United States Patent

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[54] **HYDRAULIC LASH ADJUSTER**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **123/90.35,** 123/90.36, 123/90.43, 184/6
[51] **Int. Cl.** **F01m 9/10,** F011 1/18, F011 1/24
[50] **Field of Search** ..... 123/90; 184/6 (T)

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ABSTRACT: This disclosure relates to a hydraulic lash adjuster for overhead cam engines and the like. Oil within the piston body passes through the top of the piston to lubricate a closed socket between the rocker arm and the lash adjuster. A pin, positioned in the passage is reciprocatable. The extent of reciprocation of the pin within the passage in either direction is limited to prevent losing of the pin prior to installation of the lash adjuster into the engine.

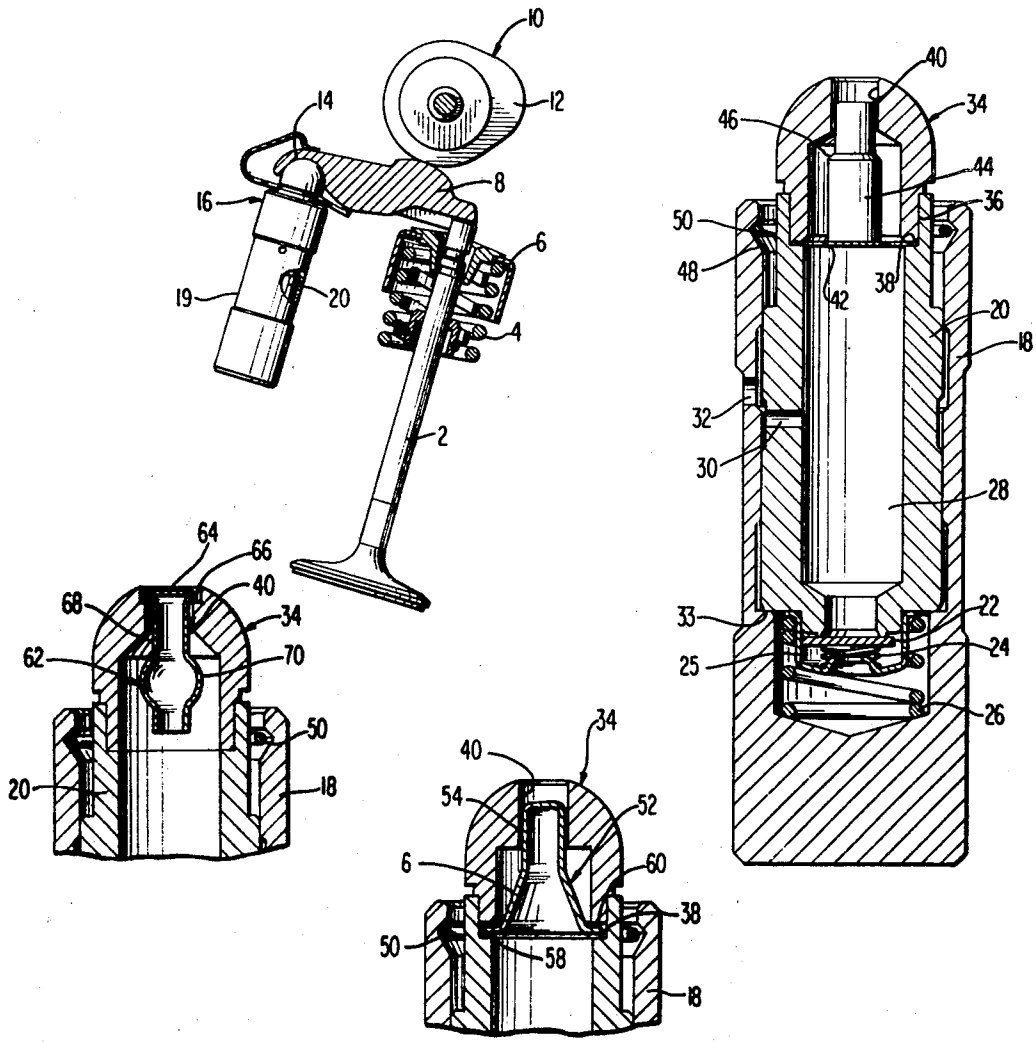
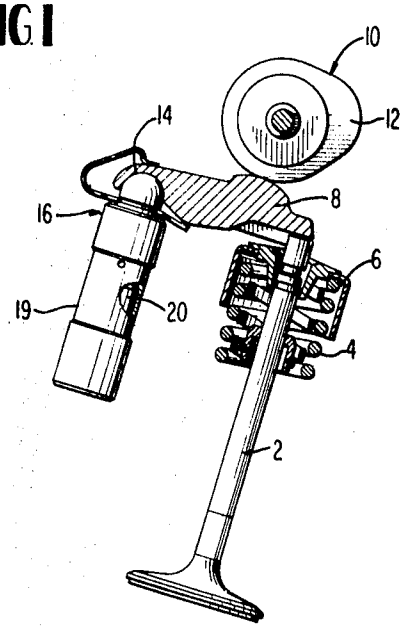


FIG. 1



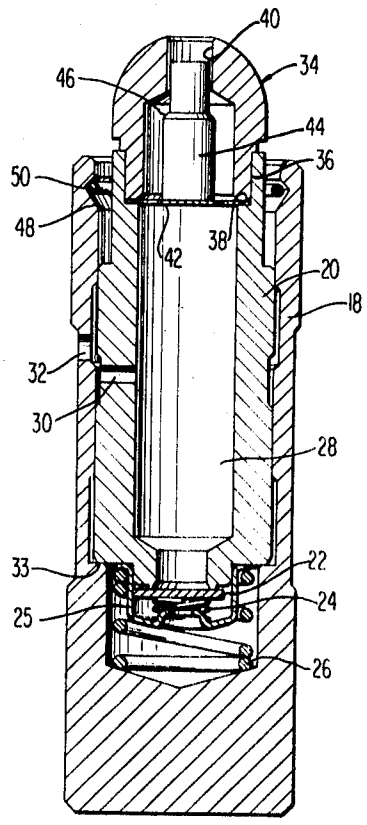


FIG. 2

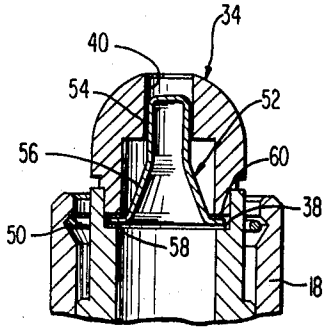
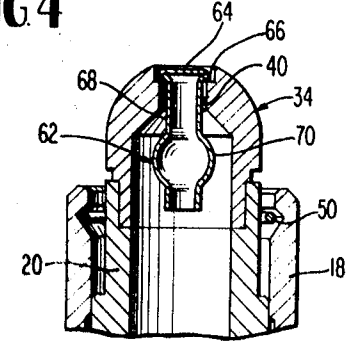


FIG. 3

FIG. 4



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HYDRAULIC LASH ADJUSTER

This application is a continuation-in-part of Ser. No. 741,750 filed July 1, 1968, and now abandoned.

This invention relates to hydraulic lash adjusters, and more particularly to a novel hydraulic lash adjuster having an unique lubricating means associated with the nose of its plunger.

In overhead cam shaft engines, the cams bear against rocker arms which open and close the engine valves. Each rocker arm assembly is pivoted on a lash adjuster which takes up slack in the valve train due to expansion of the parts as the engine heats up.

It has been proposed to lubricate the closed socket of the rocker arm in which the lash adjuster is seated from the interior of the plunger of the lash adjuster by employing a passage in the nose of the plunger and a pin within this passage. The conventional pin is merely inserted into the passage from the outside of the nose and prevented from falling into the center of the plunger by a flattened end portion which is larger than the passage diameter. When positioned in the engine, the pin is prevented from falling out by the closed socket or seat of the rocker arm. However, the pin is subject to loss prior to assembly, that is, during assembly, shipment, and subsequent handling.

I have now discovered an improved hydraulic lash adjuster in which the pin in the lubricating passage has means to limit the reciprocal motion in each direction and the plunger is formed in two parts for insertion of the pin into the interior of the piston.

By various aspects of this invention one or more of the following, or other, objects can be obtained.

It is an object of this invention to provide an improved hydraulic lash adjuster for overhead cam shaft engines wherein the loss of parts prior to installation is avoided.

It is a further object of this invention to provide an improved hydraulic lash adjuster in which a pin is provided in a lubricating passage between the adjuster and a rocker arm wherein the extent of reciprocation of the pin in the passage in each direction is limited.

It is a still further object of this invention to provide a closed socket rocker arm assembly having a hydraulic lash adjuster with an improved lubricating means for the closed socket connection with the hydraulic lash adjuster.

Other aspects, objects, and the several advantages of this invention are apparent to one skilled in the art from a study of this disclosure, the drawings, and the appended claims.

According to the invention, a hydraulic lash adjuster for an internal combustion engine with a closed socket rocker arm has a body, a plunger reciprocatable within the body, the plunger having a central cavity with a check valve means in the lower portion thereof, and lubricating oil inlet means through the body communicating with the interior of the plunger. Socket support means is provided in the upper outer portion of the plunger. A lubricating passage extends from the interior of the plunger to the socket support means and a pin is positioned within the passage. The pin is reciprocatable within the passage but is limited in the extent of reciprocation in each direction.

To this end, the plunger is provided with a two-piece body, the socket support means preferably being press fit into the top portion of the plunger. In this manner, the reciprocatable pin can be inserted into the passage prior to assembly of the pin into the lubricating passage.

The invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a schematic representation of an overhead cam, valve train having a tappet according to the invention;

FIG. 2 is an enlarged sectional view of the tappet shown in FIG. 1;

FIG. 3 is an enlarged sectional view of the upper portion of a tappet showing a second embodiment of the invention; and

FIG. 4 is a view of a tappet similar to FIG. 3 showing a third embodiment of the invention.

Referring now to FIGS. 1 and 2, a valve 2 having a spring 4 and retainer 6, is actuated by rocker arm 8 through a cam shaft 10 and cam 12. The rocker arm 8 pivots about a solid or closed socket 14 on tappet 16. The tappet, which automatically adjusts for lash, contains a body 18 with a plunger 20. The plunger 20 is biased in the upward position against the closed socket 14 of rocker arm 8 through a spring 26. The plunger 20 has an internal cavity 28 which opens into a bottom compression chamber through check valve plate 22. A spring 24 biases valve plate 22 against the bottom of plunger 20. A valve retainer 25, which holds the check valve assembly in place, is held against the bottom of plunger 28 by spring 26.

Lubricating oil enters cavity 28 through port 32 and port 30. As is conventional in hydraulic valve assemblies, the oil passes through cavity 28 through the bottom portion of the plunger 20 into the bottom compression chamber.

The reciprocal motion of the plunger 20 is limited at the lower extremity by shoulder 33 and at the upper extremity by split ring retainer 50 positioned in annular groove 48. The split ring 50 can be of conventional design or can be a ring according to the invention described and claimed in U.S. Pat. No. 3,358,660.

It is desirable to lubricate the closed socket 14 as it rotates on the upper spherical head or nose 34. To this end, a circular bore 40 and a reciprocable pin 44 are provided. The pin 44 is adapted to reciprocate within bore 40 and has a shoulder 46 to limit the extent of upward movement of the pin 44 relative to spherical head 34. The extent of downward movement of pin 44 relative to head 34 is limited by plate 42 which is seated on shoulder 38. Plate 42 is perforated to permit oil to pass into bore 40 from cavity 28. The holes are positioned circumferentially of the pin 44 to permit the oil to pass freely through plate 42.

The pin can be easily assembled into the head 34 by providing a press fit at 36 between the spherical head 34 and the inner annular upper portion of plunger 20. Thus, the tappet can be easily assembled by positioning pin 44 within spherical head 34, positioning plate 42 on shoulder 38 and forcing spherical head 34 into plunger 20.

The apertured plate 42 permits the oil to flow therethrough into the inner chamber in spherical head 34. The flow of oil through bore 40 is limited by the closed socket 14. Due to the tolerances between pin 44 and circular bore 40, the oil is permitted to slowly pass through bore 40. The pin 44 does not restrict the flow of oil through bore 40 during normal engine operation. Due to engine vibration and normal movement of the automobile, the pin 44 will ten to vibrate and reciprocate in bore 40. This reciprocal movement of pin 44 in bore 40 keeps the bore from clogging with dirt so that the lubricating oil can continuously pass through the bore and provide a thin film of lubrication for closed socket 14.

In FIG. 3, like numerals have been used to describe like parts. The spherical head 34 is slightly shorter at 60 to provide a gap between shoulder 38 and the bottom of head 34. A lubricating pin 52 has an upper circular portion 54 which is slidable in bore 40 to the same extent that the upper portion of pin 44 is slidable in bore 40. The lubricating pin contains an expanded central portion 56 which extends downward and outward to form an annular ring 58. The annular ring fits into the cavity between 60 and shoulder 38 to limit both the upward and downward movement of pin 52 relative to spherical head 34. Thus, in this embodiment, the lubricating pin 52 functions to permit oil to pass into the central chamber in spherical head 34 and through bore 40 to lubricate socket 14 while preventing the bore 40 from being plugged.

In FIG. 4, like numerals have been used to designate like parts. In this embodiment, the lubricating pin 62 has a flattened head 64 which seats against a recessed shoulder 66 in spherical head 34. The lubricating pin has an annular central portion and is reciprocatable within bore 40 to the same extent as are upper portions 54 of lubricating pin 52 and the upper portion of pin 44 in bore 40. An oval lower portion 70 of lubricating pin 62 restricts the upward movement of

lubricating pin 62 within spherical head 34. Thus, in this embodiment, the lubricating pin 62 is reciprocatable within bore 40 to keep the same clean and also permits oil to flow through bore 40 to lubricate the socket 14. In this embodiment, the oval can be formed in two ways. One is by simply pinching down the central portion of pin 62 after it has been inserted into spherical head 34. Another is to pinch the central portion only to the extent that it can be forced through opening 40, the pinched portion 70 having sufficient resilience and memory to return to its pinched oval shape. In each case, the oval lower portion 70 prevents the lubricating pin from falling out of the spherical head 34. In the first way of forming the portion 70, the spherical head can be press fitted to the upper portion of plunger 20 after forming portion 70. In the second way, the spherical head 34 can be an integral part of the plunger 20.

Thus by the invention, the lubricating pin performs the function of keeping the lubricating bore open and is retained in the spherical head before the tappet is assembled in the valve train.

Reasonable variation and modification are possible within the scope of the foregoing disclosure, the drawings, and the appended claims of the invention without departing from the spirit thereof.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

I claim:

1. In an internal combustion engine having a rocker arm forming a closed socket, a hydraulic lash adjuster supporting said socket, the lash adjuster having a body, a plunger reciprocable within said body, said plunger having a central cavity and an open end; a lubricating oil inlet means communicating with said central cavity of said plunger; a closure element in said open end of said plunger forming a pivot with said closed socket for said rocker arm, the bottom of said closure element extending downwardly into the upper end of said plunger; lubricating means extending from said cavity of said plunger through said closure element for lubricating said pivot; the improvement which comprises: said lubricating means comprising a passage through said closure element between the interior of said plunger and the outer surface of said closure element; a pin in said passage with the upper portion thereof within said passage and freely reciprocable therein, said pin having an enlarged intermediate portion larger than said passage to limit the extent of upward motion of said pin in said passage; and an apertured plate seated on said annular shoulder beneath said pin to limit the downward motion of said pin with respect to said passage but to permit oil to freely flow therethrough whereby said closed socket is lubricated with a thin film of oil.

2. An internal combustion engine according to claim 1 wherein said closure element comprises a spherical head having a downwardly extending body which is press fit into said plunger body.

3. An internal combustion engine according to claim 2 wherein the lower portion of said closure element is positioned against said apertured plate holding said plate against said shoulder.

4. In a hydraulic lash adjuster for an internal combustion engine, said lash adjuster having a body, a plunger reciprocable within said body, said plunger having a central cavity and an open upper end; an annular shoulder formed at the upper end of said central cavity; a lubricating oil inlet means communicating with said central cavity of said plunger; a closure element in said open end of said plunger forming a pivot for a lubricating arm, the bottom of said closure element extending downwardly into the open end of said plunger to a point above said inner annular shoulder, leaving an annular space between the lower end of said closure element and said annular shoulder; lubricating means extending from said cavity of said plunger through said closure element for lubricating said pivot; the improvement which comprises: said lubricating means comprising a passage through said closure element between the interior of said plunger and the outer surface of said closure element; a pin in said passage with the upper portion thereof within said passage and freely reciprocable therein, said pin having an annular flange at the lower portion thereof, said flange being positioned within said annular space such that the extent of reciprocation of said pin in said passage is limited by the lower end of said closure element and said shoulder.

5. In a hydraulic lash adjuster for an internal combustion engine, the lash adjuster having a body, a plunger reciprocable within said body, said plunger having a central cavity; a lubricating oil inlet means communicating with said central cavity of said plunger; a spherical head forming the upper outer portion of said plunger providing a pivot for a rocker arm; lubricating means extending from said cavity of said plunger through said closure element for lubricating said pivot; the improvement which comprises: said lubricating means comprising a passage through said spherical head between the interior of said plunger and the outer surface of said spherical head; a pin in said passage formed from a hollow tubular member having a closed upper end flattened to a diameter larger than said passage to limit the downward movement of said pin in said passage; and a lower portion of said pin beneath said passage being pinched to an oval shape to thereby limit the extent of axial movement of said pin in said passage.