Aug. 19, 1958 J. T. SIMMONS 2,847,752

VALVE-LIFTER EXTRACTOR

Filed May 13, 1955

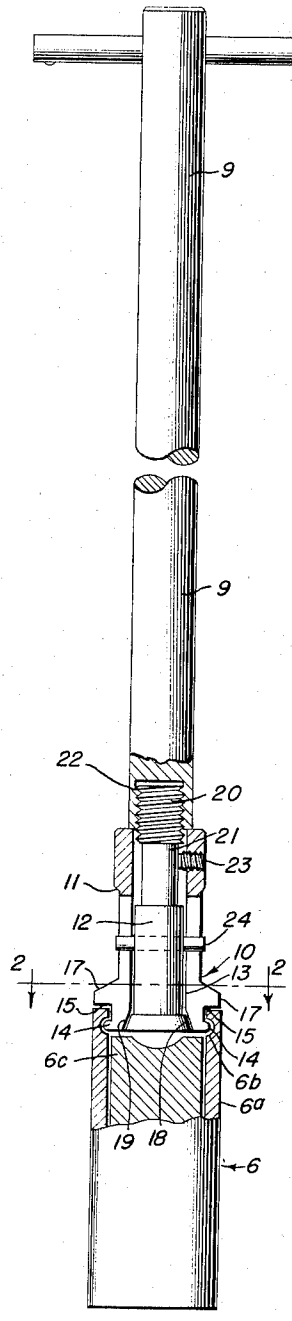


Fig. 1.

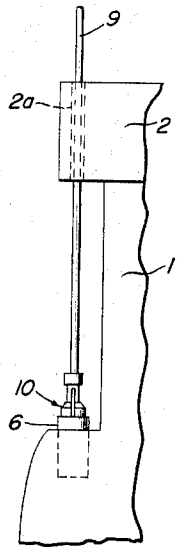


Fig. 4.

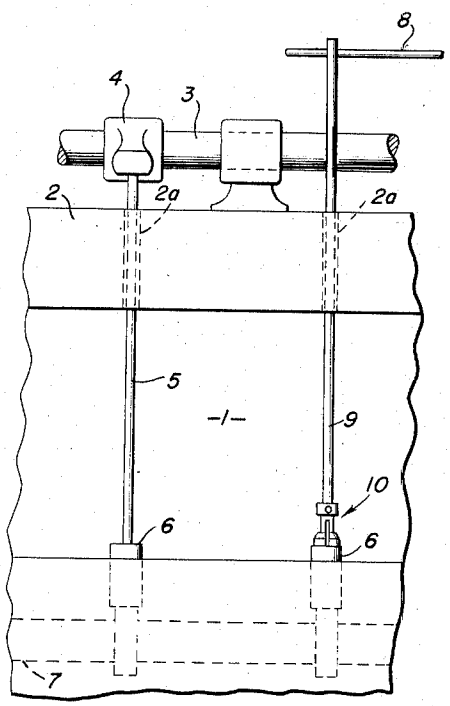


Fig. 3.

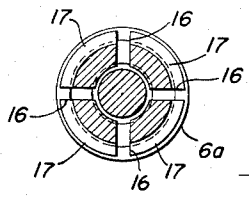


Fig. 2.

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United States Patent Office 2,847,752
Patented Aug. 19, 1958

2,847,752

VALVE-LIFTER EXTRACTOR

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Application May 13, 1955, Serial No. 508,171
2 Claims. (Cl. 29—280)

This invention relates to a tool particularly adapted for use in extracting hydraulic valve-lifter housings from internal combustion engines.

With the advent of the modern, high speed internal combustion engine, it has become common practice to replace the older adjustable clearance type of valve tappets with zero-lash hydraulic valve-lifters. These lifters consist essentially of a cylindrical housing with a chamber formed therein and a piston which closes this chamber. The housing is slidably mounted in a bore or socket in the block of the engine and is reciprocated in the bore by the cam on the cam shaft. The reciprocating motion is transmitted to the valve by the piston through a push-rod and a rocker arm in the conventional manner. The chamber is filled with oil during operation and transmits the motion of the housing to the piston, the volume of oil in the chamber being automatically varied to maintain zero-lash in the valve operating mechanism. The oil is supplied to the chamber under pressure through an aperture in the housing which communicates with passages in the block filled with oil by the oil pump.

The successful operation of the lifter depends upon maintaining the carefully controlled clearances between the moving parts. Since these clearances are small, and the operating temperature is relatively high, some difficulty is experienced from time to time with the decomposition of the oil and the formation of decomposition products known as "varnish." This varnish accumulates on the lifter parts and tends to cause the moving parts to seize, thereby rendering the operation of the lifter unsatisfactory. The lifters which have been coated with varnish may be returned to service by disassembling them and removing all varnish formation. However, the varnish formation frequently makes it impossible to extract the housings from their sockets in the block without the application of considerable force, and the compact design of modern engines makes it difficult to apply any considerable amount of force to the housing with known extracting tools.

A primary object of my invention, therefore, is to devise an hydraulic valve-lifter extracting tool which may be used to apply a relatively large force to an hydraulic valve-lifter when extracting the lifter from the block of the engine.

Another object of the invention is to provide a tool with which it is possible to simultaneously apply to the lifter an axial pull and a twist or torque, both forces being of relatively large magnitude.

A further object of the invention is to provide a tool which will transmit an extracting force applied at a readily accessible point located above the cylinder head of the engine to the valve-lifters located in a relatively inaccessible point in the block below the cylinder head without the necessity of removing the cylinder head.

Yet another object is to provide a tool of simple, rugged and inexpensive design which is easily applied to an hydraulic valve-lifter in an inaccessible location.

My invention employs a gripping unit of substantially

the same diameter as the valve-lifter housing and a removable handle having a long shaft of such diameter that it will pass through the push-rod apertures formed in the cylinder head. In using the tool, the long shaft is passed through the push-rod aperture in the cylinder head (after the push-rod has been removed) and the gripping unit is then attached to the lower end. With the gripping unit engaging the lifter housing, and the handle of the tool located above the cylinder head where it is readily accessible, it is a simple matter to simultaneously apply a twisting force and an upward pull of any magnitude required to extract the lifter from the engine block.

A preferred embodiment of my invention is illustrated in the accompanying drawing in which:

Figure 1 is an elevational view, partly in section, of an hydraulic valve-lifter extractor engaging the housing of a lifter;

Figure 2 is a sectional view taken along the line II—II of Figure 1;

Figure 3 is a side view in elevation of a portion of a typical internal combustion engine showing the extracting tool in operative position; and

Figure 4 is an end view in elevation of the engine and the extracting tool.

Referring to the drawing, a typical internal combustion engine is shown having a cylinder block **1** and a cylinder head **2**. A rocker arm shaft **3** is mounted on the cylinder head **2** and a plurality of rocker arms **4** are pivotally mounted thereon. One end of each rocker arm **4** engages the end of a valve stem (not shown) and the other end is engaged by the upper end of a push-rod **5**. The push-rod **5** extends through apertures **2***a* in cylinder head **2** and the lower end of each push-rod **5** engages an hydraulic valve-lifter **6** which is slidably mounted in a bore formed in the cylinder block **1**. The valve-lifters **6** are supported in the bores in the cylinder block **1** and are caused to reciprocate vertically in the bores by the cams formed on the cam shaft **7**. In Figure 3, one of the rocker arms **4** and its associated push-rod **5** is shown in position for the purposes of illustration. Normally, all of the rocker arms and push-rods would be removed from the engine before using the valve-lifter remover.

As will be seen from Figure 4, the cylinder head **2** overhangs the cylinder block **1**, and this fact, together with the fact that a modern automobile engine is mounted in relatively cramped quarters, has made the problem of removing hydraulic valve-lifters that have become stuck in the block a difficult one to solve. The problem is particularly acute in V-type engines in which the push-rods and valve-lifters are located on the lower side of the inclined cylinder block. Prior attempts to solve the problem with tools which were generally of an L-shaped configuration and with which access to the lifters was gained from the side of the cylinder block have met with but mediocre success, because of the limited space available for operating the tool and the limited force that could be applied to the tool to extract the lifter.

Referring now to Figures 1 and 2, the valve-lifter **6** is shown partially cut away to reveal the relationship of the extractor to the lifter housing *6a*. The cylindrical housing *6a* has an annular groove *6b* formed on the inside thereof to receive a snap ring (not shown) which retains the piston *6c* in the housing. This annular groove *6b* forms an internal shoulder which is engaged by the extractor fingers in a manner to be presently described.

The extractor tool comprises a handle **8** attached to a long, relatively small diameter shaft **9** which is attached to the gripping unit, generally indicated by the reference numeral **10**, by a threaded joint which serves an additional function as will hereinafter more fully appear.

The gripping unit itself is formed of a tubular body

11 and an expander bolt 12 slidable in the axial bore 13 of the body. The lower end portion of the body 11 is of a diameter to enter the upper end of valve-lifter casing 6a and is provided with a bead or flange 14 which engages the annular groove 6b in the lifter casing. An enlarged section of body 11 provides a shoulder 15 on the body a suitable distance from bead 14 to engage the upper edge of the lifter housing 6a. The enlarged section of body 11 tapers down to an intermediate section of reduced diameter, and four longitudinal slots 16 are cut into the body from the lower end thereof through the section of reduced diameter to provide four fingers 17 which have sufficient resilience to allow the gripping unit to be applied to and removed from the lifter housing 6a.

The lower end portion 18 of expander bolt 12 is enlarged and conical in form and engages an enlarged, conical portion 19 of the bore 13, so that axial movement of the expander bolt 12 into the body 11 tends to expand fingers 17 outward. The upper end portion 20 of expander bolt 12 is threaded and the portion 21 immediately adjacent thereto is of a reduced diameter. The threaded portion 20 extends beyond the upper end of housing 11 and is exposed for engagement with internal threads 22 formed in a bore in the end of shaft 9. A retaining screw 23 is threaded transversely of the body 11 in the region opposite the reduced portion 21 on expander bolt 12 and serves to prevent the expander bolt from becoming separated from the body 11 when the gripping unit 10 is detached from the shaft 9. A guide pin 24 is carried by expander bolt 12 and extends transversely thereof to engage one or more of the longitudinal slots 16 formed in body 11 in order to prevent relative rotation between body 11 and expander bolt 12.

In order to use the extracting tool, the rocker arms and push-rods are removed from the engine, and the retaining snap rings are removed from the annular grooves 6b in lifter housings 6a. The gripping unit 10 is next applied to one of the lifter housings 6a so that the bead 14 on the fingers 17 engages the annular groove 6b. This operation is facilitated by shoulder 15 on body 11 which positions the gripping unit 10 so that the bead 14 is aligned with the grooves 6b. It is preferred to have the outside diameter of the bead 14 slightly larger than the inside diameter of the housing 6a, whereby when the rounded bead is forced into the end of the housing, the fingers 17 are forced inwardly until the bead enters the groove 6b and then spring back to normal position. The shaft 9 is then inserted through the apertures 2a in the cylinder head and threaded on the threaded portion 20 of the expander bolt 12. It will be apparent that when the shaft 9 has been tightened on the expander bolt 12 to the point where it engages the end of housing 11, further rotation of the shaft will draw the expander bolt up into the body 11, thus causing the fingers 17 to expand and firmly grip the lifter housing 6a. The greater the torque applied to shaft 9, the more firmly will the gripping unit 10 grip the housing 6a, and consequently a torque of any required magnitude may be applied to housing 6a to loosen it in the bore in the cylinder block 1. At the same time a straight, axial pull may be exerted on the lifter housing 6a through the beads 14 which engage annular groove 6b in the lifter housing, the axial pull being applied to the upper end of shaft 9.

After the lifter has been extracted from the cylinder block, the shaft 9 is unscrewed from the gripping unit 10 and the unit removed from the housing. The above operations are repeated in turn on each lifter to be removed. If desired, the gripping unit 10 may be attached to shaft 9 after the shaft has been passed through aperture 2a but before the gripping unit is applied to the lifter to be removed. If this procedure is followed, it is necessary to refrain from tightening the shaft 9 down too far on the threaded portion 20, or it will be difficult to spring

the fingers 17 sufficiently to apply the gripping unit 10 to the lifter 6.

The four sections of bead 14 constitute radially movable claws which are positioned to enter the groove 6b when they are moved outwardly by the bolt 12.

I claim:

1. A tool for extracting valve-lifters of the type having a cylindrical housing provided with a locking-ring groove formed in the inner wall thereof, said tool comprising a tubular body having a reduced end portion of a diameter to be inserted into the bore of said housing and having an annular shoulder spaced from the end of said end portion for engaging the end of said housing when said end portion is inserted into said housing, a number of radially movable claw elements carried by said end portion and spaced about the periphery of said end portion, said claw elements being spaced from said annular shoulder in a position to be opposite the locking-ring groove in said housing when said shoulder engages the end of said housing, an expander bolt arranged within the bore of said tubular body and being freely slidable axially of said body, one end of said bolt extending out of said tubular body and having screw-threads formed thereon, said bolt having a portion thereof engaging said movable claw elements for moving said claw elements radially outward by axial movement of said bolt, means interconnecting said bolt and said body to prevent turning of the bolt in the body while permitting movement of the bolt axially of the body, and an operator for said bolt comprising a rod having an internally-threaded bore formed in one end thereof and threaded upon the threaded end of said bolt, with the end face of said rod in contact with the end of said tubular body.

2. A tool for extracting valve-lifters of the type having a cylindrical housing provided with a locking-ring groove formed in the inner wall thereof, said tool comprising a tubular body having an end portion of a diameter to be inserted into the bore of said housing and an enlarged intermediate portion providing an annular shoulder spaced from the end of said end portion for engaging the end of said housing when said end portion is inserted into said housing, said end portion being provided with an annular bead spaced from said shoulder and positioned opposite the locking-ring groove in said housing when said shoulder engages the end of said housing, said body having an intermediate portion of reduced diameter adjacent said enlarged portion and having spaced longitudinal slots formed therein throughout said end and intermediate portions, thereby providing a plurality of radially expandable fingers, an expander bolt arranged within the bore of said tubular body and being freely slidable axially of said body, said bolt having a portion thereof engaging said fingers for moving said fingers radially outward by axial movement of said bolt, means interconnecting said bolt and said body to prevent turning of the bolt in the body while permitting movement of the bolt axially of the body, one end of said bolt extending out of said tubular body and having screw-threads formed thereon, means for retaining said expander bolt within said tubular body while permitting limited axial movement thereof, and an operator for said bolt comprising a rod having an internally-threaded bore formed in one end thereof and threaded upon the threaded end of said bolt, with the end face of said rod in contact with the end of said tubular body.

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