May 24, 1966 R. N. BOWDEN 3,252,210

TOOL FOR REMOVING HYDRAULIC VALVE LIFTERS

Filed Feb. 28, 1964 3 Sheets-Sheet 1

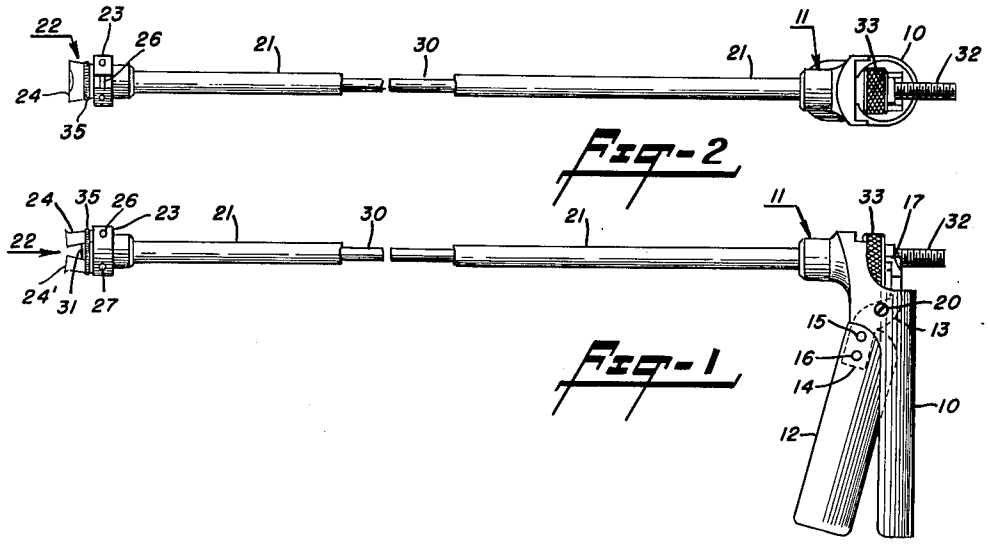


Fig-2

Fig-1

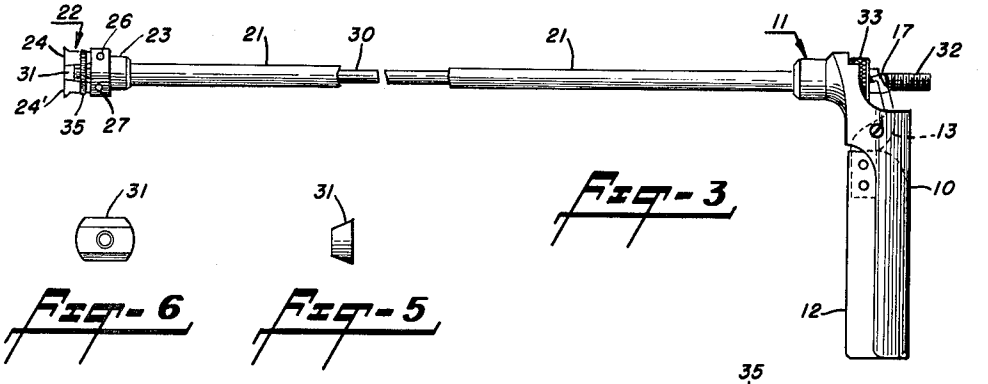


Fig-3

Fig-6

Fig-5

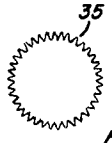


Fig-4

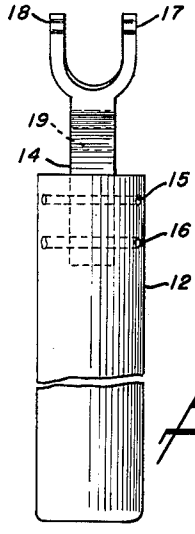


Fig-8

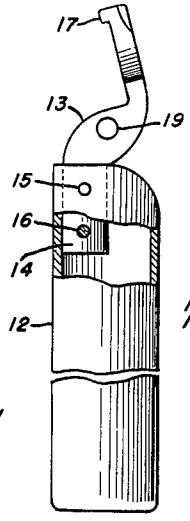


Fig-7

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TOOL FOR REMOVING HYDRAULIC VALVE LIFTERS

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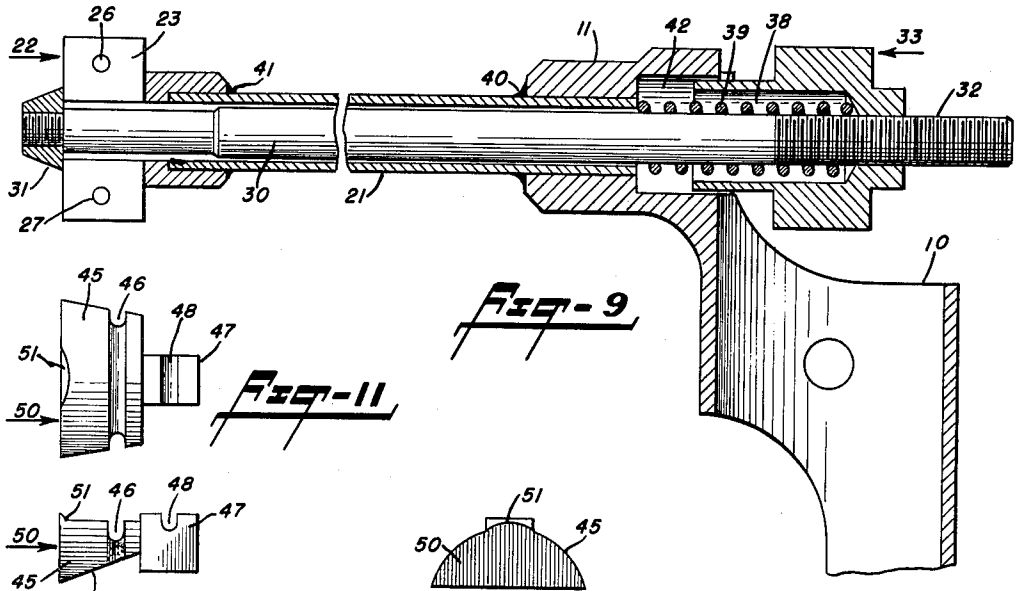


Fig-9

Fig-11

Fig-10

Fig-13

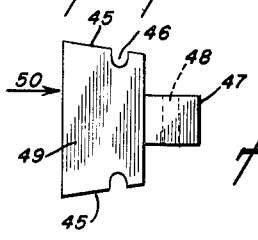


Fig-12

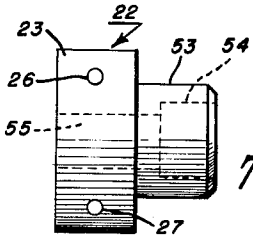


Fig-14

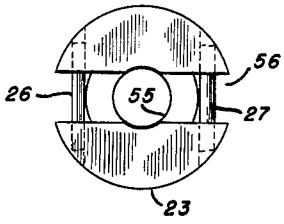


Fig-16

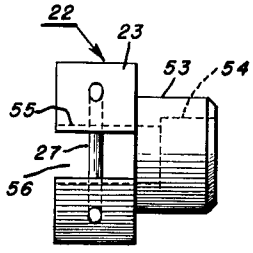


Fig-15

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TOOL FOR REMOVING HYDRAULIC VALVE LIFTERS

Filed Feb. 28, 1964 3 Sheets-Sheet 3

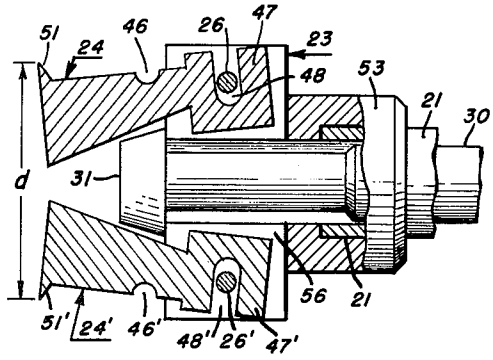


Fig-17

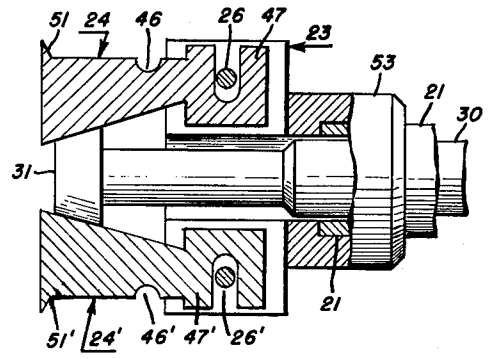


Fig-18

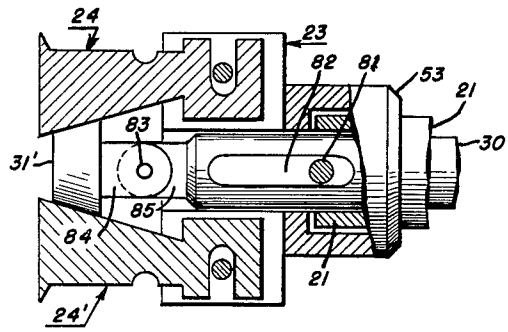


Fig-21

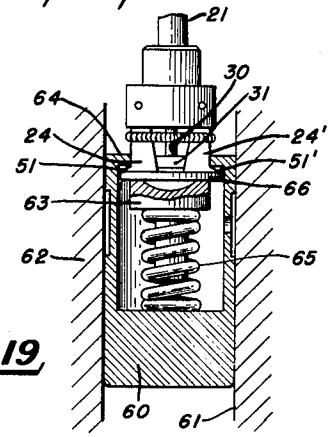


Fig-19

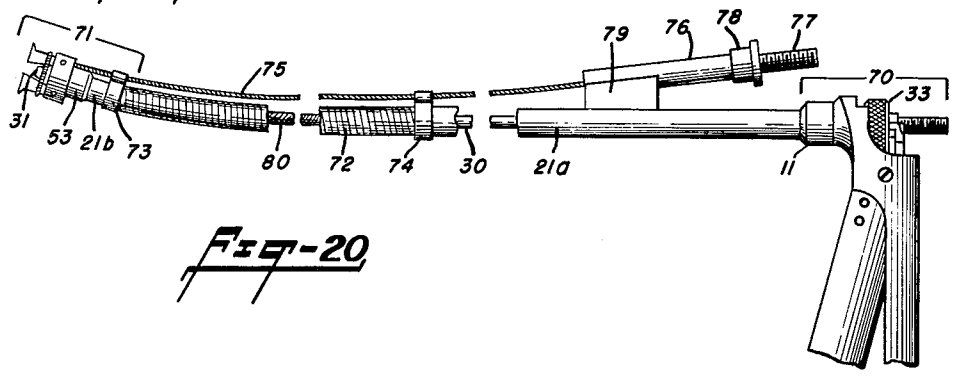


Fig-20

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United States Patent Office 3,252,210 Patented May 24, 1966

3,252,210

TOOL FOR REMOVING HYDRAULIC VALVE LIFTERS

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8 Claims. (Cl. 29—267)

This invention relates to a novel tool especially adapted for the removal of a hydraulic valve lifter from an engine block.

In many modern engines, the hydraulic valve lifters are not readily accessible from the top of the engine block. Consequently, the replacement of a defective valve lifter necessitates the removal of many engine components in order to be able to remove the lifter from the top of the engine block, or the dropping of the engine crankcase and cam shaft in order to effect a removal of the lifter from the bottom of the engine block. In either case, the operation is time consuming and costly. Further, a valve lifter often sticks due to the accumulation of gum, varnish, etc. In such case, not only is direct access to the lifter required but, also, some means must be employed to free the lifter before it can be withdrawn from the engine block. In some cases, access to the stuck lifter may be had upon removal of the rocker arm and push rod and turning over the engine to a point where the upper portion of the lifter extends above the engine block. The protruding portion of the lifter may then be grasped by a pair of pliers whereby a twisting force may be applied to the lifter to shear the varnish film. However, in many modern engines, the valve lifters are so located and oriented that the outer surface thereof cannot be grasped by pliers or the like. In such case, an attempt first is made to remove the stuck lifter by dismantling it in situ, that is, removing the lifter lock ring and piston and then attempting to loosen and pry out the shell by some means which can be inserted under the flange portion of the lifter. Such procedure seldom proves to be successful since a stuck lifter generally is frozen, firmly, to the engine block. It then becomes necessary to remove the crank case and cam shaft to permit driving the lifter downwardly out of the engine block hole.

A tool made in accordance with this invention is adapted for the removal of a defective and/or stuck hydraulic valve lifter from the top of the engine block without requiring dismantling of the lifter and regardless of the location of the lifter in a particular engine. All that is required is access to the top of the lifter upon removal of the rocker arm and push rod. In fact, such access need not be along a straight line of sight. Further, the tool is so designed that it is attachable to a new valve lifter for the purpose of inserting such lifter into the engine block hole, thereby eliminating the necessity of removing other engine components which otherwise could interfere with normal insertion of the lifter by hand.

An object of this invention is the provision of a tool for use in removing a hydraulic valve lifter from an engine block.

An object of this invention is the provision of a tool for removing a stuck hydraulic valve lifter from an engine block, which tool is provided with gripping means adapted for engagement with the lifter while the latter is positioned in an engine block hole, and manually-operable means for maintaining the gripping means in engagement with the lifter at a pressure sufficient to prevent relative rotation of the lifter and the gripping means.

An object of this invention is the provision of a tool comprising a handle portion and a head portion, a pair of jaw members pivotally carried by the said head portion and means controlled by said handle portion for spreading apart the jaw members.

An object of this invention is the provision of a tool

especially adapted for the removal of a stuck hydraulic valve lifter from an engine block, which tool comprises a handle including a pivoted member, an operating head having a pair of complementary jaw members pivotally secured thereto, said jaw members being adapted to pass through the axial hole provided in the top of the valve lifter, and means spreading apart the jaw members upon movement of the pivoted member of the handle.

These and other objects and advantages of the invention will become apparent from the following description when taken with the accompanying drawings showing two embodiments of the invention. It will be understood, however, that the drawings are for purposes of illustration and are not to be construed as defining the scope or limits of the invention, reference being had for the latter purpose to the claims appended hereto.

In the drawings wherein like reference characters denote like parts in the several views:

FIGURE 1 is a side view of a valve lifter tool made in accordance with this invention and showing the operating handle and the clamping jaws in the normal positions;

FIGURE 2 is a top view thereof;

FIGURE 3 is a side view similar to FIGURE 1 but showing the handle in a rotated, or closed, position and with the clamping jaws spread apart;

FIGURE 4 shows the spring which biases the clamping jaws to the normal position;

FIGURES 5 and 6 are enlarged side and front views, respectively, of the wedge which co-acts with the clamping jaws;

FIGURES 7 and 8 are enlarged side and front views, respectively, showing the assembly comprising the pivotal member of the handle and the rocker arm;

FIGURE 9 is an enlarged, fragmentary cross-sectional view showing the assembly of the operating rod, adjusting nut and wedge;

FIGURES 10–13 are enlarged side, top, bottom and front views, respectively, of one of the clamping jaws;

FIGURES 14–16 are enlarged side, top and front views, respectively, of the head which carries the clamping jaws;

FIGURES 17 and 18 are enlarged side views, with parts in cross-section showing the two clamping jaws assembled on the head and in the retracted and expanded positions, respectively;

FIGURE 19 is a cross-sectional view showing the manner in which the clamping jaws of the tool engage a hydraulic valve lifter for removal thereof from the engine block;

FIGURE 20 is a side view, generally similar to FIGURE 1, but showing another embodiment of the invention; and

FIGURE 21 is an enlarged view similar to FIGURE 17 and showing another embodiment of the invention.

Reference, now, is made to FIGURES 1–3. The handle of the tool comprises a relatively fixed member **10** terminating in a head portion **11**, and a cooperating member **12** pivotally attached thereto. The members **10** and **11** may be cast of a suitable metal to form an integral unit with the member **10** in the form of a longitudinal section of a cylinder for accommodating the member **12**. The member **12** is of tubular form and has secured thereto the tail **14** of a rocker arm **13** as by means of a pair of pins **15, 16** force-fitted through aligned holes formed in the tail and the wall of the member **12**. As shown in FIGURES 7 and 8, the rocker arm has a bifurcated end terminating in the spaced, integral fingers **17** and **18** and a hole **19** extending through the body portion. This hole is a clearance hole for a screw **20** (see FIGURE 1), having an end threaded into a threaded hole provided in the wall of the handle member **10**, thereby pivotally attaching the handle members together.

Secured to and extending from the head portion **11** is a rigid metal tube **21**, the other end of the tube being secured to the operating head **22** comprising a bushing member **23** having a pair of clamping jaws **24** and **24'** pivotally attached thereto by means of the respective pins **26** and **27**. An operating rod **30** slidably extends through the tube **21**. The left end of the rod **30** has secured thereto a metal wedge **31**, the side and front views of which are shown in FIGURES 5 and 6, respectively. The other end **32**, of the rod **30**, is threaded and carries thereon an adjusting nut **33** having a knurled peripheral surface. As will be described hereinbelow, with specific reference to FIGURE 9, a compression spring biases the operating rod **30** to the right, whereby the base of the wedge **31** normally abuts against the surface of the head bushing **23** and the handle member **12** extends at an angle relative to the member **10**, as shown in FIGURE 1. A helical spring **35**, having its ends soldered together to form a circle, as shown in the enlarged view of FIGURE 4, is positioned within complementary grooves formed in the outer surfaces of the clamping jaws **24** and **24'**, said spring compressively retaining the jaws in the non-extended positions when the wedge is in the withdrawn position, as illustrated in FIGURE 1.

The two handle members **10** and **12** are designed to be grasped conveniently in one hand. In order to operate the tool, the user squeezes the handle members together whereby the counterclockwise rotation of the pivoted handle member **12** causes the rocker arm to move the nut **33** and the rod **30** to the left, as shown in FIGURE 3. Such movement of the rod causes the wedge **31** to force apart the individually-pivoted clamping jaws **24** and **24'**. This radial expansion of the clamping jaws secures the tool to a hydraulic valve lifter for the purpose of withdrawing the lifter from the engine block, as will be described hereinbelow, with specific reference to FIGURE 19.

Reference, now, is made to the enlarged, fragmentary cross-sectional view of FIGURE 9. The adjusting nut **33** is provided with an axial bore **38**, for accommodating the coiled spring **39** loosely carried by the operating rod **30**, said bore communicating with a threaded axial hole matching the threads formed on the rod end **32**. The head portion **11** and the operating head **22** are provided with axial bores receiving the ends of the outer tube **21**, which tube may be soldered, or welded, to the heads, as indicated by the numerals **40**, **41**. The left hand end of the operating rod **30** is of a reduced-diameter, the end portion of which is threaded into a central hole formed in the wedge **31**. It will now be apparent that the spring **39** biases the operating rod to the right with the base of the wedge normally abutting the surface of the head **22**. Also, the range of forward movement of the wedge is determined by the distance between the end of the adjusting nut **33** and the wall defining the bottom of the bore **42** formed in the head portion **11**. Obviously, the extent of the linear movement of the operating rod can be increased or decreased by rotating the nut on the rod end **32**.

The two clamping jaws are of identical construction. FIGURES 10–13 are, respectively, side, top, bottom and front views of one of the clamping jaws. The jaw, preferably made of hardened steel, is an integral member having a cylindrical outer surface **45**, with a circumferential groove **46** formed therein, and terminating in a lug portion **47**, the latter being provided with a transverse slot **48**. The inner surface **49** is mono-planar as is the front surface **50**. Extending radially from the cylindrical surface is a lip **51**, the outer edge of which is of arcuate shape.

The construction of the operating head **22** is shown in FIGURES 14–16, which figures are side, top and front views, respectively. The shank portion **53** is provided with an axial bore **54** communicating with the smaller, central hole **55**, the former receiving an end of the tube **21** and the latter accommodating the left hand end of the operating rod **30**, as shown in FIGURE 9. The two pins **26** and **27** are force-driven through appropriate holes

formed on two cords of a circle, which circle defines the outer surface of the head. These pins span a diametrical slot **56**, formed on the front face of the head, and having a depth equal to the thickness of portion **23**, that is, such slot extends to the reduced-diameter, integral shank **53**. Such slot, which intersects the axial hole **55**, accommodates the lug portions of the two clamping jaws, as best shown in FIGURES 17 and 18, to which reference now is made.

FIGURES 17 and 18 are fragmentary views, with parts shown in cross-section. The clamping jaws **24**, **24'** each have their lug portions **47**, **47'** disposed within the diametrical slot **56**, with the pins **26** and **27** extending through the respective slots **48**, **48'**. The circular spring **35**, see FIGURES 1 and 4, is not shown in FIGURES 17 and 18. Such spring, however, is contained within the complementary circumferential grooves **46**, **46'** and provides a radial biasing force normally pressing the two clamping jaws toward each other, as shown in FIGURE 17. When the operating rod **30** is moved to the left, the wedge **31** spreads the jaws apart, as shown in FIGURE 18. In the normal positions of the clamping jaws, as shown in FIGURE 17, the diameter (*d*) is such that the jaw lips **51**, **51'** will pass into a hydraulic valve lifter, whereas when the jaws are spread apart, as shown in FIGURE 18, the jaws firmly grasp the valve lifter for removal thereof from the engine block.

Referring, now, to FIGURE 19, there is shown a hydraulic valve lifter **60** which normally reciprocates within the bore **61** provided in the engine block **62**. Generally, the valve lifter is provided with an axial bore receiving the piston **63**, which piston is biased upwardly toward the inwardly-directed flange **64** by a compression spring **65**. This piston, which has a diameter less than that of the hole defined by the flange **64**, is retained in operative position by a lock ring **66**.

Due to the accumulation of gum, varnish, etc., the lower outer surface of the valve lifter may become, essentially, frozen to the wall of the engine block. Consequently, a considerable twisting force is required to break the lifter loose and remove same from the engine block. With the clamping jaws of the tool in the normal, or relatively closed, position (as shown in FIGURE 17), the front portions of the jaws, including the outwardly-extending lips **51**, **51'**, will pass through the opening in the top of the valve lifter. With the jaws brought to rest upon the lock ring **66**, a relatively small downward pressure, exerted on the tool, depresses the spring and the piston **63**. At this point, the user squeezes together the handle members of the tool, whereby the operating rod **30** drives the wedge **31** downwardly, thereby forcing the jaw members **24**, **24'** apart with the respective lips **51**, **51'** positioned under the lifter flange **64**. It is pointed out, however, that the ends of the lips **51**, **51'** are spaced from the inner wall of the lifter when the cylindrical outer walls of the jaw members abut against the inner wall of the flange **64**. Inasmuch as the cylindrical, outer surfaces of the two clamping jaws form the major portion of a complete cylinder, there is a relatively long mutual surface area of contact between the flange **64** and the jaws. Thus, by tightly squeezing together the tool handle members, the valve lifter is securely grasped by the tool jaws and can be subjected to a twisting motion to shear the varnish film, after which the tool can be manipulated to remove the lifter from the engine block. The jaw lips **51**, **51'** serve primarily to orient the tool relative to the lifter and to retain the tool in operative position with respect to the lifter if the pressure on the handle members is somewhat relaxed during the process of freeing and removing the lifter. In such arrangement, the possibility of deforming the relatively thin lips is reduced to a minimum. As has been described, hereinabove, with reference to FIGURE 9, the nut **33** may be threadedly adjusted on the operating rod to set the extent of the forward movement of the wedge when the handle mem-

bers are squeezed together tightly. Such adjustment is desirable to adapt the tool for use on valve lifters of different sizes.

Once the old valve lifter has been removed, a new lifter can be attached to the tool, in a similar manner, thereby facilitating the placement of the new lifter into the engine block hole.

A valve lifter tool having a relatively long stem, as shown in FIGURES 1–3, is designed primarily for use on valve lifters which are positioned at a relatively long distance from the engine top. In certain engines, the valve lifters are positioned relatively close to the engine top but other engine components restrict the head room above the lifter. In such cases, a relatively short tool is required. It is apparent that the tool can be made relatively short by eliminating the outer tube **21** (see FIGURE 1) and modifying the head portion **11** to serve as the operating head **22**. In such case, only a very short operating rod is necessary, all other components of the tool remaining as described.

Also, in certain engines, the valve lifters are not only recessed at some depth from the engine top but access thereto cannot be had by means of a straight tool without removing other engine components. For use in such specific cases, the tool may be modified as shown in FIGURE 20. The handle and operating head (here identified by the numerals **70** and **71**) are constructed and arranged as has been described. The outer tube, in this case, comprises two sections **21***a* and **21***b*, the former being rigidly secured to the head portion **11** and the latter being secured to the shank **53** of the operating head. These two tube sections have secured thereto a flexible tube **72**. A pair of cable guides **73**, **74** are secured in fixed position on the tube sections **21***a* and **21***b*, each guide having a loop loosely encircling the flexible cable **75**. One end of the cable **75** is soldered to the shank **53**. The other end of the cable passes into a tube **76** and is soldered to the end of a threaded rod **77**, which rod carries an adjusting nut **88**. The tube **76** is secured rigidly to the tube section **21***a* by means of a suitable bracket **79**. Thus, rotation of the nut **78** in a direction to cause more of the rod **77** to protrude from the tube **76** will cause the cable **70** to pull the operating head into the illustrated position. In this construction, the operating rod also is made in two sections, one section being secured to the wedge **31** and the other section carrying the adjusting nut **33**. The other ends of the operating rod sections are secured to a flexible cable **80**, of the type generally referred to as speedometer cable, which cable is spaced from and substantially co-extensive with the flexible tube **72**. Once the operating head has been offset to the required extent, the tool is used and operated as has already been described.

The construction shown in FIGURE 20 permits the user to offset the operating head **71** as required, thereby to adapt the tool for use on a particular job. However, the construction of an offset tool can be simplified considerably when such tool is designed for use on a specific engine. In such case, the tool is provided with a solid outer tube **21**, as shown in FIGURE 1, the forward end of which is bent into a predetermined arcuate form such as, for example, the outer flexible tube **72** shown in FIGURE 20. Also, the operating rod includes a flexible portion co-extensive with the arcuate portion of the outer tube similar to the flexible portion **80** shown in FIGURE 20. Obviously, such tool, having a fixed, or permanently offset front end, does not require the adjusting arrangement comprising the flexible cable **75**, nut **78**, etc., as shown in the FIGURE 20 embodiment of the invention.

In order to accommodate the tool to a valve lifter which is only slightly offset from the axial line of the associated push rod, the basic tool may be modified as shown in FIGURE 21. Here, the axial bore in the shank portion **53** has a diameter somewhat greater than the tube **21**. The operating head is pivotally attached to the tube **21** by means of a rivet **81** passing through aligned holes formed in the shank portion **53** and somewhat larger, radially-aligned holes formed in the tube. Such rivet also passes through a longitudinally-extending clearance slot **82** formed in the operating rod **30**. Also, the wedge **31'** is pivotally secured to the operating rod by a pin **83**, said wedge having a slotted shank **84** spanning a flat tip **85** formed on the end of the rod.

Having now given a detailed description of the invention, those skilled in this art will be able to make various changes and modifications without thereby departing from the scope and spirit of the invention, as set forth in the following claims.

I claim:

1. A tool comprising,

(a) a first handle member,

(b) a rigid tube having one end secured to said first handle member,

(c) a cup-shaped operating head carried by the other end of said tube, said head having an axial hole formed in the base and diametrically-opposed slots formed in the side wall,

(d) a pair of spaced pins secured to said head and spanning the said slots,

(e) a pair of jaws, each jaw having a cylindrical outer surface, a mono-planar inner surface and terminating in a lug portion having a transverse slot formed therein, said jaws being pivotally-coupled to the said head by means of the said spaced pins passing through the said transverse slots,

(f) an operating rod extending through the said tube,

(g) a wedge member disposed between the said jaws and connected to one end of the operating rod,

(h) a first spring means biasing the jaws into engagement with said wedge member,

(i) a second handle member pivotally secured to the first handle member and having an actuating end, and

(j) a second means biasing the operating rod into engagement with the actuating end of the second handle member.

2. The invention as recited in claim **1**, wherein the cylindrical outer surface of each jaw member terminates in a radially-extending lip and wherein the mono-planar surfaces of the jaw members lie in planes which converge at a point remote from the said head.

3. The invention as recited in claim **1**, wherein the transverse slots formed in the lug portions of the jaws have a depth substantially exceeding the diameters of the said pins, and wherein a portion of each lug portion extends through the diametrically-opposed slots formed in the said head.

4. The invention as recited in claim **1**, wherein a portion of the said first handle member comprises a longitudinal section of a cylinder and wherein the said second handle member is cylindrical and partially disposed within the said portion of the first handle member.

5. The invention as recited in claim **1**, including an adjusting nut carried by the said operating rod, which nut is in engagement with the actuating end of the second handle member.

6. The invention as recited in claim **1**, including means forming circumferential grooves in the cylindrical outer surface of the jaws, and wherein the said first spring means comprises a circular spring member disposed within the circumferential grooves.

7. The invention as recited in claim **1**, including cooperating adjustment means carried by the said head and operating rod, said means being manually-adjustable to offset the axis of said head relative to that of the said tube.

8. The invention as recited in claim 7, wherein the said wedge member is connected to the said one end of the operating rod by a flexible cable.

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