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HYDRAULIC LASH ADJUSTER

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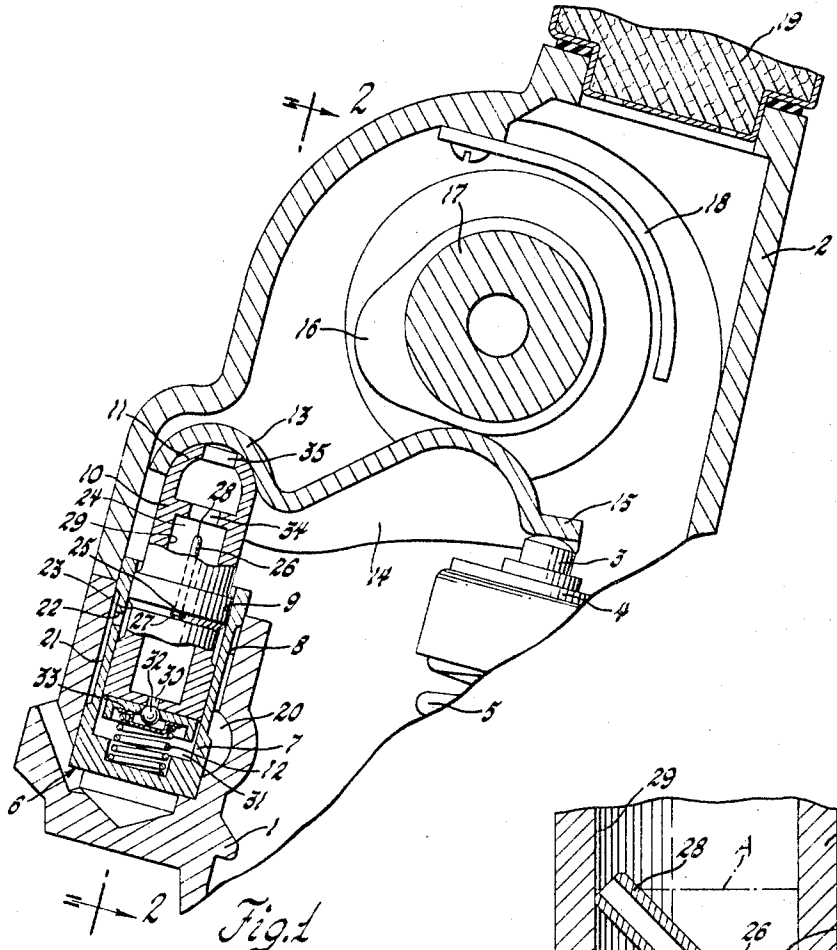


Fig. 1

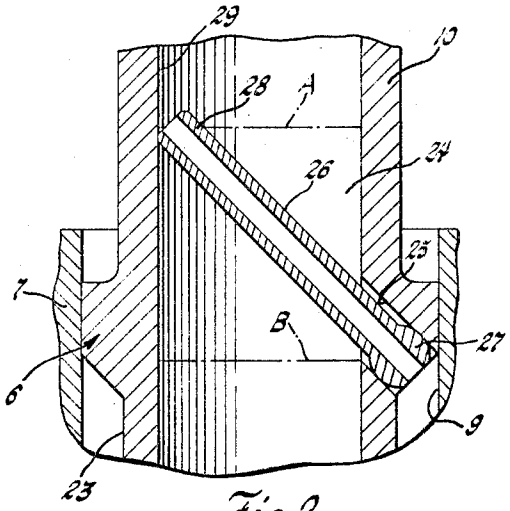


Fig. 2

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HYDRAULIC LASH ADJUSTER

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My invention relates to hydraulic reservoirs such as used, for example, in hydraulic lash adjusters and valve lifters, and particularly to means for effectively elevating the fluid supply inlet to a reservoir which must necessarily be located substantially below the fluid level desired to be maintained therein. The resultant maintenance of a higher minimum fluid level may be an important consideration, especially in the case of such reservoirs from which the fluid can drain out the inlet during periods when the normal supply pressure is cut off.

Such is the case with hydraulic lash adjusters for the valves of an internal combustion engine, in which oil from the engine lubricating system serves as the dash pot fluid. The hollow plunger of the lash adjuster serves as the fluid reservoir for the dash pot, being pressure fed with oil from the engine lubricating pump when the engine is operating. Should the engine be stopped while the plunger is under thrust load the plunger will eventually "leak down" in its dash pot, displacing the oil therefrom below the plunger, and the oil level within the plunger will also decrease through leakage out the inlet. An insufficient quantity of oil may then exist within the plunger reservoir to meet the requirements of the dash pot upon restarting the engine, particularly if resumption of normal pump supply pressure is sluggish, as may be expected when the engine is cold.

I have found that the effective height of the reservoir inlet in such a hydraulic lash adjuster can be raised in a unique but very simple manner by the addition of an inclined tube which can be inserted through the single inlet port of the plunger. Also, by providing this tube with a bulbous lower end, a press fit thereof with the side walls of the port is obtained. Also, by properly selecting the length of the tube the elevation of its opposite end within the reservoir is assured. Thus, the object of my invention is to improve the conventional hydraulic lash adjuster so as to maintain an adequate reservoir fluid level within its plunger.

The invention will be more clearly understood from the following description of one preferred embodiment thereof, selected for illustration, having reference to the drawing wherein:

FIGURE 1 is a transverse cross sectional view of a portion of an internal combustion engine incorporating the improved hydraulic lash adjuster.

FIGURE 2 is an enlarged fragmentary sectional view taken substantially on line 2—2 of FIGURE 1.

Referring now in detail to the drawing, and first FIGURE 1, there are shown portions of an internal combustion engine including a cylinder head **1**, to which is suitably affixed a cover **2**. Slidably mounted in the head **1** is a poppet valve whose stem upper end is shown at **3**. A conventional retainer washer **4** carried by the stem **3** is acted upon by the usual valve return spring **5**, tending to elevate the stem to its uppermost position shown. To one side of the valve spring **5** is located a valve lash adjuster designated generally by the numeral **6**. This includes a dash pot **7** in the form of a generally upright cup suitably supported in a pocket **8** formed in the cylinder head. Slidably fitting the bore **9** of the dash pot **7** is a hollow plunger **10** having a spherically shaped upper end **11**. A plunger return spring **12** is interposed between the bottom of the dash pot **7** and the lower end of the plunger **10** and acts at all times to elevate the plunger

to maintain its engagement with the spherically concave end **13** of the rocker **14**. The opposite end **15** of the rocker rests on the valve stem end **3**, and overlying the rocker and bearing thereagainst intermediate its ends is the usual cam lobe **16** of the engine cam **17**. It will be appreciated that the camshaft **17** is suitably journaled for rotation in the rocker cover tooth, and is suitably driven by the engine crankshaft (not shown). The member **18** is a shield overlying the camshaft opposite the end of an oil filler plug **19**.

Fluid for the dash pot **7** of the lash adjuster is supplied in the form of oil from the engine lubricating pump (not shown) to a gallery **20** near the bottom of the pocket **8**. Communicating at all times with this gallery is an external groove **21** on the dash pot **7** which connects with a side port **22** leading into the bore **9** of the dash pot. The plunger likewise has an external groove **23** which communicates with the dash pot port **22**, and connecting this plunger groove with the interior or reservoir **24** of the plunger is a single inlet port **25**. This plunger port **25** is preferably inclined upwardly as best shown in FIGURE 2, and extending therethrough and upwardly within the plunger reservoir is an inclined tube **26**. The lower end **27** of this tube is preferably bulbous-shaped, i.e., provided with a generally spherical enlargement relative to the external diameter of the remainder of the tube. This arrangement facilitates insertion of the tube into the plunger with a press fit of the bulbous end **27** in the port **25** so that the tube sealingly engages the side walls of the port. As shown, the length of the tube is such that its upper end **28** is substantially elevated relative to the port **25**, the tube upper end being adapted to slidably engage the opposite internal side wall **29** of the plunger during insertion of the tube.

Referring again to FIGURE 1, the lower end of the plunger is provided with the usual outlet port **30** by which oil within the plunger may pass into the lower end of the pressure chamber **31** between the plunger and the lower end of the dash pot **7**. Such flow is controlled by a check valve in the common form of a ball **32**, loosely retained opposite the lower end of the passage **30** by a valve cage **33** which, in turn, is held in place against the bottom of the plunger by the plunger return spring **12**. Openings **34** and **35** are provided in the upper portion of the plunger to enable the oil within the reservoir to lubricate the end **13** of the rocker.

During engine operation, with pressure supplied to the gallery **20** a reservoir of oil will thus be maintained within the plunger to the level indicated by the letter A, representing the height of the upper end of the tube. Upon shutting down the engine, should the plunger **10** be under thrust load by reason of the cam lobe **16** being in position to hold the rocker **14** depressed downwardly from its position shown, against the force of the valve spring **5**, oil trapped in the pressure chamber **31** will gradually escape by leakage around the exterior of the plunger. During this time, however, the oil level within the reservoir will remain at the line A, notwithstanding the oil supply pressure to the gallery **20** is no longer maintained. The press fit of the tube end **27** in the plunger port **25** provides a seal which prevents the reservoir oil level from dropping to the line B representing the actual height of a port **25**. Accordingly, when restarting the engine there is a sufficient quantity of oil within the plunger to meet the requirements of the dash pot in enabling the pressure chamber **31** therein to again receive sufficient oil as the plunger moves upwardly in the dash pot with return of the valve rocker **14** to its position shown in FIGURE 1.

While only one embodiment of the invention has been described and shown, it is appreciated that minor changes in the parts and their arrangement may be made without

departing from the spirit and scope of the invention herein claimed.

I claim:

1. In a hydraulic lash adjuster, a generally upstanding dash pot, a hollow plunger therein, the interior of said plunger constituting a reservoir for hydraulic fluid to be supplied to the dash pot and having a side port intermediate the ends of said plunger, said port being the sole inlet to said reservoir, and a tube open at both ends and extending into and upwardly of the reservoir from said port, said tube having a bulbous external enlargement at its lower end, said enlargement closely fitting said port to confine fluid flow into the reservoir to pass through the tube and thereby elevate the effective height of said port.

2. In a hydraulic lash adjuster, a generally upstanding dash pot, means for supplying hydraulic fluid to the dash pot including a hollow plunger therein having a side port, said port being inclined upwardly from the exterior of the plunger and constituting the sole inlet for fluid flow into the plunger, and a tube inclined upwardly within the plunger for conducting said fluid thereinto from said port, said tube having a bulbous external enlargement sealingly fitting said port.

3. The invention of claim 2, wherein said tube is of sufficient length to ensure its end remote from said enlargement being engageable with the opposite side of the plunger to maintain said end elevated relative to said port.

4. In combination, a generally upstanding hydraulic dash pot, a hollow plunger therein, the interior of said plunger constituting a reservoir for the dash pot fluid, said plunger having a side port intermediate its ends for delivery of make-up fluid to the reservoir, and a tube extending into and upwardly within the reservoir from said port, said tube being open to the interior of the plunger and having a bulbous enlargement at its lower end having a press fit in said port whereby said fluid delivery is confined to pass through the tube and the effective height of the port is thereby increased.

References Cited by the Examiner

UNITED STATES PATENTS

1,802,766	4/1931	Kerr	138—44
2,175,467	10/1939	Johnson	123—90
2,237,854	4/1941	Voorhies	123—90
2,322,172	6/1943	Spencer	184—6
2,667,149	1/1954	Purchas et al.	123—90

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