rods which are seated in a push rod seat. This flow however must be metered accurately so that the supply is neither too small nor too large. Too much oil results in loss to the valve guides and subsequent leakage and collection of dirt while too little results in premature fatigue of the various parts. Proposals which utilize a restricted cylindrical orifice to meter the oil are inadequate in that they are so small they are susceptible to plugging since dirt and other foreign matter which ultimately enters the oil supply collect around the orifice to reduce the meter rate or stop it completely. Thus, it is desirable to meter the oil through a relatively flat passageway preferably defined by two or more elements which move or rotate relative to each other. One commercially successful form of this type is shown in U.S. Pat. No. 3,358,658 which utilizes a metering disc.

In all present proposals, the tappet plunger (in a hydraulic tappet) or the interior wall of the tappet body (in a mechanical tappet) are machined to provide a shoulder on which the push rod seat rests. Such machining is relatively expensive. Also, the push rod seat itself has heretofore required a high degree of tolerance and machining which in many cases includes the boring or dulling of some type of passageway to permit the oil to flow to the hollow push rod. It will appreciated that cost is of extreme importance in tappet construction since the volume of tappets used in the automobile industry is extremely large.

Another drawback of the present art is the lack of interchangeability of parts in tappet construction or the ability to vary the amount of oil flow unless the whole tappet is replaced. Thus, there is a need today for a new and improved tappet construction which provides greater flexibility, complete accuracy in oil flow while at the same time significantly reducing the overall manufacturing costs.

This invention substantially eliminates the problems presented by prior push rod seats by providing a novel push rod seat having an upper and lower part. The upper part includes a push rod seating surface and opening extending from the seating surface to at least the upper surface of the lower part. A slot is formed in at least one of the surfaces of engagement between the upper and lower parts and extends from the opening to the space between the lower seat part and inner wall of the tappet body. The opening, slot and space form part of the passageway between the oil reservoir and push rod.

The two part seat construction greatly reduces the amount of machining required on the push rod seat itself. Each part of the seat can be formed of heat sintered and treated outer metal parts since the slot on one of the exposed surfaces and opening does not require high tolerance machining.

In a preferred aspect, the spacing between the outer wall of the lower part and the inner wall of the tappet body defined the metering means. This annular path will not plug since the path is of flattened cross-section and the lower part of the seat continually moves and rotates relative to the tappet body.

This will crush or dispose of any foreign matter which might be positioned therebetween. The meter rate can be simply and easily adjusted by varying the axial thickness of the lower seat part. Nothing else in the entire tappet construction need be altered.

In other aspects of this invention, metering is achieved in the push rod seat slot which is also free from plugging since the lower part will move relative to the upper part. In hydraulic tappets, it is also envisioned that metering be achieved in that part of the passageway formed between the engaging surfaces of the lower seat part and the plunger utilized in a hydraulic tappet. The two part seat construction permits less costly replacement of either part as well as the amount of machining involved.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a transverse sectional view of a hydraulic tappet constructed according to one embodiment of this invention;

FIG. **2** is a cross-sectional view taken along line II—II of FIG. **1**;

FIG. **3** is a fragmentary view similar to FIG. **1** of an alternative embodiment of this invention;

FIG. **4** is a cross-sectional view taken along line IV—IV of FIG. **3**;

FIG. **5** is a fragmentary view similar to FIGS. **1** and **3** of yet another alternative embodiment according to this invention; and

FIG. **6** is a fragmentary view similar to FIGS. **1**, **3** and **5** of still another alternative embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The novel push rod seat provided by this invention and the means for metering lubricating oil through the seat to a push rod are applicable regardless of whether the tappet construction is of the mechanical or hydraulic type. Briefly, a tappet body is mounted for reciprocal movement within an engine block and is actuated by a cam shaft and cam lobe in a conventional fashion which for that reason is not shown or described in detail. The tappet body generally includes a push rod seat means for receipt of a hollow push rod having a passageway extending up to the rocker arm and valve train assembly. Lubricating oil is metered through the tappet, the oil flowing through a passage in the engine block for entry into a port provided through the wall of the tappet body. This invention, in one of its aspects provides positive metering which can be varied by utilizing a novel push rod seat means comprising an upper and lower part having slots or grooves defining flow passageways for the metered oil.

Referring now to FIGS. **1** and **2** in detail, a hydraulic tappet **10** is shown with a tappet body **12** in which is mounted a push rod seat means **14** above a plunger **16**, the seat means having a push rod seating surface **18** for receipt of a hollow push rod **20**. Tappet body **12** is generally cylindrical in shape having a closed end **22** whose outer surface **24** provides a cam engaging sur-

face for actuation by the cam lobe (not shown). The opposite end 26 is open to permit insertion of plunger 16 and push rod seat means 14 which closes end 26.

The outer wall 28 of tappet body 12 includes an annular groove 30 which is axially extended so that the engine block passage is in constant communication with groove 30 regardless of the reciprocal movement of tappet 10 within the engine block. A port 32 connects groove 30 with the inner portion of the tappet body which is defined by an axial bore 34. This permits constant communication between the engine block passage and port 32 of the tappet body. Bore 34 extends through the tappet body from open end 26 to closed end 22. The inner wall 36 of bore 34 has a circular configuration. A plurality of axially spaced recesses or grooves 38, 40 and 42 having a diameter greater than bore 34 are provided in tappet body 12. The bottom or lower groove 38 cooperates with plunger 16 and a valve mechanism 44 to provide lash adjustment for the push rod, the details of which will not be described herein since they are well known. The intermediate groove 40 is aligned with port 32 so that regardless of the axial position of plunger 16 or push rod seat means 14, oil flowing through port 32 will have access to surround the plunger or seat means via groove 40. The upper groove 42 is provided for receipt of a lock ring 45 to prevent unintentional removal of push rod seat means 14 and plunger 16.

Plunger 16 also has an overall cylindrical configuration with both the upper and lower ends 46 and 48 being open. The lower end 48 has a more restricted opening than the upper end for cooperation with the lash adjustment valve means 44 referred to briefly above. The outer wall 50 of plunger 16 corresponds dimensionally to the diameter of bore 34 of the tappet body so that plunger 16 is movable axially within bore 34. Some clearance is provided between the outer wall of plunger 34 and the inner wall of tappet body 12 so that oil will flow therebetween to provide a friction free contact between the surfaces. The upper end 46 of plunger 16 is necked down in comparison to the overall diameter of plunger 16 so that an annular cavity or spacing 52 is provided between inner wall 36 of tappet body 12 and upper end 46 of plunger 16. The provision of spacing 52 eliminates the need of groove 40. The elimination of groove 40 increases the economical advantages provided by this invention and although it is shown in FIG. 1, it will be appreciated that one important aspect of this invention is the utilization of the unique push rod seat means 14a in existing tappet body construction. However, as a result of this invention, it is no longer necessary to machine groove 40 into new tappet body constructions. The upper end 46 of plunger 16 provides a shoulder 54 upon which seat means 14 is indexed. The interior portion 56 surrounded by the plunger walls and seat means provides a reservoir for the lubricating oil within the tappet body.

Turning now to the push rod seat means configuration, seat means 14 is comprised of upper and lower parts 58 and 60, respectively both of which are generally disc-shaped. Upper part 58 has an outer wall 62 the diameter of which corresponds roughly to that of tappet body bore 34 so that upper part 58 is slidable axially within the bore. The top surface 64 includes push rod seating surface 18 which has an interior crater-like surface for receipt of push rod 20. The outer portion of surface 64 defines an annular shoulder 66 which is engageable with lock ring 45, the latter preventing the seat and plunger from being unintentionally removed from the tappet body when the ring is positioned in groove 42. The bottom surface 68 of upper part 58 is engageable with the top surface 70 of lower part 60 and supported thereby. An opening 72 extends axially through upper part 58 from push rod surface 18 to lower part 60.

Lower part 60 in addition to top surface 70 includes a bottom surface 74 (FIG. 2) which engages upper end 54 of plunger 16 and is supported thereby. The outer wall 76 of lower part 60 has a diameter generally equal to that of tappet body bore 34 so that the lower part of seat means 60 is likewise movable axially within tappet body 12.

The outer diameter of lower seat part 60 is preselected so that a restricted annular pathway 80 is provided between outer wall 76 of seat part 60 and inner wall 36 of bore 34. The upper surface 70 of lower seat part 60 includes a diametrical slot 82 which forms a flow passageway from seat opening 72 to pathway 80. The bottom surface 74 of lower seat part 60 also includes a diametrical slot 84 (FIG. 2) similar to slot 82 to provide a means for flow communication between port 32, spacing 52, and reservoir 56 to permit oil flow into and out of reservoir 56 up through annular pathway 80 into slotted passageway 82 and opening 72 into the push rod.

Having described the various elements in the embodiment shown in FIGS. 1 and 2, its operation will now be described in detail. Oil flowing from the engine block passageway into groove 30 leads directly into port 32 for entry into tappet body 12. Annular groove 30 on the outer wall of tappet body 12 is of sufficient axial length such that there is constant flow communication between the engine block passageway and port 32 regardless of the vertical orientation of tappet 10. Flow through port 32 surrounds plunger 16 by flowing through interior annular groove 40 and also into interior spacing 52. From here, flow into and out of reservoir 56 is permitted through unrestricted slot 84. In accordance with with this embodiment, the flow of lubricating oil to a hollow push rod 20 is metered between inner wall 36 of the to hollow push rod 20 is body and outer wall 76 of lower seat part 60. By preselecting the diameter and thickness of lower seat part 60 the total cross-sectional flow area through annular path 80 is determined. By making this less than the cross-sectional flow area through slots 82 and 84 and opening 72, the entire metering of the lubricating oil is achieved between the top and bottom surfaces 70 and 74 of lower seat element 60. Once the metered flow has passed this surface, relative unrestricted flow through slot 82 directs the oil through opening 72 and up into the hollow push rod 20. It will be appreciated, that while there is some clearance between outer wall 62 of upper seat element 58 and inner wall 36 of tappet body 12, so long as this cross-sectional flow area is less than that of slot 82 and opening 72, the metered flow will follow the path of least resistance into the push rod.

Since the rate or volume of metered oil flowing into the push rod is a function of the cross-sectional flow are of annular pathway 80 and its axial or longitudinal

length, this invention provides an extremely simplified means for varying the volume of lubricating oil into the push rod simply by inserting a new lower seat part **60** having a different thickness. This can be done without altering or changing the configuration of any of the other elements of tappet **10**. It will be appreciated that lower seat part **60** moves both axially and rotationally with respect to inner wall **36** as the tappet is in use so that annular pathway **80** is prevented from becoming clogged.

Referring specifically to FIG. **2**, it will be appreciated that the movement of lower seat part **60** within tappet body bore **34** of the tappet body will sometimes cause a very slight eccentric positioning of the lower seat member within bore **34**. According to this invention, this does not significantly after the flow rate through pathway **80** since the overall cross sectional flow area remains a constant. However, it is realized that the portion of lower seat element **60** is abutment with inner wall **36** could coincide with one of the openings of slot **82** or **84**. Preferably, the cross-sectional flow area of slots **82** and **84** is large enough to accommodate full metered through either end of the slots. However, a plurality of slots are envisioned in those situations where this may not be practical. Thus, the top or bottom surfaces of lower seat element **58** could include more than one slot.

Before turning to an examination of other alternatives shown in the drawings, it will be appreciated that slot **82** could just as easily be disposed in the bottom surface **68** of upper seat element **58** without departing from the teachings herein. In fact, there may be instances wherein it is desired that slot **82** perform the metering function. However, it will also be appreciated that the provision of slots **82** and **84** in lower seat part **60** permits this part to be inserted indiscriminately. I.e., it is symmetrical in the sense that either surface can face up or down.

Referring now in detail to FIGS. **3** and **4**, an alternative use of the two-part push rod seat in combination with a slightly altered plunger and tappet body is shown. Except for these alternations, like reference numerals with the suffix *a* are used to correspond to similar elements described with respect to FIG. **1**. Tappet body **12***a* has been altered by eliminating interior groove **40** shown in FIG. **1**. Plunger **16***a* has been modified to permit more unrestricted flow into and out of reservoir **56***a* without altering the configuration of the lower seat part **60***a*. Again, it will be appreciated that the interchangeability of parts is desirable in that the ability to utilize lower seat parts identical to seat part **60** in other configurations reduces overall costs. Hence, where it is necessary to provide larger cross sectional flow ability between reservoir **56***a* and annular spacing **52***a*, and alternative plunger **16***a* is incorporated which permits usage of the same lower seat parts **60***a* corresponding to seat part **60**.

The modification of plunger **16***a* is illustrated in detail in FIG. **4**. Instead of the upper end **46***a* of plunger **16***a* being necked down as described with respect to FIG. **1**, a plurality of circumferentially spaced radially projecting grooves or slots **90** are provided to permit free flow of oil into reservoir **56***a* regardless of the rotary or axial position of plunger **16***a*. The remaining upper surface areas **92** intermediate slots **90** on upper end **46***a* provides an annular intermittent shoulder on which lower push rod seat part **60***a* rests. Preferably, slots **90** are convergent toward the center of plunger **16***a* so that they are widest at the point of oil entry from the engine block passageway. This prevents the slots from acting as a metering means in that an unrestricted amount of oil is permitted to flow through port **32***a* into the circumferentially spaced slots **90** adjacent inner wall **36***a* of tappet body **12***a*. The remaining portions of the tappet assembly are identical to that shown in FIG. **1** and although slot **82***a* is shown in the lower surface **74***a* of lower seat part **60***a*, it does not perform the primary function of providing a flow passageway into and out of reservoir **56***a*. Rather, it permits the insertion of lower part **60***a* in an indiscriminate fashion since the part is reversible. The function and operation of the unique push rod seat means **14***a* is identical to that described with reference to FIG. **1**.

Turning now to FIG. **5**, another use of the novel two part seat means is shown. In this combination is illustrated a more conventional hydraulic tappet construction wherein the seat means is positioned on an internal shoulder in the plunger. Identical reference numerals with the suffix *b* will be used for similar parts corresponding to similar elements in FIGS. **1** and **3**.

Although the overall construction of tappet assembly **10***b* is conventional, it will be described briefly herein to illustrate how the unique push rod seat means **14***b* provided by this invention can be used in more conventional tappet assemblies.

Plunger **16***b* is somewhat distinguishable from those described previously in that the upper end **46***b* of plunger **16***b* extends beyond and above port **32***b* where oil enters the tappet body. The interior portion of upper portion **46***b* has an enlarged cross section with regards to the remainder thereof to provide a shoulder **94** on which push rod seat means **14***b* is seated. Also, the introduction of oil into reservoir **56***b* is different than that described. Namely, an interior groove **40***b* is provided to permit oil entering through port **32***b* to be disposed annularly around upper portion **46***b* of the plunger. In addition, adjacent upper portion **46***b* of plunger **16***b*, an annular groove **96** is provided in the outer wall of plunger **16***b* for communication with groove **40***b*. A port **98** through the wall of plunger **16***b* provides the flow passageway of oil into reservoir **56***b*. Flow out of reservoir **56***b* to push rod **20***b* is provided through slot **84***b* in a fashion similar to that described with regards to the embodiment shown in FIG. **1**. That is, oil flows through slot **84***b* for metering through annular restricted passageway **80***b* as defined by the dimensions of lower seat part **60***b* into the upper diametrical slot **82***b* of lower seat part **60***b* and thence through passageway **72***b* into the hollow push rod. Thus, it will be appreciated that the unique push rod seat means comprising an upper and lower seat part **58***b* and **60***b* can be conveniently utilized in more conventional existing tappet assemblies.

The thickness of lower seat part **60***b* is shown in FIG. **5** to be less than those shown with regards to the embodiments described in FIGS. **1** and **3**. This is simply to illustrate that the overall metering rate can be varied by varying either the diameter of lower seat part **60***b* or its thickness. In the preferred embodiments shown, this is all that need be modified in the tappet assembly in order to vary the metering rate.

Referring now to FIG. 6, another alternative embodiment of this invention is shown wherein the novel push rod seat means is utilized in a mechanical tappet. Similar reference numerals with the suffix *c* are used to designated similar elements as described with regards to FIGS. 1–5. The same metering function is provided by push rod seat means **14***c* in that it is comprised of an upper and lower seat part **58***c* and **60***c* identical to that described with regards to FIG. 1. The essential distinction here is that in a mechanical tappet assembly such as shown in FIG. 6, there is no plunger mounted within the tappet body. Rather, oil entering the body through port **32***c* goes directly into reservoir **56***c*. Axial bore **34***c* is comprised of an upper and lower part, the upper part being positioned and spaced above port **32***c* and having an enlarged cross section with relation to the lower part. The juncture of the two parts provides a shoulder **100** on which push rod seat means **14***c* is positioned. Hence reservoir **56***c* is defined by the inner wall of bore **34***c* in the lower portion which is closed by lower seat part **60***c*. Oil flow from reservoir **56***c* to annular path **80***c* is achieved in the same way as described previously by flow through slot **84***c* in the lower surface of lower seat part **60***c*. The thickness and diameter of lower seat part **60***c* defines the overall cross sectional flow area of annular path **80***c* and determines the meter rate of the tappet assembly. Meter flow is directed to push rod **20***c* through slot **82***c* and passageway **72***c* in the same fashion as described previously. However, the same savings in cost and simplicity and construction are achieved as described previously. In addition, the embodiments shown illustrate further savings in that seat means **14***c* can be used interchangeably in a hydraulic or mechanical tappet assembly.

As a result of the foregoing, an important aspect of this invention is the provision of a push rod seat means comprising an upper and lower part, with the lower part being capable of determining the meter rate by either varying its thickness or its diameter. The overall seat means construction can be utilized in a variety of existing and proposed tappet assemblies without varying the overall tappet configuration. The utilization of a two part seat means greatly reduces the amount of high tolerance machining required over existing proposals and in fact permits the utilization of a less expensive material such as heat sintered and treated metal. In addition, it eliminates the necessity of an additional internal groove in the tappet body configuration of hydraulic tappets thereby further reducing the overall cost structure.

Although several embodiments have been shown and described in detail, it will be obvious to those having ordinary skill in this art that the details of construction of this particular embodiment may be modified in a great many ways without departing from the unique concepts presented. It is therefore intended that the invention is limited only by the scope of the appended claims rather than by particular details of construction shown, except as specifically stated in the claims.

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

1. In a tappet adapted for operative connection to a push rod and including a tappet body having an oil reservoir; a push rod seat means positioned within said tappet body above said reservoir, said seat means having a passageway adapted for communication with said push rod; and means for metering oil conducted from said reservoir and into said rod; the improvement comprising: said push rod seat means being formed of an upper and lower part which are maintained in constant engagement with each other; said upper part having a push rod seating surface in its upper surface and an opening extending from said seating surface to at least the upper surface of said lower part; and a slot formed in at least one of the surfaces of engagement between said upper and lower parts, said slot extending from said opening to the space between the seat and inner wall of said tappet body; said opening and said slot forming the said passageway adapted for communication of said reservoir with said push rod.

2. The improvement as defined in claim 1 wherein said tappet includes means for supporting said push rod seat within said tappet body, said lower surface of said lower part being in contact with said shoulder, a second slot in one of said engaging surfaces between said shoulder and lower part, said second slot extending from the space between said seat and said inner wall of said tappet body to at least the point in communication with said reservoir, said lower part having a portion spaced from the inner wall of said tappet body providing an annular path between at least a portion of the outer wall of said lower part and the inner wall of said tappet body, said second slot, path and passageway providing a means for oil to communicate from said reservoir to said opening, at least one of said second slot, path and passageway defining a restricted flow means to provide said metering means.

3. The improvement as defined in claim 2 wherein the cross-sectional flow area of said annular path is less than each of said passageway and second slot so that said annular path provides said metering means.

4. The improvement as defined in claim 3 wherein the rate of said metering is determined by preselecting the thickness of said lower seat part.

5. The improvement as defined in claim 3 wherein the rate of said metering is determined by preselecting the diameter of said lower seat part.

6. The improvement as defined in claim 2 wherein the cross-sectional area of the clearance between said inner tappet wall and the outer wall of said upper part of said push rod seat is substantially less than any cross-sectional area of said passageway so that said metered oil will flow freely through said passageway into said seat opening.

7. In a tappet adapted for operative connection to a push rod and including a tappet body having an oil reservoir; a push rod seat means positioned within said tappet body above said reservoir, said tappet including shoulder means for supporting said push rod seat means; said seat means having a passageway adapted for communication with said push rod from said reservoir; and means for metering oil conducted from said reservoir and into said rod; the improvement comprising: said push rod seat means being formed of an upper and lower part which are maintained in constant engagement with each other, the upper part having a push rod seating surface in its upper surface and an opening extending from said seating surface to at least the upper surface of said lower part, said lower part including a slot formed in each of its upper and lower surfaces, said

upper slot extending at least from said opening to the inner wall of said tappet body, said lower slot extending from at least said reservoir to the inner wall of said tappet body, said lower part having a portion spaced from the inner wall of said tappet body and providing an annular path between at least a portion of the upper and lower surfaces of said lower part, said opening, slots, and path providing a means for oil to communicate from said reservoir to said opening, at least one of said opening, slot and path defining a restricted flow means to provide said metering means.

8. The improvement as defined in claim 7 wherein said means for supporting said seat means with said tappet body is comprised of a portion of said tappet body defining a shoulder, at least a portion of said reservoir being below said shoulder.

9. The improvement as defined in claim 7 wherein said tappet includes a plunger mounted within said tappet body, a portion of said plunger being disposed beneath said push rod seat means, said plunger including a shoulder for supporting said push rod seat means.

10. The improvement as defined in claim 7 wherein the cross-sectional flow area of said annular path is less than each of said slots and opening so that said annular path provides said metering means, the rate of said metering being varied by varying the dimensions of said lower seat part.

11. A tappet comprising, in combination: a tappet body having an internal cavity, the upper end of which is open; a hollow plunger positioned within said cavity, the upper end of which is open, said hollow plunger defining an oil reservoir; a push rod seat means separate from said plunger and supported by said plunger within said cavity closing the open end of said tappet body, said push rod seat means being formed of an upper and lower part which are maintained in constant engagement with each other, said upper part having a push rod seating surface in its upper surface and an opening extending from said seating surface to at least the upper surface of said lower part, and a slot formed in at least one of the surfaces of engagement between said upper and lower parts, said slot extending from said opening to the space between the seat and inner wall of said tappet body, the upper end of said plunger including a support surface for said seat means, said support surface including one or more grooves extending from the space between said seat and inner wall of said tappet body to at least the point in communication with said reservoir, said slot, space and groove providing a means for oil to communicate from said reservoir to said opening; and means for metering the rate of oil flow to said opening, one of said slot and space defining a restricted flow means to provide said metering means.

12. The combination according to claim 11 wherein said one or more grooves are comprised of a plurality of circumferentially spaced radially projecting grooves.

13. The combination according to claim 12 wherein at least a pair of said circumferentially spaced grooves are in diametrical alignment.

14. The combination according to claim 11 wherein said grooves are convergent toward the center of said plunger, the cross section of which is a maximum at said space between said seat and inner wall.

15. In a tappet adapted for cooperative association with a rocker arm and including a tappet body having an oil reservoir; a closure means positioned within said tappet body above said reservoir, said closure means having a passageway adapted for communication with said associated rocker arm and means for metering oil conducted from said reservoir to said arm; the improvement comprising: said closure means being formed of an upper and lower part which are maintained in constant engagement with each other; said upper part having an opening extending from its upper surface to at least the upper surface of said lower part; and a slot formed in at least one of the surfaces of engagement between said upper and lower parts, said slot extending from said opening to the space between the closure means and inner wall of said tappet body; said opening and said slot forming the said passageway adapted for communication of said reservoir with said closure means.

16. The improvement as defined in claim 15 wherein said tappet includes means for supporting said closure means within said tappet body, said lower surface of said lower part being in contact with said support means, a second slot in one of said engaging surfaces between said support means and lower part, said second slot extending from the space between said closure means and said inner wall of said tappet body to at least the point in communication with said reservoir, said lower part having a portion spaced from the inner wall of said tappet body providing an annular path between at least a portion of the outer wall of said lower part and the inner wall of said tappet body, said second slot, path and passageway providing a means for oil to communicate from said reservoir to said opening, at least one of said second slot, path and passageway defining a restricted flow means to provide said metering means.

17. The improvement as defined in claim 16 wherein the cross-sectional flow area of said annular path is less than each of said passageway and second slot so that said annular path provides said metering means.

18. The improvement as defined in claim 17 wherein the rate of said metering is determined by preselecting the thickness of said lower part.

19. The improvement as defined in claim 17 wherein the rate of said metering is determined by preselecting the diameter of said lower part.

20. The improvement as defined in claim 16 wherein the cross-sectional area of the clearance between said inner tappet wall and the outer wall of said upper part of said closure means is substantially less than the cross-sectional area of said passageway so that said metered oil will flow freely through said passageway into said closure means opening.

21. The improvement as defined in claim 16, wherein said closure means is a push rod seat means, said upper part having a push rod seating surface in its upper surface operatively engaged with a push rod.

22. The improvement as defined in claim 16 wherein said tappet further includes a plunger reciprocal within said tappet body, the upper end of said plunger forming said support means on which said lower part seats.

23. The improvement as defined in claim 22 wherein said upper part is a push rod seat means having a push rod seating surface in its upper surface operatively engaged with a push rod.

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