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HYDRAULIC TAPPET

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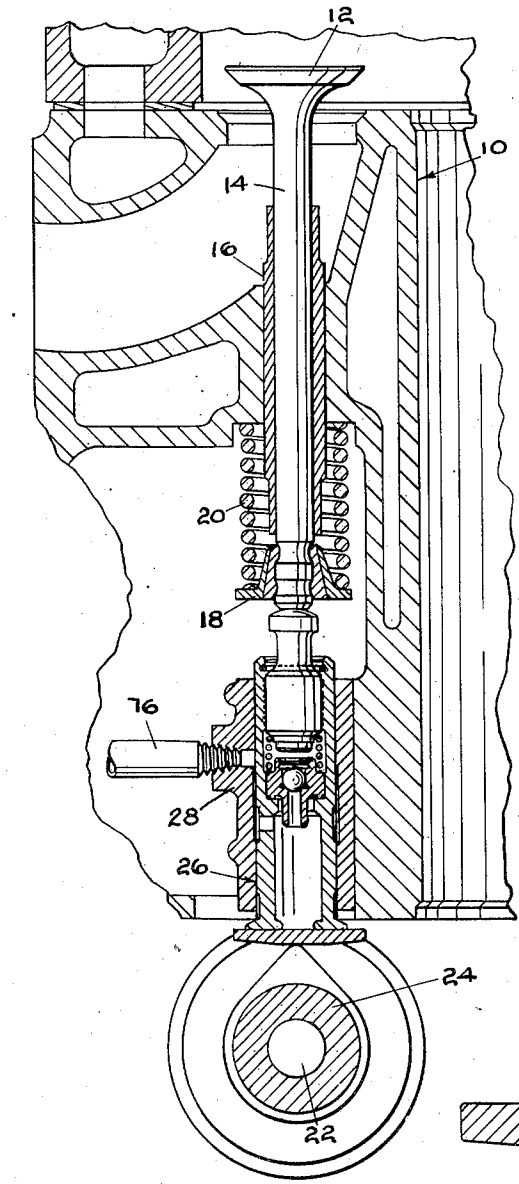


Fig 1

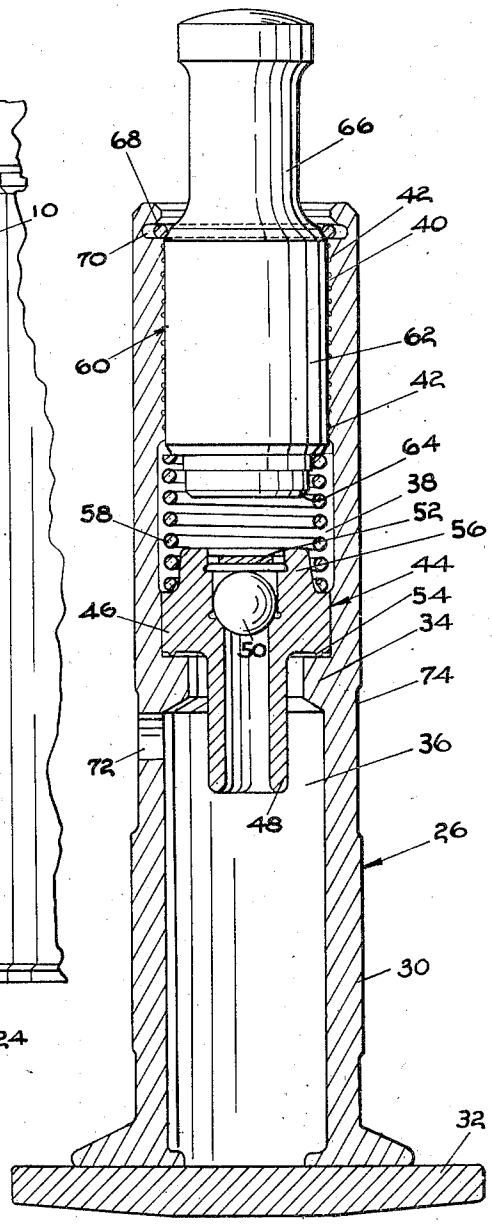


Fig 2

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HYDRAULIC TAPPET

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This invention relates to poppet valve controlled internal combustion engines and more particularly to hydraulic tappets associated with the valve gear system thereof.

Broadly the invention comprehends a compensating hydraulic tappet adapted to be incorporated in a valve gear system of simple and economical construction having a unitary assembly hydraulic compensating mechanism for insertion directly into the tappet body proper.

Heretofore the complexity of design of hydraulic tappets together with the cost of manufacture thereof has curtailed the adoption of hydraulic tappets for use in all but the most expensive internal combustion engine power motor vehicles. The instant invention is aimed at providing a simple, economical, and effective hydraulic tappet adaptable for use in low priced motor vehicles.

An object of the invention is to provide a simple, two-unit assembly hydraulic tappet.

Another object of the invention is to provide a single cylinder tappet having an assembly unit comprising a plunger, spring, and valve unit disposed therein.

A further object of the invention is to provide a hydraulic tappet of a minimum number of parts, said parts being easily assembled into a compact, effective unit.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawing forming a part of the specification and in which:

Figure 1 is a longitudinal sectional view of a fragmentary portion of a conventional internal combustion engine incorporating hydraulic tappets of the type constituting the invention; and

Figure 2 is an enlarged longitudinal sectional view of the hydraulic tappet.

It has become most desirable in the construction of internal combustion engines employing valve gear train to incorporate hydraulic compensating tappets in the gear train for the purpose of silently and effectively maintaining the operating clearance thereof at zero or no-clearance relation despite variations in temperature and wear of parts. Although hydraulic tappets have proven their value in terms of effective operating characteristics, the cost of manufacture and assembly thereof has limited the extent of use up to the present time.

The present invention embodies all the outstanding features of previously developed hydraulic tappets plus the feature of simplicity of design whereby the overall cost of production

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comparable to other hydraulic tappets is greatly reduced.

The structural design feature of this invention resides in the provision of a cylindrical body adapted to receive an assembly unit consisting of a plunger reciprocable in the body, a valve unit adapted to rest on a shoulder in the cylinder, and a spring interposed between the plunger and valve unit having its ends in gripping relation upon the valve unit and plunger for urging the plunger outwardly with respect to the cylinder and valve unit and a floating snap ring on the internal surface of the cylinder at one end thereof adapted to be expanded upon passage of the assembly unit therethrough and contraction thereof after the passage therethrough to retain the unit in the cylinder. In addition to the plunger, spring, and valve unit being insertable in the cylinder body as an assembly structure, they may be inserted individually, depending on the mode of assembly found to be preferable; but regardless of the method of assembly used, the plunger, spring, and valve unit will always be joined together upon removal from the cylinder body. Furthermore, with the plunger spring, and valve unit in inserted position in the cylinder wherein the snap ring retains the plunger from normal outward movement from the cylinder, a light axial rotary pull on the plunger is sufficient for the easy extraction of the plunger, spring, and valve unit whereas a much greater direct axial force will not free the assembly from the cylinder. Because of this last feature, a normal non-rotative relation existing between the plunger and cylinder during the operation of the tappet will have no tendency to force the plunger from the cylinder; while at the same time wherein necessity for repair of the tappet is required, the plunger, spring, and valve unit may be readily removed for inspection, repair, or replacement if necessary.

Referring to the drawings for more specific details of the invention, 10 represents generally an engine casing having a poppet valve 12 provided with a stem 14 extending through and reciprocable in a valve stem guide 16 mounted in the engine casing. The stem is provided with a valve spring support 18 for supporting one end of a spring 20 interposed between a portion of the engine and the support, said spring adapted to urge the valve toward its seated position.

A cam shaft 22 has a cam 24 fixedly secured thereto, said cam engaging one end of a tappet 26 interposed between the valve stem and cam.

The tappet 26 is reciprocable in a tappet guide

28 suitably secured in the engine casing 10 and includes a hollow cylindrical body 30 closed at one end by a hardened disc member 32 welded or otherwise fixedly secured to the body adapted to be engaged by cam 24, said body having an annular internal shoulder 34 substantially intermediate the length thereof dividing the body into a reservoir 36 and a compression chamber 38. The bore 40 of said chamber has a helically disposed groove 42 formed therein extending from the lower end to the upper end thereof.

The groove 42 provides for the proper rate of leak down the walls of the cylinder from the compression chamber between the valve unit and the base of the plunger, assists in centralizing the plunger in the cylinder by insuring an ample supply of oil to all the surfaces thereof to thus eliminate cocking of the plunger in the cylinder, and additionally provides for the carrying off of any foreign material that may find its way between the cylinder and plunger thereby discharging it quickly from any position where it might tend to score or wear between the cylinder and plunger.

Inserted in the chamber 38 and supported in sealing engagement on shoulder 34 is a valve unit 44 comprising a valve body 46 having a hollow suction tube 48 extended well down into the reservoir 36 when the valve unit is in seated position, a one way ball check valve 50 arranged to be seated in the body over the passageway through the hollow tube for controlling communication between the compression chamber and reservoir and an apertured retaining member 52 suitably secured in the valve body above the check valve 50 to afford limited predetermined valve opening movement. The valve body is also provided with an annular depending projection 54 adapted to provide effective sealing contact with the shoulder 34 and a reduced portion 56 for the receipt in gripping engagement of one end of a spring 58, said spring firmly embracing the valve body when placed in concentric encompassing relation.

A plunger 60 reciprocable in the bore 40 includes a body 62 having close fitting relationship with the bore 40, a reduced portion 64 adapted to be received by the other end of spring 58 in snug fitting relationship, and a valve stem contacting portion 66 extending beyond the body when the plunger is held in assembled position therein. The plunger 60 is extended outwardly by the spring 58 interposed between the valve unit 44 and plunger and retained to a predetermined limited extension by a snap ring 68 seated in a groove 70 in the wall of the cylinder body, said groove being of greater diameter than the normal external diameter of the snap ring so that the snap ring may be expanded into said groove and thus provide for the insertion and extraction of the plunger 60, spring 58, and valve unit 44 without necessitating the removal of the ring from the groove once it is assembled therein.

The reservoir 36 communicates with a suitable oil supply through opening 72 in the wall of the cylinder body, an annular external groove 74 in the cylinder interconnected with opening 72, and oil pipe line 76 in the tappet guide communicating with the annular groove 74.

Inasmuch as the operation of this type of tappet construction is well known, it is not deemed requisite that a detailed description be made. Because of the specific features of structure shown and described, several new advantages accrue especially relative to the facility of assembly of

the parts thereof. One of these is the possible sub-assembling of the plunger 60, spring 58, and valve unit 44 into an integral unit for insertion as such in the cylinder body or the individual insertion of the valve unit 44, spring 58, and plunger 60, in that order, into the cylinder body, said members assuming an assembled position within the cylinder body such that upon extraction the members will comprise as assembled a unit as if initially integrally in assembled relationship. Furthermore, the snap ring 68 which is floatable in groove 70 may be initially inserted therein, and the plunger 60, spring 58, and valve unit 44 pressed into the cylinder past the snap ring as the ring is expanded radially into the greater depth of the groove by these members, said ring returning to its normal size after the passage therethrough of the plunger, spring, and valve unit and serving to effectively retain the assembled unit therein against the spring exerting an outward force on the plunger, and the inertia forces imparted to the assembled unit during the operation of the tappet. When it is desired to extract the assembled unit from the cylinder body for inspection, repair, or replacement, a slight axial rotative pulling force applied to the plunger will provide for the easy removal thereof although the ring is effective to resist a much greater axial force.

While this invention has been described in connection with certain specific embodiments, the principle involved is susceptible of numerous other applications that will readily occur to persons skilled in the art. The invention is, therefore, limited only as indicated by the scope of the appended claims.

What I claim is:

1. In a hydraulic tappet, a cylinder, a snap ring fitted for radial expansion in one end of the cylinder, a plunger reciprocably mounted in said cylinder adapted to be inserted and removed past the snap ring, valve means for admitting and trapping liquid medium between said plunger and said valve means, and a spring interposed between the plunger and valve means biasing the plunger outwardly with respect to said cylinder, the ends of said spring having gripping relationship respectively with the plunger and valve means.

2. In a hydraulic tappet, a tappet body having a longitudinal bore closed at one end and an internal shoulder substantially intermediate the length of the body separating the body into a compression chamber and a reservoir, a plunger reciprocably mounted in the compression chamber, a valve unit seated on the shoulder comprising a valve body, a tubular portion extending into the reservoir and one way check means in the body controlling communication between the reservoir and compression chamber, a spring interposed between the plunger and valve unit coupling the plunger to the valve unit for biasing the plunger outwardly with respect to the tappet body and urging the valve unit to its seat on the shoulder, and a floating snap ring loosely mounted for radial expansion in the open end of the tappet body for normally retaining the plunger in the compression chamber.

3. In a hydraulic tappet, a cylinder having a closed end and an annular internal shoulder separating the cylinder into a reservoir and compression chamber, a valve unit seated on the shoulder having means incorporated therein for controlling communication between the reservoir and chamber, a plunger reciprocably mounted in

the compression chamber, a spring interposed between the plunger and valve unit coupling the plunger and valve unit together, and a snap ring mounted freely in the open end of the cylinder for normally retaining the plunger in the cylinder, said plunger, spring, and valve unit being insertable and extractable from the cylinder without necessity of removing the snap ring from the cylinder.

4. In a hydraulic tappet, a cylinder having a closed end and an annular internal shoulder separating the cylinder into a reservoir and compression chamber, a valve unit seated on the shoulder having means incorporated therein for controlling communication between the reservoir and chamber, a plunger reciprocably mounted in the compression chamber, a spring interposed between the plunger and valve unit coupling the plunger and valve unit together axially disposed from one another, and a snap ring mounted freely in the open end of the cylinder for normally retaining the plunger in the cylinder, said plunger, spring, and valve unit being insertable and extractable from the cylinder without necessity of removing the snap ring from the cylinder, the wall of said compression chamber having a helical groove throughout the length thereof thus providing a fluid leakdown and foreign matter passage between the plunger and cylinder wall.

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