

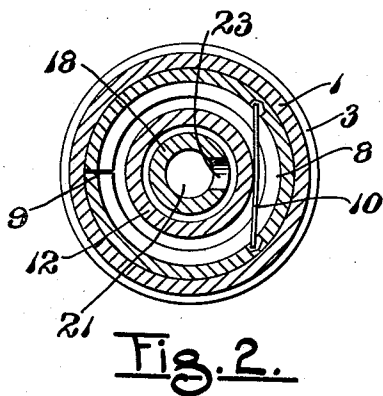
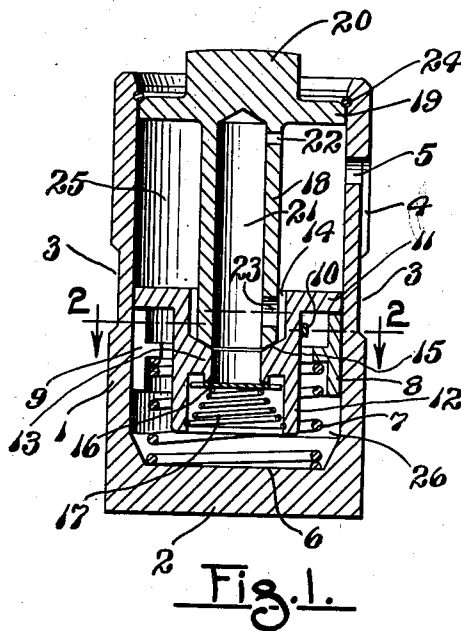
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HYDRAULIC TAPPET

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HYDRAULIC TAPPET

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This invention relates to self-adjusting valve tappets used in internal combustion engines, of the type which are automatically hydraulically operated. The present invention is directed to useful improvements in hydraulic self-adjusting valve tappets to attain economy of production and ease of assembly, and wherein the oil in an oil reservoir chamber is located above the hydraulic or pressure sustaining chamber, said latter chamber being maintained with oil therein so that there will be no gaps between an end of the tappet and the end of a valve stem which rests against the tappet, the valve on said valve stem being moved in the usual manner by a rotating cam shaft against a relatively heavy valve spring to open a port in the engine.

With the construction which we have devised, the length of the tappet may be materially reduced, thereby making it possible to use these valve tappets in restricted spaces between a cam shaft and the end of the valve stem of the valve with which it is associated. Furthermore, the assembly of the parts to make up the valve tappet is accomplished without requiring any pressing fits which would be liable to distort the thin walls of the tappet body, and there is a further novel construction which eliminates any danger of the parts binding against each other or tilting so as to permit escape of oil which would materially reduce or defeat the efficiency of the tappet.

Various other objects and purposes with novel constructions for securing the same will be apparent upon an understanding of the invention, had from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a vertical section taken centrally of a valve tappet in one form embodying our invention, and

Fig. 2 is a horizontal section substantially on the plane of line 2—2 of Fig. 1, looking downwardly as indicated.

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

In the construction of the tappet a hollow cylindrical body 1 of cast metal, preferably cast iron, is provided, being integrally closed at its lower end, as at 2. Around the outer curved side of the body a shallow and relatively wide continuous horizontal groove 3 is made, from which at one point a vertical groove 4 extends upwardly to join with an opening 5 made through the wall 1 of the tappet body to the interior space thereof. The tappet body at such interior space 5 is machined to cylindrical form and at the bot-

tom of the opening a flat seat 6 is provided on the upper side of the closed end 2, joining with the vertical cylindrical walls by a conical section as shown.

A coiled compression spring 7 is seated at its lower end upon said flat seat 6 and is guided to a central position thereon by reason of the conical section previously mentioned. A ring 8 of T-shape in cross section as shown, parted at one side at 9, is inserted within the cylindrical body 1, the inwardly extending leg of the T-shaped section bearing against the upper end of the spring 7. This ring 8 has similarities to piston ring packings, that is, the ring normally tends to spring open at the parting for a short distance when free to do so, so that when it is placed within a cylindrical opening and is contracted to substantially close the parting, its tendency to spring outwardly causes the outer curved surface of the ring to bear with pressure against the cylindrical walls of the cylinder in which it is located. The ring 8 at one side, substantially opposite the parting 9, carries a bar 10 of spring material, the purpose of which, as will later appear, is the same as that disclosed in the patent to C. E. Johnson, No. 2,175,465, granted October 10, 1939.

A member is placed in the cylinder over the ring 8 which includes an upper flange 11, the exterior diameter of which is slightly less than the interior diameter of the body 1, and from the flange a cylindrical sleeve 12 extends downwardly through the ring 8, with the spring bar 10 bearing against one side of the sleeve and flexed outwardly so that the tendency of the spring bar to return to its normal position pushes the flange 11 against the interior wall of the tappet body 1 over the parting 9 of the ring. Said sleeve 12 between its upper and lower ends is provided with an integral inwardly extending continuous annular ledge 13 with a central opening through it, and above which, is a downwardly extending cylindrical opening 14, at the lower end of which the ledge 13 is machined to provide a substantially conical seat 15. At the lower side of the ledge 13 and covering the central opening therethrough, a valve 16 of thin flat metal is located which is normally held in an upper position to close said opening, by a light strength coiled spring 17, the lower coil of which is seated in a groove adjacent the lower end of the sleeve 12.

In the upper portion of the tappet a member is located including a central stem 18, at the upper portion of which is an outwardly extending continuous annular flange 19, which like the

flange 11, has an exterior diameter slightly less than the interior diameter of the tappet body; and above the flange and directly over the stem 18 is a head 20, against the outer end of which the end of a valve stem may bear, with the lower end 2 of the tappet body bearing against a cam on a cam shaft. The stem 18 is of sleeve-like form, having a central vertical opening 21 therein, an opening 22 being made through the upper portion of the stem and a second opening 23 near the lower portion thereof to communicate with the interior 21. The lower end of the stem is shaped so that it seats against the conical seat 15 previously described. A parted snap spring retaining ring 24 is seated in a groove adjacent the upper end of the tappet body and engages with the flange 19 to hold the assembly together when the tappet is not in an engine.

In the manufacture of the tappet the body may be completely machined and finished at its outer surfaces and also its inner cylindrical wall and the seating face 6 completely machined and finished. Then the parts which are assembled therewith are merely introduced one after the other into the tappet body, first the spring 7, then the split ring 8, thereafter the member having the flange 11 and sleeve 12 thereof inserted in place, valve 16 and spring 17 having first been put in place, passing freely into the tappet body without the necessity of any press fits which would distort the relatively thin walls of the body, and thereafter the last member consisting of the stem 18, flange 19 and head 20, with a snapping of the retaining ring 24 in place at the end of the assembly.

It is of course to be understood that the tappet in use is installed in a tappet guide sleeve therefor and that the oil under pressure from the oil system of the engine is pumped so that the space made by the groove 3 between the tappet body and the surrounding guide sleeve is continuously filled with oil under pressure. This is old and well known in the art and is shown for example in the Patent No. 2,145,484, issued January 31, 1939, to Charles E. Johnson. Said oil under pressure will follow the groove at 4 to the opening 5, thence into the oil supply reservoir chamber 25, which surrounds the vertical stem 18 and is located between the flanges 10 and 19. The exterior diameter of the stem 18 is less than the interior diameter of the recess at 14 so that the oil can flow freely through the passage at 23 into the vertical opening in said stem 18 and thence come against the upper side of the valve 16.

In the operation of the engine, if the chamber at 26 below the flange 11 is not sufficiently filled with oil, the pumping action which takes place through the downward and upward movement of said flange 11 under the pressure influence of the valve stem against the head 20, and a return movement imparted by the spring 7, will cause the valve 16 to unseat on said return movement and permit oil to flow into the chamber 26 until it is sufficiently filled that further reciprocating movement of said flange 11 and the parts associated therewith does not take place. The chamber 26 which may be called a hydraulic or pressure chamber is thus automatically filled with oil to the necessary amount and extent, immediately after the engine has been started, if at the time the engine is started there is any deficiency of oil in the chamber 26. The opening at 22 permits any escape of air which may arise from the oil within the stem 18.

In this construction it will be noted that the

bar 10 which moves the flange 11 to the left and over the parting 9 in the ring 8, does not, because of such movement, affect the vertical position of the stem 18 or the horizontal position of the flange 19. Thus there is no binding of said flange 19 against the inner cylinder walls of the tappet body, nor is there any tilting of the flange to the horizontal or lateral movement thereof which would make a vertical separation at any point from the inner walls of the body 1. This is a desirable feature of the invention, insuring against undue and excessive leakage of oil which might render the operation of the valve ineffective.

The location of the oil supply reservoir above the hydraulic chamber is a desirable feature of this invention. Within the hydraulic chamber 26 oil free of air is maintained at all times in the proper amount so that the tappet and the end of the valve stem are not separated during engine operation, resulting in noiseless operation of the tappets irrespective of the temperature conditions under which the tappets and valves operated. Oil in the reservoir chamber 25 is in sufficient amount at all times and is maintained in the chamber so as to be always available to feed to the hydraulic chamber. Being held in the upper supply or reservoir chamber 25 for a considerable time, any air in the oil separates and rises therefrom, so that when oil passes to the chamber 26 it is free of air. By having the hydraulic chamber at the lowest portion of the tappet body and utilizing space above for the oil supply, the tappet may be materially decreased in length. The machine operations and the assembly are of the simplest and most economical type.

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

We claim:

1. A valve tappet comprising, a hollow tappet body closed at its lower end, a member within the lower portion of said body having at its upper end an annular outwardly extending flange slightly less in diameter than the interior diameter of the body, and having a downwardly extending sleeve portion with a vertical opening therethrough, the upper end portion of said opening being of larger diameter than a lower portion thereof, a split packing ring within the body below said flange engaging at its upper side against the lower outer edge portions thereof, a coiled compression spring between said ring and lower closed end of the body, a second member located within the upper portion of the body comprising an annular flange of substantially the same diameter as the flange on the first member and a stem extending downwardly into the enlarged upper end portion of said opening in the first member, said stem bearing at its lower end against said first member around the upper end of the reduced portion of the vertical opening therethrough, there being provided an oil receiving chamber between the flanges of said first and second members, and a yielding spring member carried by said ring, pressing against a side of the sleeve of said first member, said spring member being located substantially opposite the parting in the ring, said tappet body having a passage through the wall thereof leading to said chamber between said flanges, as and for the purposes specified.

2. A valve tappet comprising, a hollow tappet body closed at its lower end, a member within the lower portion of said body having at its up-

per end an annular outwardly extending flange slightly less in diameter than the interior diameter of the body and having a downwardly extending sleeve portion with a vertical opening therethrough, the upper end portion of said opening being of a larger diameter than the lower portion thereof, a second member within the body having an annular flange of substantially the same diameter as the first flange and having a downwardly extending stem which enters the upper enlarged portion of said opening in the first member and bears at its lower end against the first member, there being an oil receiving chamber between said flanges, said tappet body having an opening through a side thereof joining with said chamber, and said second member having a head at its upper end against which the end of a valve stem is adapted to engage, spring means yieldingly holding said first member against the lower end of said stem, and means for controlling the passage of oil from said oil receiving chamber downwardly through said opening in the first member, as specified.

3: A valve tappet comprising, a hollow tappet body closed at its lower end, a member within the lower portion of said body having at its upper end an annular outwardly extending flange slightly less in diameter than the interior diam-

eter of the body and having a downwardly extending sleeve portion with a vertical opening therethrough, the upper end portion of said opening being of larger diameter than the lower portion thereof, a split packing ring within the body below said flange engaging at its upper side against the lower outer edge portions of the flange, a coiled spring between said ring and lower closed end of the body, a valve extending across and closing said passage, a light spring normally elevating the valve into upper closing position, a second member having a flange of substantially the same diameter as the flange on the first member and a central stem extending downwardly therefrom into the larger upper end portion of said opening in the first member, the lower end of the stem normally bearing at its lower end against said first member, said stem having a vertical opening therein from its lower end upwardly for a distance, and having a lateral opening connecting the interior of the stem with the chamber in the body between the flanges of said two members, and said body having an opening through a side thereof between said flanges.

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