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Hamilton et al.

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[54] TAPPET WITH MEANS FOR RELIEVING ENTRAINED AIR

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[52] **U.S. Cl.** **123/90.55**, 123/90.57

[51] **Int. Cl.** **F01l 1/24**

[58] **Field of Search** 123/90.35, 90.55, 90.57, 90.59, 123/90.56, 90.58, 90.46, 90.63

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[57] **ABSTRACT**

A hydraulic tappet is formed by a barrel having a closed end and a plunger reciprocal within the barrel. The plunger has an oil chamber and a cap is seated on one end of the plunger to close the oil chamber. Passage means are provided at the seat of the cap upon the plunger for the relief of air within the plunger chamber.

6 Claims, 4 Drawing Figures

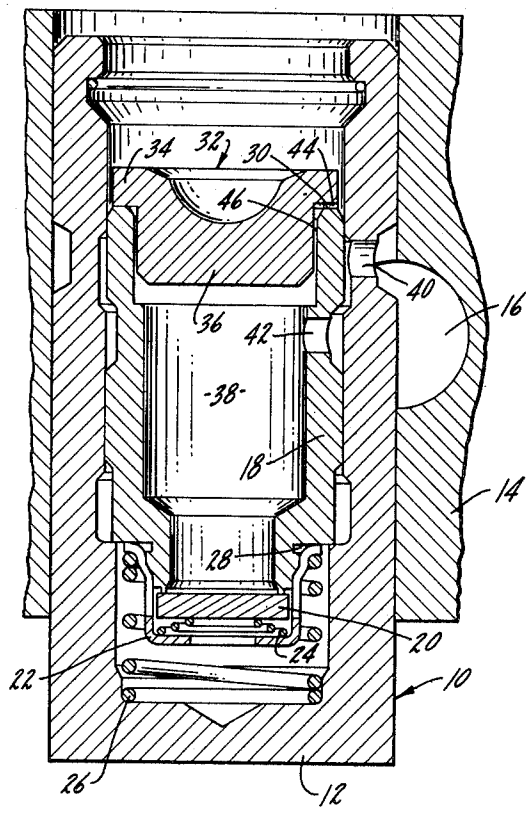
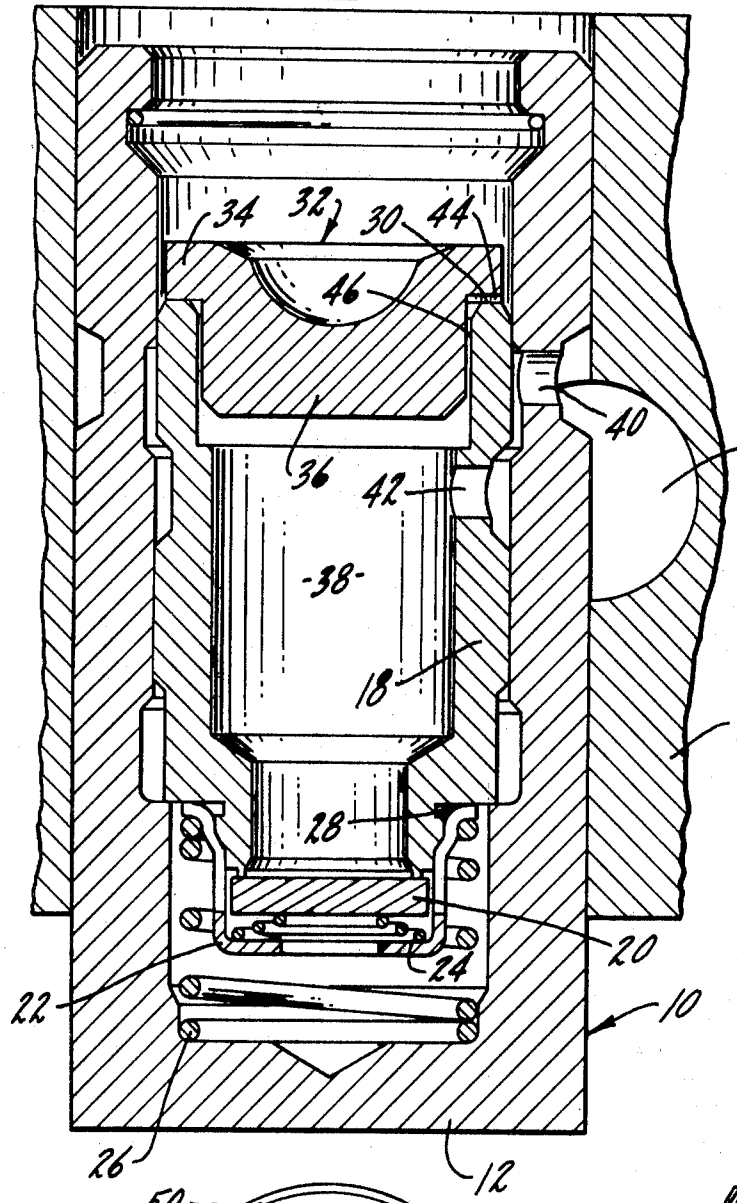


Fig. 1.



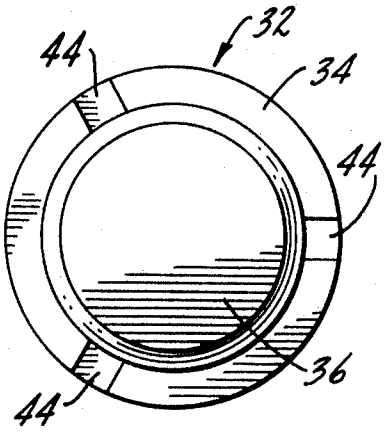


Fig. 2.

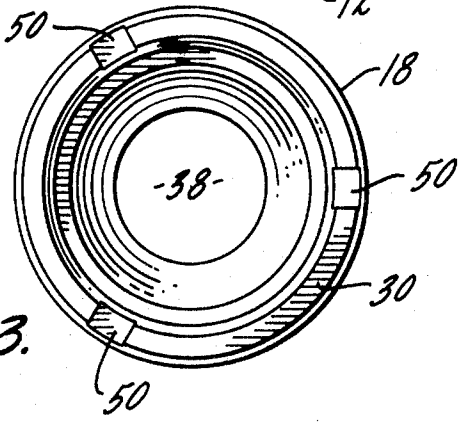
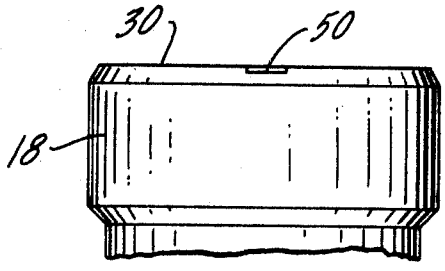


Fig. 3.

Fig. 4.



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TAPPET WITH MEANS FOR RELIEVING ENTRAINED AIR

SUMMARY OF THE INVENTION

This invention relates to means for removing entrained air from within a hydraulic tappet.

One purpose of the invention is a hydraulic tappet in which either the cap closing the plunger chamber or the plunger itself may have a series of notches for the relief of entrained air from within the plunger chamber.

Another purpose is a hydraulic tappet of the type described in which the notches are formed in the plunger.

Another purpose is a hydraulic tappet of the type described in which notches for the relief of entrained air from within the plunger are formed in the cap closing the end of the plunger.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

FIG. 1 is a vertical section through a tappet of the type described,

FIG. 2 is a bottom plan view of the cap in Figure 1,

FIG. 3 is a top plan view of the plunger of a modified form of tappet, and

FIG. 4 is a side view of the plunger illustrated in Figure 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The advent of extreme pressure additives to engine lubricants, higher engine speeds and higher engine temperatures have made automotive engine lubrication oils somewhat susceptible to the phenomenon known as aeration. Aeration can occur when a vehicle undergoes rapid acceleration or rapid braking, causing the oil in the engine sump to collect preferentially in such a position as to cause the oil pump to entrain a combination of air and oil. If an excess of air is entrained within the oil, and the oil is delivered to a hydraulic valve lifter or tappet and taken into the low-pressure chamber of the tappet, and subsequently into the high-pressure chamber, the oil and air mixture may compress during operation causing excessive valve train lash and essentially defeating the purpose of the tappet. The present invention provides a simple and reliably operable means for the relief of entrained air from within the low-pressure chamber of a hydraulic tappet.

In FIG. 1 a generally cylindrical tappet barrel is indicated at **10**. The tappet barrel has a closed end **12**. The engine cylinder wall is indicated at **14** and the oil gallery is indicated at **16**.

Reciprocally mounted within the barrel **10** is a plunger **18**. The lower end of the plunger is closed by a valve **20** held in position by a valve cage **22**. A coil spring **24** positioned between the lower end of the valve **20** and the valve cage biases the valve **20** toward the plunger bottom. A spring or the like **26** bottoms against the barrel closed end **12** and urges the valve cage **22** against a lower surface **28** of the plunger **18**.

A seat **30** is formed at the upper end of the plunger and a cap **32** is positioned upon the seat. The cap **32** may have an annular flange **34** which overlies and rests upon the plunger seat. The body portion **36** of the cap extends downwardly within the low pressure chamber **38** of the plunger **18**.

Oil from the gallery **16** may pass through a port **40** in the barrel and then through a port **42** in the plunger to enter the chamber **38** within the plunger. As illustrated in Figure 2, the lower surface of the flange **34** may have a series of notches **44** which form passages between the low-pressure chamber **38** within the plunger and the open area above the cap **32**. As stated above, there are serious operational problems if excessive air is entrained within the oil in the low-pressure chamber **38** and in turn taken into the high-pressure chamber below cage **22** and surrounded by the lower portion of the closed barrel **10**. During tappet operation, movement of the plunger will compress the air. The notches **44** provide means for passing air from the chamber **38** to the atmosphere. The body portion **36** of the cap **32** is slightly smaller than the plunger area adjacent the cap. Hence, there is a space **46** which communicates with the notches **44** and with the chamber **38** to permit the air to reach the notches.

FIGS. 3 and 4 show a modified form of the invention. The upper seat **30** of the plunger has a series of notches **50** which also provide communication between the low pressure oil chamber **38** and the atmospheric space above the cap **32**.

The notches or passages can be formed either in the lower surface of the cap which seats upon the plunger, or upon the plunger seat itself. In some applications it may be desirable to have notches both on the cap and on the upper end of the plunger at its seat. What is important is to provide sufficient passage space to relieve the entrained air from the oil and the plunger chamber, but yet not such a large passage area that oil will be lost from the chamber. Under normal operation the air will rise to the surface or toward the top of chamber **38** and the operation of the reciprocal plunger within the barrel will cause this air to be forced upwardly through space **46** and then through the notches either in one or both of the plunger and its associated cap.

Whereas, the preferred form of the invention has been shown and described herein, it should be realized that there are many modifications, alterations and substitutions thereto.

We claim:

1. In a hydraulic tappet, a barrel closed at one end and open at the other end, and oil passage in the barrel, a plunger reciprocal within the barrel, a chamber between the barrel closed end and the plunger, spring means within the chamber biasing the plunger toward the barrel open end,

a chamber within the plunger, an oil passage in the plunger connecting the plunger chamber and the barrel oil passage to permit oil to flow from outside the barrel into the plunger chamber, a seat at the end of the plunger spaced from the barrel chamber, said plunger oil passage being spaced from said plunger seat, a cap positioned on said plunger seat, and at least one passage located at the plunger seat for the relief of air within the plunger chamber.

2. The structure of claim **1** further characterized by a plurality of passages formed in the plunger seat.

3. The structure of claim **2** further characterized in that said passages are formed by notches in the plunger seat.

4. The structure of claim **1** further characterized by a plurality of passages located in the cap adjacent the plunger seat.

5. The structure of claim **4** further characterized in that said passages are formed by a plurality of notches in that portion of the cap positioned on the plunger seat.

6. The structure of claim **5** further characterized in that said cap includes a flange overlying and positioned upon the plunger seat, said notches being formed in the flange.

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