April 7, 1942. I. E. AROLA 2,278,963

VALVE OPERATING MECHANISM

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Fig. 1.

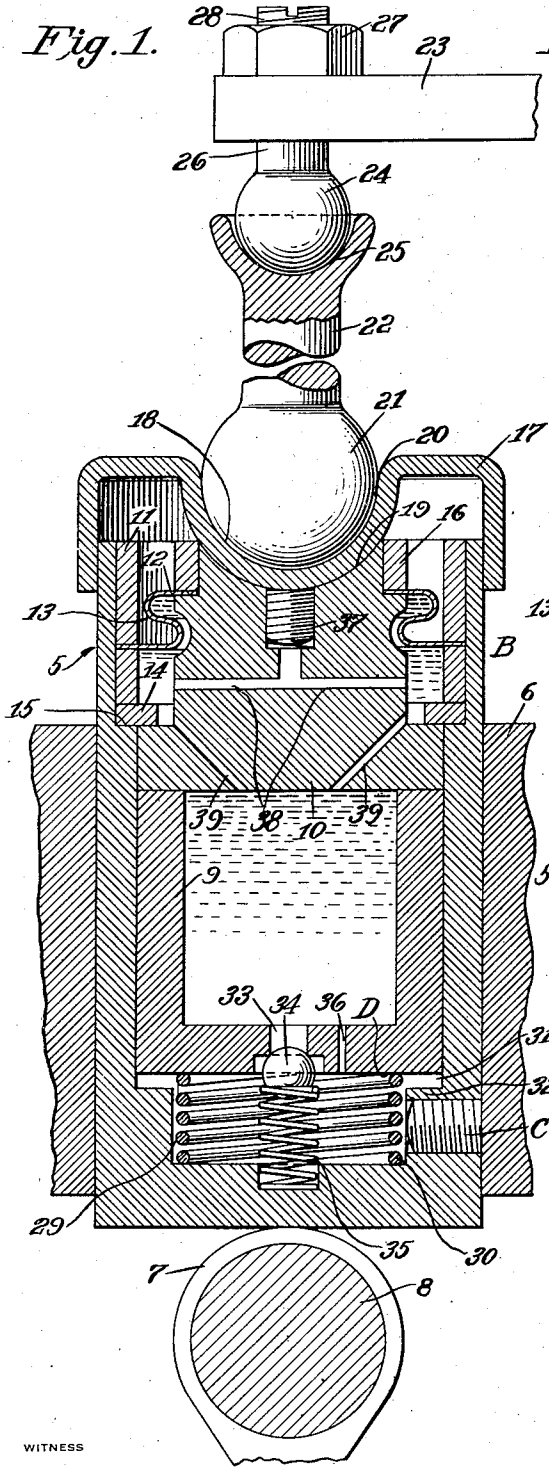
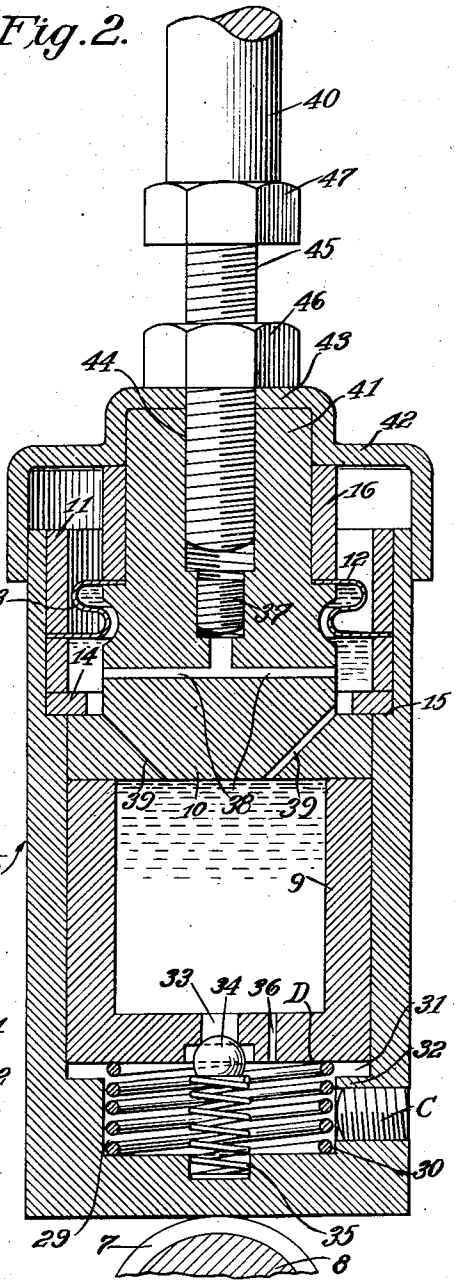


Fig. 2.



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VALVE OPERATING MECHANISM

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3 Claims. (Cl. 123—90)

The present invention relates to improvements in valve operating mechanisms and more particularly to a hydraulic valve tappet.

The primary object of the invention is to provide a hydraulic valve tappet adapted to maintain a zero clearance between the poppet valve of a gasoline or Diesel engine and tappet, thereby eliminating noise occasioned by movement of the above-mentioned parts.

The invention will be fully and comprehensively understood from a consideration of the following detailed description when read in connection with the accompanying drawing which forms a part of the application.

In the drawing:

Figure 1 is an enlarged vertical sectional view showing the invention in use with overhead valve engines.

Figure 2 is an enlarged vertical sectional view showing the invention in use with L head engines.

Referring to the drawing for a more detailed description thereof and particularly Figure 1, the tappet generally designated by the reference numeral 5 is mounted for slidable movement within a casing 6 and is adapted to be actuated by the cam 7 carried by the cam shaft 8. The tappet 5 is cylindrical-shaped, the interior of which is hollow for receiving a hollow piston 9 adapted to contain a fluid of the type used with shock absorbers and having a relatively high boiling point. The upper end of the piston 9 is closed by means of a plunger 10, said plunger resting upon the cylinder in the manner shown.

An annular member 11 is disposed within the upper end of the tappet and supports a metal diaphragm 12 which acts as a seal for the fluid contained within the piston 9. The diaphragm 12 is formed with a bellows 13 to compensate for movement of the tappet and piston, it being understood that the annular member 11 is pressed into engagement with the tappet 5 and moves therewith. A ring-shaped member 14 is positioned betwen the annular member 11 and the flange 15 formed in the wall of the tappet for locking the plunger 10 in engagement with the piston 9. A ring 16 encircles the upper end of the plunger 10 and forms the means of attaching the diaphragm 12 to said plunger.

A cap 17 is slidably held on the upper end of the tappet 5, said cap being formed with a convexed portion 18 disposed within a concaved recess 19 formed in the upper end of the plunger 10. The convexed portion 18 provides a concaved recess 20 for supporting therein the spherical end 21 of the push rod 22 said push rod adapted to operate the rocker arm 23 to which is attached a poppet valve of conventional construction, not shown.

At the present time when associating the rocker arm with the push rod, it is customary to provide a clearance between the spherical end 24 and the concaved recess 25 formed in the upper end of the push rod. However, by means of the present invention such clearance has been eliminated and the spherical end 24 will be held in engagement with the recessed end 25 at all times. The arm 26 on which the spherical end 24 is formed is adjustably held on the end of the rocker arm by means of the nut 27 in engagement with the threaded end 28 of said arm.

A chamber 29 is formed in the lowermost portion of the tappet 5 smaller in diameter than and communicating with the piston receiving opening. A tension spring 30 is positioned within the chamber 29 against which the bottom wall D of the piston 9 rests. The normal position of the piston relative to the spring is shown in Figure 1 of the drawing and it will be noted that a clearance 31 is formed between the bottom wall of the piston and the shoulder 32 formed about the chamber 29. Of course, to be effective in transferring all of the clearance of the valve operating mechanism to the tappet chamber, the clearance 31 would have to be not greater than the maximum clearance permissible under any operating conditions, yet large enough to take care of any expansion of the valve operating linkage during operation. A port 33 is formed in the bottom wall of the piston 9 communicating with the chamber 29, said port being closed by means of a ball valve 34 backed by a spring 35. The pressure of the fluid within the piston 9, during the operation of the tappet, will be sufficient to displace the ball valve against the tension of the spring to permit fluid to enter the chamber 29. A working port 36 of reduced diameter is also formed in the bottom wall of the piston 9 having communication with the chamber 29 for a purpose to be hereinafter described.

Fluid is admitted into the piston 9 through the plugged inlet 37 which inlet communicates with branched conduits 38 emptying into the space B above the plunger 10 the fluid entering the cylinder from said space through the diagonally disposed conduits 39. It will be readily understood that fluid is prevented from escapement from the cylinder by means of the diaphragm seal 13 and that the fluid contained within the chamber 29 serves as a cushion or shock absorber for the piston. The diagonally disposed conduits 39 also permit the displacement of fluid from within the piston 9 into the space B surrounding the plunger 10 and sealed by the diaphragm 13.

A bleeder plug C is provided in the lower end of the tappet 5 having communication with the chamber 29 for draining the fluid from the piston as the occasion demands.

In the operation of the tappet, upon rotation of the shaft 8 the cam 7 moves the tappet 5 ver-

tically through the casing 6 lifting the push rod 22 to actuate the rocker arm and poppet valve. As the tappet 5 is being moved vertically, the fluid within the chamber 29 will be placed under pressure and will be forced through the working port 36 thereby cushioning the contact of the shoulder 32 with the lower end of the piston 9. The poppet valve spring will exert a pressure upon the rocker arm 23, push rod 22 and plunger 10 to return the tappet 5 to normal position during which time the fluid that had been displaced through the working port 36 will be returned to the chamber 29 through the port 33. Also upon the release of the cam 7 from the tappet 5, the tension spring 30 will return the piston 9 to its normal position and at the same time allow fluid to be returned to the chamber 29 through the port 33.

Thus it will be seen that a hydraulic tappet has been devised which provides for the maintenance of a zero clearance between the rocker arm 23 and the push rod 22 which will eliminate substantially all noise of the above-mentioned parts while permitting normal functioning of the valve disposed on the other end of the rocker arm.

In Figure 2 of the drawing the hydraulic tappet is shown in use with an L head engine in which case the valve stem 40 is in direct contact with the tappet and it will be noted that the structure of the tappet is identically the same as that shown in Figure 1 with the exception of the plunger 41 and cap 42. The plunger 41 and cap 42 instead of being recessed as in Figure 1 of the drawing are extended as indicated at 43. The plunger 41 is formed with an interiorly threaded opening 44 for receiving the threaded adjusting screw 45, said screw being locked to the cap by means of a lock nut 46. It will be observed that the lower end of the valve stem 40 is in direct contact with the hexagonal-shaped head 47 of the adjusting screw 45 and that no clearance is provided between these two members, the cushioning action of the fluid within the opening 29 compensating for the clearance provided between the bottom end of the piston 9 and the shoulder 32. The operation of the tappet shown in Figure 2 is identically the same as the operation of the tappet shown in Figure 1 previously described. Adjustment of the tappet and valve stem 40 is accomplished through the screw 45.

The improved hydraulic tappet, either of the form shown in Figure 1 or that in Figure 2 may be used with any construction of valve mechanism adapted for mechanical tappets, and may be used as a replacement for such mechnical tappets.

Also it will be understood, of course, by those skilled in the art that variations in the hereinabove described device involving the substitution of substantial equivalents for the devices described are intended to be comprehended within the spirit of the present invention and that the invention is capable of extended application and is not confined to the exact showing of the drawing nor to the precise construction described and, therefore, such changes and modifications may be made therein as do not affect the spirit of the invention nor exceed the scope thereof as expressed in the appended claims.

What is claimed is:

1. A valve operating mechanism of the character described comprising a hollow substantially cylindrical-shaped member closed at its bottom end and adapted to be reciprocated within a casing, a piston slidably held within said member, said piston being formed with a chamber for housing a fluid, the side walls of the said cylindrical member adjacent the bottom end thereof extending inwardly to form a chamber beneath said piston with the inwardly extending walls forming a stop for said piston, the said piston having a passage providing restricted communication between the said chambers, spring means within the chamber beneath the piston adapted to be compressed upon upward movement of said member for urging said piston upwardly, a plunger for the upper end of said piston serving as a closure for the same, closure means mounted slidably over the upper end of the said cylindrical member and in contact with the said plunger, and means engaging the said closure means for operating the valve upon movement of the said cylindrical member.

2. A valve operating mechanism of the character described comprising a hollow substantially cylindrical-shaped member closed at its bottom end and adapted to be reciprocated within a casing, a piston slidably held within said member, said piston being formed with a chamber for housing a fluid, the side walls of said member adjacent the bottom end thereof extending inwardly to form a chamber beneath said piston with the inwardly extending walls forming a stop for said piston, the said piston having a passage through the bottom wall thereof providing restricted communication between the respective chambers, spring means mounted within the chamber beneath the piston and adapted to be compressed upon upward movement of said member for urging said piston upwardly, a plunger for the upper end of said piston serving as a closure for the same, a cap slidably supported on the upper end of said member, said cap having a concaved central portion in contact with the top of the said plunger, and adapted to retain an arm for operating a valve upon movement of said member.

3. A valve operating mechanism of the character described comprising a hollow substantially cylindrical-shaped member closed at its bottom end and adapted to be reciprocated within a casing, a piston slidably held within said member, said piston being formed with a chamber for housing a fluid, the side walls of said member adjacent the bottom end thereof extending inwardly to form a chamber beneath said piston with the inwardly extending walls forming a stop for said piston, the said piston having a passage through the bottom wall thereof providing restricted communication between the chambers within and beneath the piston, spring means mounted within the chamber beneath the piston and adapted to be compressed upon upward movement of said member for urging said piston upwardly, a plunger for the upper end of said piston serving as a closure for the same, a cap slidably supported on the upper end of said member and forming a closure means for the same, the central portion of said cap being in engagement with said plunger, and means extending through said cap into said plunger for operating a valve upon movement of said member.

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