Dec. 23, 1941. R. W. OSBORN 2,267,535

HYDRAULIC TAPPET

Filed March 6, 1941

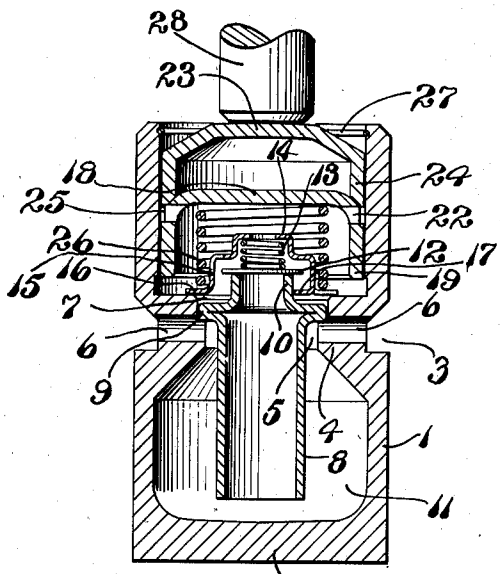

Fig. 1.

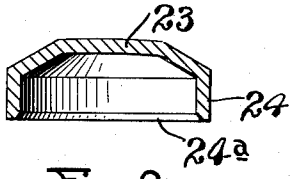

Fig. 2.

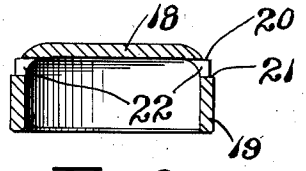

Fig. 3.

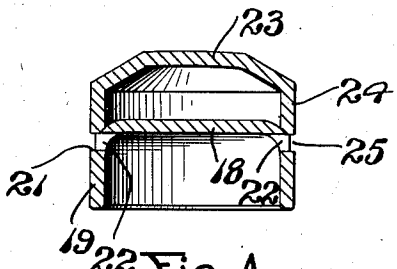

Fig. 4.

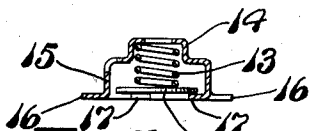

Fig. 5.

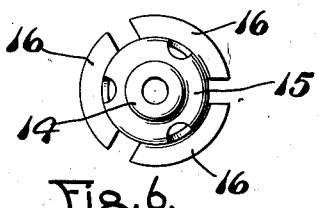

Fig. 6.

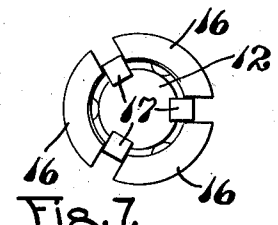

Fig. 7.

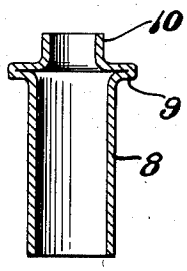

Fig. 8.

Inventor
Ralph W. Osborn
By Livernace and
Van Antwerp
Attorneys

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HYDRAULIC TAPPET

Ralph W. Osborn, Muskegon Heights, Mich., assignor to Johnson Products, Inc., Muskegon Heights, Mich., a corporation of Michigan

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7 Claims. (Cl. 123—90)

This invention relates to hydraulic tappets and is concerned with improvements in connection therewith whereby economy in manufacture of parts and in their assembly is greatly facilitated, resulting in an ability to manufacture the tappets and sell them at a price which can be afforded by the purchaser of large quantities thereof for use in internal combustion engines, and with a profit to the manufacturer.

A further object of the invention is to provide a tappet construction which is particularly practical and efficient in use, which will not get out of order and which has no parts liable to need replacement or repair. At the same time if replacement of parts is needed or if the tappet needs to be disassembled for cleaning or other service the construction lends itself in a particularly effective way to serve such purpose.

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 longitudinal vertical section through a hydraulic valve tappet constructed in accordance with my invention.

Figs. 2 and 3 are similar sections through the two parts of the movable piston member of the tappet as they are manufactured and previous to their connection.

Fig. 4 is a similar central vertical section after the two parts shown in Figs. 2 and 3 have been welded together to make the complete piston.

Fig. 5 is a vertical section through a sheet metal valve cage in which a flat plate valve is held.

Fig. 6 is a plan view of the structure shown in Fig. 5.

Fig. 7 is an under view thereof, and

Fig. 8 is a longitudinal vertical section through the sleeve member which extends into the oil reservoir of the tappet and makes a communication between said oil reservoir and the under side of the piston, the upper end of said sleeve being normally closed by the flat plate valve shown in Fig. 5.

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

The body 1 of the valve tappet is of a cylindrical form and is substantially hollow, open at its upper end and integrally closed at its lower end by the bottom 2, the under side of which is designed to bear against a cam of the cam shaft of an internal combustion engine. Intermediate the upper and lower ends of the body and continuous around the same is an annular groove 3. The body is thickened inwardly at the place where such groove is made, providing a continuous annular rib or ledge 4 as shown surrounding a central opening 5. A plurality of horizontal holes 6 connect the groove 3 with the opening 5. The opening 5 extends upwardly part way through the rib or ledge 4 at the upper part of which there is a larger shallow opening 7 extending from the upper end of the opening 5 to the upper side of said rib or ledge 4.

A sleeve member which may be drawn and pressed from flat stock consists of a lower cylindrical relatively long sleeve portion 8, an outwardly extending continuous horizontal rib 9 and an upper short sleeve section 10, the diameter of which preferably is less than that of the lower section 8. The rib 9 is provided by extending the tubular sides of the member outwardly as shown in Fig. 8 so that the rib consists substantially of two thicknesses of the metal integrally connected at their outer edges, the two thicknesses of metal lying against each other. The outer edge of the rib 9 is of a diameter such that it may be forced into the upper shallow opening 7 in the rib 4 previously described, the connection being a tight one or a press fit. This closes off in the lower part of the body 1 an oil reservoir or chamber 11 into which the lower sleeve portion 8 extends, nearly to its bottom as shown in Fig. 1. The oil reservoir 11 is connected through the opening 5 and the passages 6 with the groove 3.

A flat metal valve 12 of circular outline normally rests upon the upper end of the upper sleeve section 10 being pressed thereagainst by a light coiled spring 13 which with the valve is housed and retained in a sheet metal cage. The cage has an upper extension 14 of a diameter sufficient to receive the upper end of the spring 13, and a lower larger cylindrical portion 15 at the lower edges of which a horizontal flange 16 is turned outwardly. From the flange a plurality of fingers 17, shown as three in number, are struck and turned inwardly to lie underneath the plate valve 12. When the cage with the valve and spring therein is assembled in the structure it is placed over the upper part 10 of the sheet metal sleeve, the inner ends of the fingers 17 guiding the cage into place by reason of their close proximity to the outer sides of the part 10. The flange 16 extending outwardly goes beyond the limits of the opening 7 and lies upon the upper side of the rib or ledge 4 (see Fig. 1).

In the upper open portion of the body 1 a piston of a special construction is mounted.

In producing this piston a lower part of inverted cup shape form is pressed from flat metal having a top 18 and cylindrical sides 19. The outer edge portions of the top 18 are curved outwardly and downwardly and meet a narrow annular ledge 20 as shown in Fig. 3. The outer diameter of the member at such ledge 20 is slightly less than the outer diameter of the depending sides 19 and is continued downwardly for a short distance until a second narrow annular ledge 21 is reached, said ledge 21 forming a junction with the outer sides of the depending sides 19 of said cup member. At this position between the ledges 20 and 21 horizontal openings 22 are made through the member as shown. The upper member of the piston is also pressed from flat metal having a top 23, preferably of the form shown, with depending sides 24 which at their inner portions and at their under edges are shaped with a curved annular recess 24a as shown, to fit the downwardly and outwardly curved sides of the top 18 where it joins with the depending sides of the first member.

The two members are placed together as shown in Fig. 4 fitting closely at their contacting points and are securely welded to make in effect an integral structure. The outer diameter of the depending sides 24 is the same as that of the depending sides 19 thereby providing in the completed structure a continuous shallow groove 25 with which the passages 22 connect.

The interior of the upper portion of the body 1 is properly machined to a prescribed size and the exterior diameter of the piston is likewise machined so as to fit therein with a reasonably close fit but not be tight or binding so that the piston member may have free vertical movements within the tappet body. A coiled compression spring 26 surrounds the valve holding cage previously described, bearing at its lower end upon the flange 16 and at its upper end against the under side of the part 18 which forms a horizontal partition through the assembled piston. The usual retaining snap ring 27 of spring wire material is seated in the groove at the inner side of and at the upper end of the body. The valve stem 28, of the internal combustion engine of which this tappet is a part, holds the piston in an intermediate position between the snap ring 27 and the bottom of the upper chamber of the body of the tappet.

The valve tappet described is used in an engine in the usual manner of hydraulic tappets mounted for reciprocation in a guide and with a communication for the passage of oil under the pressure of the oil pump of the engine to supply oil continuously to the groove 3 which will be closed at its outer portions by the guide for the tappet, therefore the reservoir at 11 is supplied with oil which enters at the lower end of the sleeve portion 10 by going past the valve and passing through the openings in the side and top of the sheet metal cage, said cage being vented with openings for such purpose. This provides oil to fill the hydraulic chamber underneath the part 18. The openings at 22 will permit escape of air contained in the tappet before the oil was let into the tappet, into the groove 25 and thence upwardly between the walls of the piston and the inner walls of the tappet body. After this initial air is once expelled from the hydraulic chamber it very seldom happens that any more air ever gets into it, but if it does, it is expelled in the same way. It is not necessary to describe the operation of the tappet in detail as such tappets in general are known in the art.

The construction lends itself particularly to simplicity of manufacture and assembly with a resultant economy. The parts of the tappet which need to be machined are the outer curved sides and the under flat side of the body, the inner sides of the upper portion of the body, the outer sides of the piston, the edges of the rib 9 and the sides of the shallow recess at 7. And by machining is meant a making to accurate size which so far as the sheet metal parts are concerned is accomplished by dies. The assembly is merely forcing the sleeve member 8, 9, 10 into place, putting the valve cage over the projecting upper end 10, then putting the spring 26 in position, inserting the piston and finally the retaining spring ring 27. The construction is particularly simple. It is effective in practical use.

The construction of tappet described is very practical from a manufacturing standpoint. On forcing the sleeve member 8, 9, 10 into place, the middle portion of the body 1 is slightly enlarged exteriorly, and the bottom portion of the open upper half of the body is likewise enlarged. But with this construction the outer cylindrical surface of the body is ground to remove any slight intermediate enlargement while the interior of the upper portion of the body is bored to make the inner walls vertical and not tapered at any portion, the assembly of the valve unit, the spring 26 and the piston being done after the final machining operation of interiorly boring the upper end portion of the body 1.

A further feature of advantage of the tappet resides in the shallow recess or reservoir at 7 above the rib 9 on the central sleeve member. Any dirt or other foreign material which might get in the oil and, if it should become interposed between the upper end of the part 10 and the lower side of the valve 12 would interfere with the operation, settles into such shallow recess 7 and stays there indefinitely, not being stirred up or affected in any manner.

The piston construction illustrated in Figs. 2, 3 and 4 is of particular utility. It can be manufactured from flat metal by dies, greatly reducing the expense of production over pistons which might serve the same purpose made from solid bar stock. After the parts are welded together, all surfaces except those housed within the upper member 23 are hardened and the outer cylindrical surfaces ground to accurate size. The piston is light but is very strong by reason of its constructive design.

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, a hollow cylindrical body open at one end and closed at the other and having an inwardly extending annular ledge at its inner side, there being an opening through the ledge enlarged at its upper portion, and a sleeve member provided a short distance below its lower end with a continuous annular rib inserted downwardly through said opening in the ledge and forced with a press fit at said rib into the larger upper portion of said opening, as specified.

2. In a hydraulic tappet, a hollow cylindrical body open at one end and closed at the other and having an inwardly extending annular ledge at its inner side, there being an opening through

the ledge enlarged at its upper portion, and a sleeve member provided a short distance below its upper end with a continuous annular rib inserted downwardly through said opening in the ledge and forced with a press fit at said rib into the larger upper portion of said opening, with the upper side of the rib in a plane below the upper side of said ledge, providing a shallow annular space around the sleeve above the rib.

3. The improvement in hydraulic tappets, wherein the tappet has a hollow cylindrical body closed at one end and open at the other and has an inwardly extending ledge with a central opening therethrough disposed between the upper and lower ends of the body and within the same, and is provided with a piston hollowed out at its under side above said ledge, said improvement consisting in providing a vertical sleeve drawn from flat metal and formed a short distance below its upper end with an outwardly extending continuous annular rib connected with the ledge and transversely filling the opening through said ledge, a flat valve lying against the upper end of the sleeve, a spring bearing against said valve, a sheet metal cage open at its lower side enclosing the valve and spring into which the upper end of the sleeve member extends, said cage at its lower end bearing against the upper side of the ledge, and a coiled compression spring means between said piston and said cage, said means extending upwardly into the lower hollowed out portion of the piston.

4. In a hydraulic tappet, an oil reservoir and a hydraulic chamber therein, a vertically positioned sleeve member having a lower relatively elongated sleeve portion, an upper much shorter sleeve portion and an integral outwardly extending continuous annular rib of circular outline between the upper and lower portions of the sleeve, said rib adapted to have a pressure fit against the body of the tappet to form a liquid connection between said oil reservoir and hydraulic chamber.

5. A construction comprising the sleeve member as defined in claim 4, a flat valve adapted to lie over the upper end of the sleeve member, a coiled compression spring bearing at one end against the upper side of the valve, a sheet metal cage covering the spring and valve and surrounding the upper end portion of the sleeve member, said cage being open at its lower side and having an outwardly extending flange at its lower edges with fingers struck from said flange and turned inwardly toward each other, the ends of said fingers lying closely adjacent the outer sides of the upper end of said sleeve member thereby locating cage, valve and spring with reference to the upper portion of the sleeve member.

6. In a hydraulic tappet, a cylindrical hollow body closed at its lower end and open at its upper end and provided with a continuous inwardly extending horizontal ledge at its inner sides between its upper and lower ends, said ledge having a central opening therethrough which is enlarged at its upper end portion, and said body having an exterior groove between its upper and lower ends at the outer portions of said ledge with horizontal passages extending from said groove through the ledge, a tubular sleeve member inserted at its lower portion downwardly through said opening and provided with a rib having a circular outline located in the upper enlarged portion of said opening through the ledge and in tight engagement with the sides thereof, the upper side of said annular rib being below the upper side of the ledge, a piston mounted within the upper portion of the body having a recessed under side, the upper end portion of the sleeve member extending above said ledge, a plate valve covering the upper end of the sleeve member, a spring bearing against the upper side of the valve, a sheet meal covering cage ventilated by openings therethrough housing said spring and valve and at its lower edges provided with an outwardly extending flange bearing against the upper side of the ledge, said flange having fingers struck therefrom and turned inwardly toward and positioned around the upper end of the sleeve member, and a coiled compression spring engaging at its lower end with said sheet metal cage and at its upper end against the piston at the upper part of the recessed under portion thereof.

7. A hydraulic tappet having an oil reservoir and a hydraulic chamber therein, an opening between the oil reservoir and hydraulic chamber, a vertically positioned sleeve member extending at its lower end into the oil reservoir and at its upper end into the hydraulic chamber, and a laterally extending continuous annular rib on said sleeve member closing said opening and having a pressure fit with the body to maintain a liquid tight exclusion between said oil reservoir and hydraulic chamber except lengthwise through the interior of the sleeve.

RALPH W. OSBORN.