July 14, 1953 R. C. MOSER 2,645,215

HYDRAULIC TAPPET

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Fig. 1.

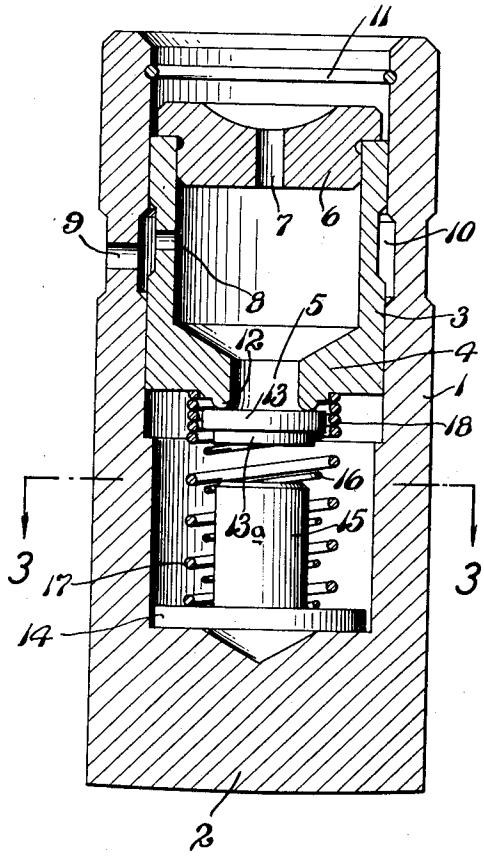
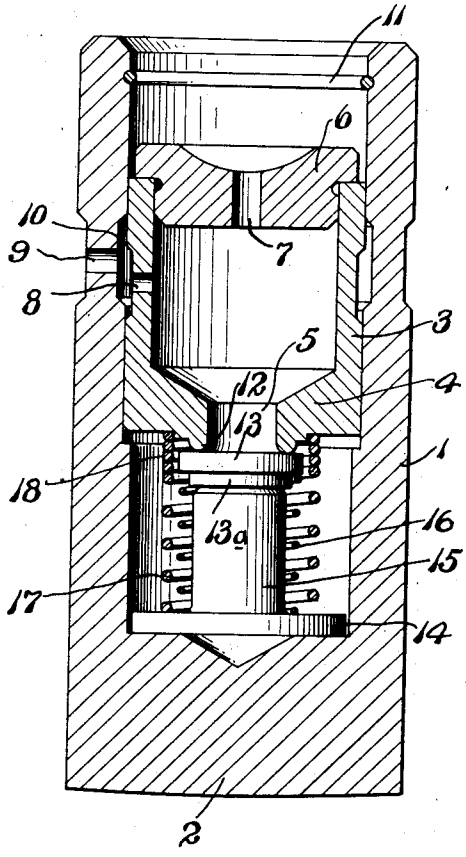


Fig. 2.



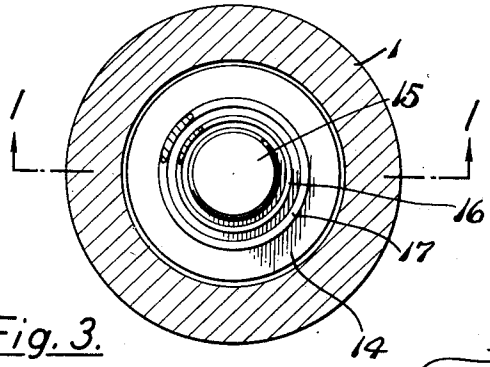


Fig. 3.

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HYDRAULIC TAPPET

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4 Claims. (Cl. 123—90)

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This invention relates to a very useful, novel and practical improvement in hydraulic tappets.

The oil which is supplied to hydraulic tappets, coming usually from the lubricating oil of the engine in which the tappet is used, many times may be contaminated with dirt or other foreign particles or bodies which, if lodged between the piston and the valve of a hydraulic tappet separates the valve a sufficient distance from its seat against the piston that leakage of oil takes place, the operation of the tappet being rendered defective and, at times, completely ineffective.

The present invention is concerned with a simple, useful improvement in hydraulic tappets, in which any contaminating bodies of dirt or the like in the oil thus held between the valve and the piston of the hydraulic tappet, is crushed and will be washed away by the flow of oil, making the tappet operative to serve its purposes, being self-corrective when such pieces of dirt or the like in the oil are lodged and held between the piston and the valve.

It is the object and purpose of the present invention to provide a hydraulic tappet with such improvement to insure against defective operation of the tappet because of dirt contamination of the oil.

An understanding of the invention may be had from the following description, taken in connection with the accompanying drawing, in which,

Fig. 1 is a central vertical section through a tappet having my invention incorporated therewith, with the parts of the tappet in their normal position when in use, the plane of the section being substantially on the line 1—1 of Fig. 3.

Fig. 2 is a like vertical section, showing the tappet parts in the position they take when oil leakage has occurred to bring the valve against an anvil and forcing the valve against its seat to crush dirt between it and the valve seat, and

Fig. 3 is a horizontal section substantially on the plane of line 3—3 of Fig. 1, looking downwardly.

Like reference characters refer to like parts in the different figures of the drawing.

The tappet body includes the usual vertically positioned annular wall 1, surrounding an axial bore in the tappet open at its upper end and closed at its lower end as indicated at 2, the lower side of the lower end portion 2 being adapted to ride up a cam of an engine camshaft.

Within the tappet bore, surrounded by the walls 1 thereof, is a piston having vertical walls 3 and a bottom 4, centrally of which is a vertical

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passage 5. The piston is hollow and closed at its upper end by a closure member 6 through which a central opening 7 may be made for oil passage into the piston. Or, alternately, oil may be supplied to the interior of the piston through the passages 8 and 9, respectively, in the walls 3 of the piston and 1 of the body which join with a continuous annular chamber 10 between the walls of the piston and body provided by cutting complementary grooves therein. In the upper end of the tappet body the usual retaining split ring 11 is located.

At the lower side of the piston, and surrounding the lower end of the vertical passage 5 through the bottom thereof, an annular projecting rib 12 is provided forming a seat against which the upper side of a flat disk valve 13 is adapted to bear. The valve 13 is a solid disk of metal having a diameter sufficient to close the passage 5 and extend beyond the seat 12. At its lower side it is provided with a short downwardly extending cylindrical projection 13a of lesser diameter than the valve.

Below the piston and between it and the lower end of the axial bore of the tappet an oil pressure chamber is provided. Within this chamber an anvil is located including a disk-like base 14, having a diameter slightly less than the interior diameter of said chamber, which rests against the bottom of said axial bore and centrally of which is an upwardly extending anvil 15, the diameter of which may approximate the diameter of the projection 13a. A coiled compression spring 16 of light strength is around the anvil, rests upon the base 14 and at its upper end surrounds the projection 13a and bears against the peripheral portions of the valve 13 at its inner side.

A second much heavier spring 17 is also located within the oil chamber, rests upon the base 14 and extends upwardly to bear at its upper end against the bottom 4 of the piston. It surrounds the first spring 16 and the valve 13. At its upper end portion its coils are closely wound, as indicated at 18, to surround the valve 13 and hold it against lateral displacement.

In the operation of the tappet, the lower end of the stem of an engine valve bears against the upper side of the member 6. When the tappet is lifted by the cam associated with it, the heavy engine valve spring which generally acts to hold the engine valve closed is compressed and the force of said spring transferred to the piston. The piston thereupon comes against the oil in the oil pressure chamber in the tappet; and as

oil is incompressible the piston is stopped from downward movement, the engine valve being lifted. On return movement of the tappet to lower position, if the engine valve seats before the tappet has reached its lowermost position, spring 17 under compression moves the piston upwardly if necessary to maintain contact of the upper closure 6 of the piston with the lower end of the engine valve stem, tending to create a vacuum in the oil pressure chamber, which causes oil to flow from within the piston past the valve 15 into said chamber, automatically filling it as the piston is thus moved upwardly. Upon a succeeding upward movement of the tappet, the piston will thereupon be at a higher elevation in the tappet body when the engine valve has been lifted and returned to lower position; and except for such minor leakage as normally takes place, the oil chamber in the lower part of the tappet will be substantially sufficiently filled so that movement of the piston does not take place. But if there has been leakage during the lifting of the engine valve, it is taken care of and resupplied to the oil chamber.

At times dirt in the oil will be caught between the upper portion of the valve 13 and the lower edges of the seat 12, to partially hold the valve 13 open, so that on the upward movement of the tappet to lift the engine valve, oil from the lower hydraulic chamber is forced upwardly past the valve 13 and through the passage 5 depleting the oil supply in the lower hydraulic chamber. Under such circumstances the tappet, piston and its associated valve 13 will be moved downwardly until projection 13*a* comes against the upper end of the anvil 15. Upon the following upward movement of the tappet and lifting of the engine valve, such dirt is subjected to a crushing pressure equal to the strength of the engine valve spring and will be washed out by the flow of oil from the piston downwardly through passage 5 into the lower chamber when the valve has seated and the tappet moved to its lowest position, valve 13 under such conditions opening relatively widely and larger flow of oil than normal passing downwardly through the passage 5 to supply the requisite amount of oil in the pressure chamber.

The improvement made in hydraulic valves as disclosed is very practical and useful and insures against the difficulties which have been encountered in hydraulic valves because of the presence of dirt in the oil used. It is to be understood that the height of the anvil 15, and, correspondingly, of the pressure chamber are subject to wide variations. The anvil may be much shorter than shown or, if the tappet requires it, may be longer.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a hydraulic tappet having a hollow cylindrical body with a closed lower end, a piston reciprocable within the body normally spaced a substantial operating distance from said closed lower end to provide a liquid pressure chamber between said piston and said closed cylinder end and an upper liquid supply reservoir said piston having a liquid passage connecting said chamber and reservoir with a valve seat at the lower end of said passage, a valve below said piston adapted to engage upwardly against said valve seat, a light spring in said pressure chamber acting on said valve normally to move it to closed position against said seat, a heavier spring arranged to urge said piston in an upward direction, and a rigid stop means at said lower closed end of said chamber against which the valve is adapted directly to engage when the said piston is moved downwardly a sufficient distance beyond its normal operating position thereby forcing said valve against its seat by positive mechanically applied pressure.

2. A hydraulic tappet as defined in claim 1 in which said rigid stop means embodies a part projecting upwardly from the said closed cylinder end and said light valve spring is coiled around said part.

3. A hydraulic tappet as defined in claim 1 in which the valve seat comprises a narrow annular downwardly extending rib rounded on its bottom edge to provide a relatively narrow valve contact line.

4. In a hydraulic tappet having a hollow body having a closed end, a piston reciprocable therein and a liquid compression chamber between the piston and the closed end of the body, said piston having a liquid passage therethrough leading to the chamber, and spring means acting on the piston normally tending to move the piston in a direction to increase the volume of said chamber, the improvement comprising, a flat valve at the chamber side of the piston and thereagainst adapted to close said liquid passage, spring means of light strength normally moving the valve to passage closing position, and an anvil located in said chamber against which said valve is brought to bear on movement of the piston a predetermined distance in a direction opposite to the spring actuated movement of the piston thereby to force said valve to its seat by positive mechanically applied pressure capable of crushing intervening foreign matter.

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