

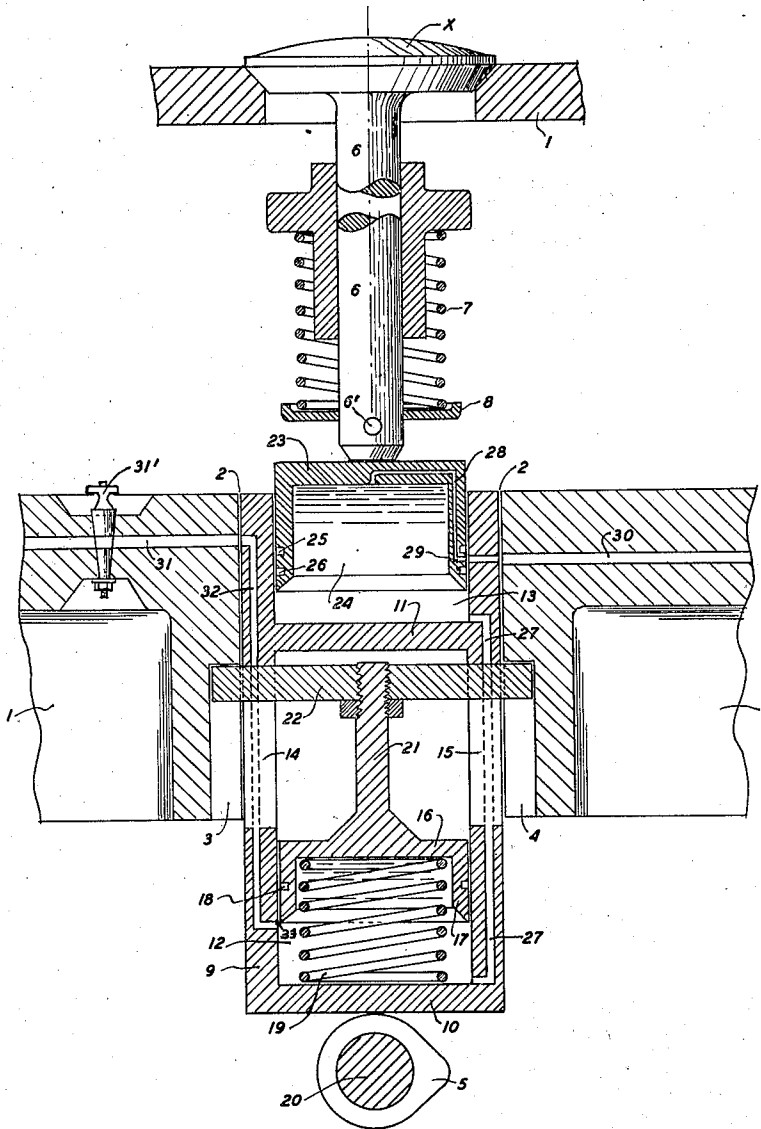
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O. W. METH

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HYDRAULIC EXTENSIBLE VALVE TAPPET

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Oval W. Meth
INVENTOR.

BY Roy Daily
attorney

UNITED STATES PATENT OFFICE

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HYDRAULIC EXTENSIBLE VALVE TAPPET

Orval W. Meth, Sacramento, Calif.

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1 Claim. (Cl. 123—90)

This invention relates more particularly to an hydraulic extensible valve tappet for internal combustion engines.

Among the objects of the invention is to increase the power and efficiency of internal combustion engines by increasing the volume of carbureted fuel intake during the suction cycle.

Another object is to increase the opening speed and lift of tappet valves per unit of cam displacement.

Another object is to delay the closing of exhaust valves to the full piston stroke of the exhaust cycle.

Another object is to eliminate clearance between the valve stem cam and tappet and the incidental noise and inefficiency of such clearance.

Another object is to raise the valve head higher from the valve seat so as to present less obstruction to the incoming fuel mixture and outgoing exhaust gases.

A further object is to reduce the wear and noise of a metal valve seating on a metal valve seat, by retarding and cushioning the descent of the valve assembly; which has a like beneficial effect in the cam assembly. Other objects and advantages will appear as the description progresses.

In the specification and drawing the invention is disclosed in the preferred form. But is to be understood that it is not limited to this form because it may be embodied in modifications within the spirit of the invention as defined in the claim following the description.

In the one sheet of drawing, a valve tappet assembly is shown in vertical section installed in a portion of the engine block, in accordance with this invention.

In detail the structure diagrammatically shown in the drawing comprises the engine block 1, having a cylindrical guide opening 2, and the lateral vertical guides 3, 4, therein.

The valve tappet assembly is interposed between the cam 5 and the valve stem 6, that is surrounded by the spring 7, expanding between the valve stem guide, on the engine block 1, and the washer 8, bearing against the transverse pin 6' through the valve stem, to normally seat the valve K in the usual manner.

The tappet cylinder 9 slides freely within the opening 2 and has the closed bottom 10, and the intermediate partition 11, which divides the cylinder 9 into upper and lower chambers 12, 13. This cylinder has the vertical slots 14, 15, registering with the guides 3, 4, in the engine block.

The stationary piston 16 has the depending skirt 17 sliding freely within the lower chamber 12, with interposed sealing rings, such as 18. The expansive spring 19 interposed between the stationary piston 16 and the bottom 10, normally holds the cylinder 9 depressed so that the bottom 10 rests upon the dwell interval of the cam 5 on the cam shaft 20. A similar spring as 19 may be used in the upper chamber between the dividing wall 11 and the inverted hollow plunger 23. The stem 21 on the piston 16 has the transverse stop bar 22 adjustably mounted thereon and projecting through the slots 14, 15 and abutting the tops of the guides 3, 4.

The upper chamber 13 has the inverted hollow plunger 23, with the skirt 24, sliding freely within the upper chamber with the interposed sealing rings 25, 26. The upper and lower chambers are interconnected by the bypass 27 formed in the wall of the cylinder 9. The plunger 23 has a smaller duct 28 within its wall and opening inside of the head of the plunger 23 and through the skirt 29. The opening of duct 28 at 29 is between the sealing rings 25, 26. The oil line at 31 registers with the upper end of the passage 32 in the wall of the cylinder 1. This provides a free circulation of oil from the usual oil pressure system of the engine, from the line 31, through the passage 32, the lower chamber 12, bypass 27, the upper chamber 13, the duct 28 to the outlet oil line 30, during the dwell interval of the cams as shown in the drawing. This oil pressure normally holds the upper plunger 23 elevated into contact with the end of the valve stem 6, and the cylinder head 9 in pressure contact with the cam 5, without clearance or lost motion between the cam and valve stem. Any air bubbles in the oil pressure system would accumulate in the top of the upper plunger 23 and escape into the outlet 30. Thus assuring a compact body of oil in the tappet system of the invention. A valve such as 31' in the inlet oil line 31, may be used to regulate the flow of oil to the tappet assembly.

The invention operates substantially as follows: The rise of the cam 5 lifts the bottom of the cylinder 9, against the tension of the spring 19 and stop bar 22. This lifts the whole tappet assembly and displaces the oil from the lower chamber 12, through the bypass 27 into the upper chamber 13, which has the same superficial area and capacity as the lower chamber. The oil filling the chamber 13 lifts the plunger 23, and the valve stem 6 and opens the valve X on its upper end.

The volumetric displacement from the lower chamber 12, displaces the plunger 23 upward higher and at greater speed than the rise and speed of the larger cylinder 9. In this manner increasing the mere height and mechanical lift of the cam 5, if directly acting against the valve stem 6 in the usual practice.

In the present instance the valve rising faster increases the length of the time interval in the fuel intake cycle, increasing the fuel volume taken into the engine cylinder during the suction cycle. The rise of cylinder 9 upon the skirt 17 of the stationary piston 16 shuts off the lower end of oil passage 32 at 33, and the rise of the skirt 24 on the upper plunger closes the escape of oil through the line 30, leaving the tappet assembly packed with oil to capacity.

As the cam 5 begins its descent the lowering of the cylinder 9 under the tension of the spring 19 and the tension of the spring 7, provides space for the oil being displaced from the upper chamber through the bypass 27 by the expansion of the valve spring 7, until the duct 28 again registers with the outlet line 30. This bypass opening 27 being relatively small, acts as a dash pot restricting the flow from the upper chamber 13 and retarding the closing of the valve of the stem 6. This retards the closing of this valve X at the end of the intake cycle, thereby lengthening the suction cycle and increasing the volume of fuel gas taken into the engine cylinder.

When the hydraulic tappet assembly, according to this invention, is interposed between the cam 5 and the stem 6 of the exhaust valve assembly, the mode of operation and the mechanical effect is the same. Except that the exhaust valve opening faster and higher, effects an earlier initial exhaust cycle, with a retarded closing of the exhaust valve, which increases the exhaust interval. This improves the scavenging efficiency, and leaves practically no residual burned gases in the engine cylinder to dilute the incoming fuel of the succeeding suction cycle.

Some of the advantages of this invention are, increased horse power output, due to more efficient valve operation in the suction and ex-

haust cycles; improved thermal efficiency due to an increased volume of cold fuel gases and a more complete exhaust of hot burned gases; less wear and tear on valve assemblies and valve seats, due to retarded closing and the absence of noisy tappet clearances. Motor balance is improved and greater speeds are possible because of the improved general performance of the reciprocating parts under better balanced stresses.

In overhead valve in the head systems having rocker arms working directly on the valve stems, the present invention can be interposed between the cam actuated push rods and the rocker arms; or otherwise applied to the various types of tappet valves.

Having thus described this invention and its mode of operation, what is claimed and desired to secure by Letters Patent is:

In an internal combustion engine having a block with an oil line with a valve therein, a cylindrical guide, and a cam and valve stem operative therein; an extensible tappet assembly comprising a cylinder having side slots through its wall and slidable in said guide with its bottom resting on said cam and an inlet oil passage in its wall registering with said oil line and terminating near said bottom; and an outlet passage through said wall registering with the outlet opening of said oil line, whereby the passage of oil through said line is stopped when said cylinder is lifted by said cam; a partition dividing said cylinder into lower and upper chambers connected by a bypass in the wall of said cylinder; a stationary piston in said cylinder below said partition and having a stem fixed in a stop bar extending through said slots and engaging said block; a spring expanding between said stationary piston and said bottom; a hollow plunger slidable in said cylinder above said partition and having a top bearing against said valve stem and having an oil duct open to the top of said upper chamber and extending through the wall of said plunger and registering with said outlet passage through the wall of said cylinder.

ORVAL W. METH.