Jan. 3, 1967 J. F. MANESS 3,295,193

AUTOMOTIVE VALVE SPRING COMPRESSING APPARATUS

Filed Aug. 24, 1964

FIG. 1

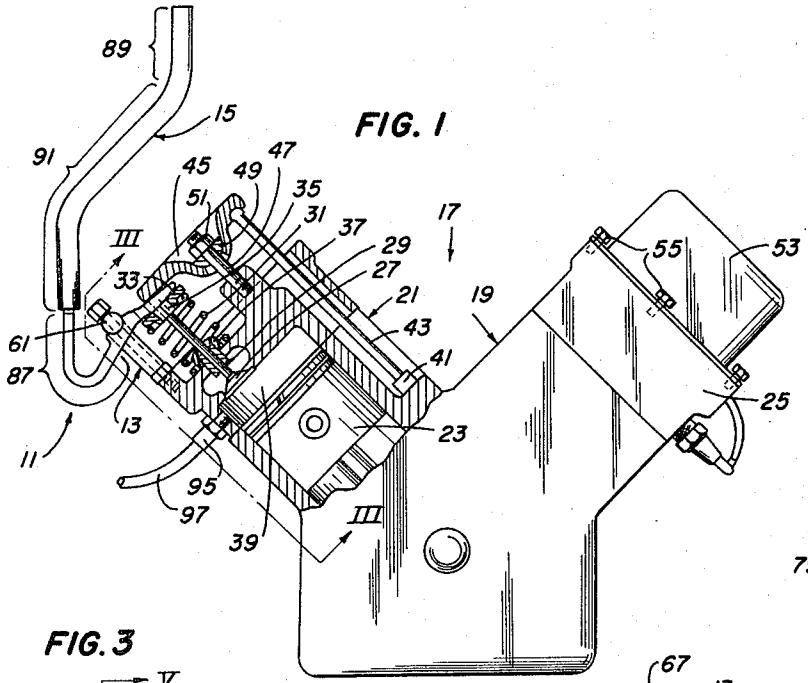


FIG. 2

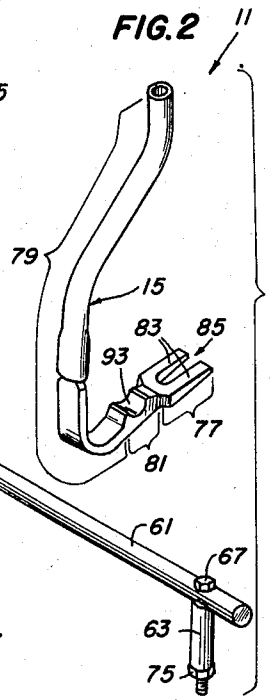


FIG. 3

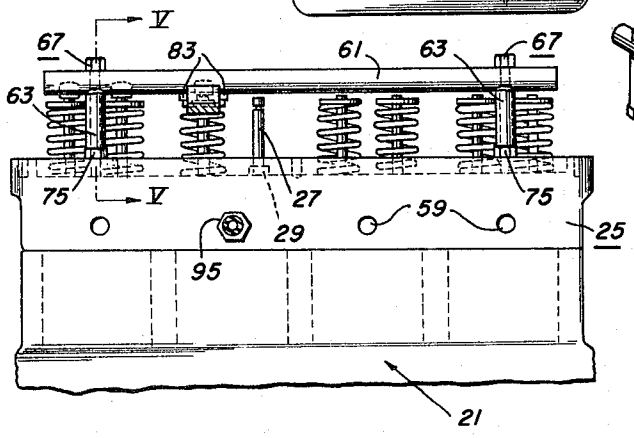


FIG. 4

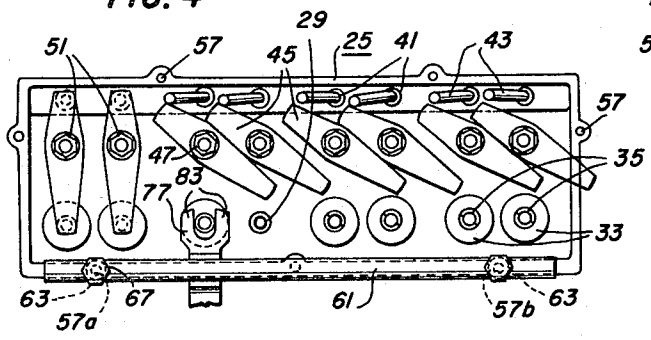


FIG. 5

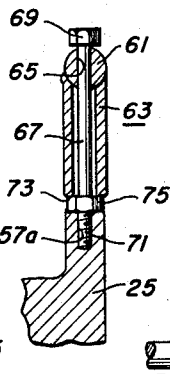


FIG. 6

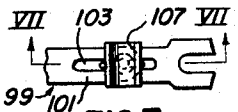


FIG. 7

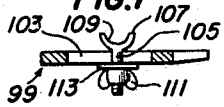
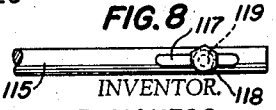


FIG. 8



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AUTOMOTIVE VALVE SPRING COMPRESSING APPARATUS

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6 Claims. (Cl. 29—220)

This invention relates generally to valve spring compressing apparatus and particularly to such apparatus for compressing the valve springs in valve-in-head type automotive engines.

In the repair of automotive engines, it is frequently necessary to replace broken valve springs and also to replace defective valve stem oil seals. In the valve mechanism of contemporary automobile engines, there are provided oil seals around each of the valve stems. Such seals prevent oil from passing into the cylinder combustion chamber and being burned, which would result in excessive oil consumption by the engine. Since it is desirable to repair the engine as quickly and as easily as possible, it is not unusual for the automobile mechanic to replace the defective parts without removing the cylinder head from the cylinder block. The procedure in such valve mechanism repair consists principally of removing the valve cover from the cylinder head, compressing the valve spring and valve spring retainer, removing the valve spring retainer lock, and releasing the valve spring.

Valve-in-head type engines for some time have typically been provided with a rocker arm shaft on which each valve rocker arm of a plurality of valves were fulcrumed. In compressing a spring on such engines having a rocker arm shaft, the operation was easily performed by using a forked-end bar compressor tool fulcrumed from the rocker arm shaft. A comparatively recent evolvement in automotive valve train mechanisms has been the use of an individual rocker arm stud for each valve instead of the rocker arm shaft. In this arrangement, each rocker arm is pivotally fulcrumed by a substantially short rocker arm stud fixedly secured to and projecting outwardly from the cylinder head of the engine.

Although the present invention is concerned with the provision of a valve compressing apparatus applicable for both rocker shaft fulcrumed and individual stud fulcrumed rocker arms, it is most concerned with the provision of such apparatus applicable for the repair of engines having stud fulcrumed rocker arms.

Valve spring compressor tools for use in the repair of engines employing stud fulcrumed rocker arms have heretofore been an adaptation of the forked-bar type tool used for such repair jobs on engines having rocker shaft fulcrumed rocker arms. Previous to the present invention, the compressor tool for compressing springs on stud fulcrumed valve rocker arm engines consisted principally of a single forked-bar tool. In using a compressor tool of such prior type on stud fulcrumed valve rocker arm engines, it was necessary to remove the rocker arm stud nut and rocker arm of the applicable valve, replace the rocker arm stud nut on the rocker arm stud, and use the underside of the nut as a fulcrum for the forked-bar compressor tool as the valve spring was compressed. As is readily apparent, this was a tedious and prolonged task, and particularly so if all the valve springs of the engine were to be removed, as in the replacement of defective valve stem oil seals. Another disadvantage in prior valve

spring compressor tools and in their method of use on stud fulcrumed rocker arm engines was that, in removing the stud nut and rocker arm, the valve adjustment was disarranged. Substantially all engines employing the individual fixed stud for the rocker arm fulcrum have so-called hydraulic valve lifters for eliminating back-lash in the valve mechanism. The stud nut in such engines, in addition to pivotally securing the rocker arm, also provides the adjustment for the hydraulic lifter of that rocker arm and its respective valve. It is thus apparent that, in removing the stud nut, the hydraulic tappet adjustment of each valve is disarranged, and must be re-adjusted after the respective valve spring has been re-installed. The procedure for adjusting each valve will not be described; suffice to mention that it is a tedious operation which requires considerable skill and effort.

The so-called V–8 type engine is perhaps most prevalent today. Such engines include two cylinder heads which accommodate respectively four cylinders. The two banks of cylinders are arranged in a V, and the respective valves and valve springs for each bank of cylinders are arranged substantially at the upper and outside part of the V configuration. When the typical V–8 engine is installed in an automobile, it is often very difficult to "get at" the valve mechanism to do the repair job. Various chassis parts or engine assessories often hinder the mechanic in the valve mechanism repair, and it is often necessary for such parts or assessories to be removed. If such parts are removed to facilitate access to the valve mechanism, the repair job may not be expeditiously performed.

It is a primary object of the present invention to provide a valve spring compressing apparatus whereby the various valve mechanism repair operations may be expeditiously and accurately performed.

A further object is to provide, in such a valve compressing apparatus, means for expeditiously performing the repair operation without removing the rocker arm from the cylinder head and without disarranging the valve adjustment.

A further object is to provide, in such a valve compressing apparatus, means for performing the repair operation without removing the cylinder head from the cylinder block.

A further object is to provide such valve spring compressing apparatus particularly suitable for valve mechanism repairs on the contemporary V–8 type engine which typically has limited work space around the cylinder head and valve mechanism.

A further object is to provide such valve spring compressing apparatus that is strong, durable, and dependably operable.

A further object is generally to improve the design and construction of automotive valve spring compression apparatus.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

FIG. 1 is an environmental illustration of the apparatus of the present invention illustrated as being used in compressing a valve spring in a typical automobile engine, with parts being broken away for purposes of illustration.

FIG. 2 is a perspective view of the apparatus of the present invention.

FIG. 3 is substantially a fragmentary side elevational view taken as on the line III—III of FIG. 1.

FIG. 4 is a top view of the device of FIG. 3.

FIG. 5 is an enlarged transverse fragmentary sectional view taken as on the line V—V of FIG. 3.

FIG. 6 is a fragmentary plan view showing a modified form of the lever part of the present invention.

FIG. 7 is a sectional view taken as on the line VII—VII of FIG. 6.

FIG. 8 is a fragmentary plan view showing a modified form of the base part of the present invention.

Referring now to the drawings in which the various parts are indicated by numerals and referring first to the principal embodiment shown in FIGS. 1–5, the apparatus of the present invention, indicated by numeral **11**, includes a base part **13** and a lever part **15**.

As indicated previously, apparatus **11** is perhaps most useful for compressing valve springs in the contemporary V–8 valve-in-head type automobile engine and in such an engine having stud fulcrumed rocker arms. It is this type engine that is illustrated in the drawings and is the type which will be conjunctively described with apparatus **11** in the following description.

The engine is indicated generally by numeral **17** and includes a V-shaped cylinder block having a right bank of cylinders **19** and a left bank of cylinders **21**. Pistons **23** are slidably fitted in cylinders **19**, **21**. A cylinder head assembly **25** is secured to each of right and left banks of cylinders **19**, **21**. Each cylinder head assembly **25** includes eight valves **27** and provides an intake and exhaust valve for each cylinder. A valve guide **29**, securely fitted in the respective cylinder heads **25**, slidably receives the respective valves **27**. A helical valve spring **31** encircles the valve stem of each of valves **27**. A disc-like valve spring retainer **33** and a pair of retainer locks **35** securely attach to the valve stem end and provided the spring retainer means for urging the valve to a closed position. A rubber cap-like oil seal **37** frictionally fits around the upper portion of guide **29**, slidably engages the valve stem, and prevents oil from passing into combustion chamber **39**. A cam shaft, not shown, actuates each valve **27** through a hydraulic valve tappet **41**, a push rod **43**, and a rocker arm **45**. Each rocker arm **45** is secured to the cylinder head by a rocker arm stud assembly which includes a substantially short stud **47**, a retainer **49**, and a nut **51**. Stud **47** is threadedly secured to the cylinder head and projects outwardly therefrom. Rocker arm **45** is provided with a slotted aperture and a hemispherically-surfaced interior. Stud **47** is disposed through the aperture of rocker arm **45**. Retainer **49** and nut **51** pivotally secure the rocker arm **45** to the rocker arm stud **47**. With reference to FIG. 1, it may be readily seen that the action of the valve train mechanism is such that the valve tappet **41** and push rod **43** are moved outward by the cam shaft; the push rod engages rocker arm **45**, which is fulcrumed from the rocker arm stud assembly; and, acting as a lever, the rocker arm engages the end of the valve stem and opens the valve. A valve cover **53**, as that shown on right bank of cylinders **19**, covers the respective valve mechanism. Screw fasteners **55**, extending through apertures in the base flange of valve cover **53**, engage respectively the threaded bore openings **57** in cylinder head assembly **25** and securely attach the valve cover to the cylinder head. Threaded apertures **59** extend into the cylinder combustion chamber **39** for receiving the spark plug ignition means of the engine.

By way of exemplification, apparatus **11** will be described as illustrated in the drawings and as being applicable in the valve mechanism repair of the left bank of cylinders **21** of engine **17**. More specifically, the apparatus is illustrated and will be described as being applicable in the compression of a valve spring on the left bank of cylinders; it being considered beforehand that the valve cover **53** of that bank of cylinders has been removed.

Base part **13** of apparatus **11** includes a substantially straight rod member **61** and support means for supporting rod member **61** in spaced relationship with cylinder head **25**. Rod member **61** is preferably of solid round-sectioned rod stock and is of a length substantially equal the length of cylinder head **25**. The support means for rod member **61** includes two tubular spacer members **63**. Two bore openings **65** are provided through the oppositely disposed end portions of rod member **61** in perpendicular relationship to the axis of the rod member. The axes of bore openings **65** are substantially in a common plane and are spaced apart a distance equal the distance between bore openings **57***a* and **57***b*, as best seen in FIG. 4. Spacer members **63** are fixedly secured respectively at an end of each thereof to rod member **61**, as by welding. Spacer members **63** are secured perpendicularly to rod member **61** and are in axial alignment respectively with bore openings **65**. Two bolt fasteners **67** extend respectively through bore openings **65** of rod member **61** and tubular spacer member **63**. Each bolt fastener **67** includes a head portion **69** and a threaded end portion **71**. With head portion **69** of each fastener **67** engaging rod member **61**, the length of each fastener is such that the threaded end portion **71** projects somewhat past the free end **73** of the respective member **63**. A stop nut **75** is threadedly engaged respectively on the end portion **71** of each bolt fastener **67**. Stop nuts **75** respectively are freely engageable with ends **73** of spacer members **63**, and bolt fasteners **67** preferably are freely turnable in spacer members **63**.

Lever part **15** includes a foot portion **77** at one end thereof, an arm portion **79** disposed toward the other end of lever part **15**, and a fulcrum portion **81** adjacent foot portion **77** and interposedly joining portions **77**, **81**. Foot portion **77** is bifurcated and includes a pair of prongs **83** which provide a slot **85** therebetween. Prongs **83** are tapered toward the respective ends thereof and are spaced apart a distance slightly more than the diameter of the pair of retainer locks **35** of engine **17**. Fulcrum portion **81** of lever part **15** operably engages rod member **61** of base part **13**. Arm portion **79** is preferably, though not essentially, of somewhat tortuous configuration and includes a proximal portion **87**, a distal end portion **89**, and an intermediate portion **91**, as best seen in FIG. 1. Such a configuration of lever part **15** has been found to be effective for valve repair operations on V–8 engines. Referring to the environmental view of the apparatus **11** in FIG. 1, it will be noted that the U-shaped proximal portion **87** substantially doubles arm portion **79** of lever **15** back over foot portion **77**. Distal end portion **89** serves as a hand grip for the manipulation of the lever part, and such configuration provides means whereby the repairman may use the apparatus in a limited work space.

It is contemplated that the apparatus will be used for repair of valve-in-head engines having vertically disposed cylinder blocks, and in such apparatus the lever part may be L-shaped or substantially straight. However, as mentioned previously, it is thought that the apparatus is most suitable for repair of V–8 valve-in-head type engines, and thus such a lever configuration as above described is the preferred form of the lever part.

Scotch means is included in fulcrum portion **81** of lever part **15** for providing a substantially fixed bearing point relative to the length of the lever part and for scotching or preventing unwanted longitudinal movement of the lever part relative to base part **13**. A recessed cylindrical surface **93**, disposed transversely of the lever, preferably provides the scotch means of the apparatus. Recessed surface **93** is adapted to co-actingly engage rod member **61** of base part **13**.

By way of exemplifying the use of apparatus **11**, a typical repair operation will be described on engine **17**; such repair operation being the replacement of defective oil

seals **37**. To replace the oil seals in the engine, the following simple steps are carried out: Valve cover **53** is removed by removing screw fasteners **55**; base part **13** is securely mounted to head **25** by engaging bolt fasteners **67** respectively in bore openings **57***a*, **57***b*. With base part **13** securely attached to the cylinder head **25**, forked foot portion **77** is moved under rod member **61** and manipulated so that recessed surface **93** engages the underside of rod member **61**, and foot portion **77** engages retainer **33** of the desired valve. Distal portion **89** of lever part **15** is then urged downwardly and inwardly toward engine **17** fulcruming lever part **15** under rod member **61** and compressing valve spring **31**. With lever part **15** held thus, and valve spring **31** compressed, the respective rocker arm **45** is moved to the side of the valve spring by pivoting the rocker arm around its stud **47** (see FIG. 4). Next, with valve spring **31** being held compressed, retainer locks **35** are disengaged from the valve stem, the lever part released and removed, and retainer **33** and valve spring **31** removed from the valve stem and from the cylinder head. Oil seal **37** may then be removed and replaced in a conventional manner, and the reverse of the above-described steps carried out to reassemble the engine.

Although not constituting a part of apparatus **11**, an additional component in the above-described operation is usually necessary. That component is the means whereby the valve may be held against its seat while the spring is being compressed. A conventional practice for holding the valve in such a seated position is by injecting compressed air into the combustion chamber. This may readily be done by threadedly engaging an adaptor **95** into the applicable one of apertures **59** and providing adaptor **95** with a source of compressed air, as through hose **97**.

If desired, the base part and the lever part of the present invention can be modified as shown in FIGS. 6–8 so that the parts can be adjusted to fit various sizes of engines. Thus, instead of having the cylindrical surface **93** fixed on lever part **15**, as in the principal embodiment, the lever part **99** is modified in the fulcrum portion **101** thereof so as to provide a longitudinal slot **103** therein through which extends a threaded fastener **105** to which is fixedly attached a member **107** in the shape of one-half of a cylinder. Member **107** has a cylindrical surface **109** corresponding to cylindrical surface **93** of the principal embodiment. A wing nut **111** and a washer **113** are provided on fastener **105** so that member **107** can be positioned at the desired place along fulcrum portion **101**. The remainder of lever part **99** is similar to lever part **15**. Also, instead of having the spacer members **63** fixed on rod member **61**, as in the principal embodiment, the modified rod member **115**, which corresponds to rod member **61**, is provided with a slot **117** therethrough which adjustably holds a fastening member **118**, corresponding to fastener **67** of the principal embodiment, so that spacer member **119**, corresponding to spacer member **63** of the principal embodiment, can be positioned at the desired place along rod member **115**.

It is apparent from the foregoing that, with the use of apparatus **11**, a valve repair job may be performed on a stud fulcrumed rocker arm engine without disturbing or rearranging the initial hydraulic valve tappet settings. The apparatus of the present invention is particularly useful for repairs on V–8 engines, as it is substantially operable from the underside of the valve and thus permits the repairman to have ready access to the valve mechanism as the several parts thereof are being removed or installed. The upwardly extending lever part and the specific configuration of the lever also provide means whereby many valve repair operations may be performed without having to remove chassis parts or engine accessories to obtain sufficient work space.

In summary, the apparatus of the present invention provides means whereby the compressing of a valve spring and the repair of the valve mechanism in an automobile engine may be accurately and expeditiously performed.

Although the invention has been described in some detail by way of illustration and example for purposes of clarity or understanding, it is to be understood that it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of this invention as hereinafter claimed.

I claim:

1. Apparatus for compressing a valve spring means in an engine, said apparatus comprising a base part and a lever part, said base part including a rod member and support means for rigidly supporting said rod member in spaced relationship with said engine and adjacent said valve spring; said lever part including a forked foot portion at one end engagable on top of said valve spring means, a fulcrum portion having a substantially cylindrical upwardly facing recess surface, said fulcrum portion being fixedly attached to said forked foot portion with said recess surface being disposed transversely of said lever part and fixed relative to said lever part and turnably engaging the underside of said rod member, and an arm portion fixedly attached to said fulcrum portion and extending over said rod member for turning said lever part about said rod member to compress said valve spring means.

2. Apparatus for compressing valve spring means in an automobile valve-in-head type engine having threaded bore openings in the cylinder head for receiving the threaded fasteners securing the valve cover to the cylinder head, said apparatus comprising a base part and a lever part, said base part including a substantially straight rod member and support means, said support means including means threadedly engageable with said threaded bore openings in said cylinder head for rigidly supporting said rod member from said cylinder head; said lever part including a forked foot portion at one end thereof, a fulcrum portion having a substantially cylindrical upwardly facing recess surface, said fulcrum portion being fixedly attached to said foot portion with said recess surface being disposed transversely of said lever part and fixed relative to said lever part, and an arm portion extending from the other end of said lever part remote from said foot portion over said foot portion and fixedly adjoining said fulcrum portion; said base part being adapted to be securely attached to said cylinder head with said support means threadedly engaging said threaded bore openings of said cylinder head and with said rod member of said base part being disposed substantially parallel with said cylinder head and in spaced adjacency with said valve spring means, said apparatus being adapted to be operably disposed with said fulcrum portion of said lever part engaging said rod member and with said recess surface of said forked foot portion of said lever part engaging said valve spring means and to be operable by turnably urging said arm portion of said lever part in a rotative direction to fulcrum said lever part from said base part and to compress said valve spring means.

3. The apparatus of claim **2** in which said support means includes two bore openings extending axially perpendicular through oppositely disposed end portions of said rod member and disposed substantially in a common plane, two straight tubular spacer members fixedly secured respectively at an end of each thereof perpendicularly to said rod member and secured in axial alignment respectively with said two bore openings, and two bolt fasteners extending respectively through said two bore openings and said two tubular spacer members, said bolt fasteners being adapted to threadedly engage said threaded bore openings in said cylinder head of the automobile engine and to securely attach said base part to said cylinder head.

4. The apparatus of claim **2** in which at least one of said support means includes a spacer member and means adjustably attaching said spacer member to said rod member at a selected place along the length thereof.

5. The apparatus of claim 2 in which said fulcrum portion includes means adjustably mounting said fulcrum portion relative to said forked foot portion for selectively varying the distance between said recess surface and said forked foot portion.

6. The apparatus of claim 2 in which said arm portion of said lever part includes a U-shaped proximal portion adjoining said fulcrum portion and disposed substantially on that side of said fulcrum portion opposite from said foot portion, a distal end portion, and an intermediate portion interposedly joining said proximal portion and said distal end portion, said lever part being of an arcuate configuration whereby said distal end portion is disposed a shorter distance from said foot portion than from said fulcrum portion.

References Cited by the Examiner

UNITED STATES PATENTS

1,438,791	12/1922	Seppmann	29—220
1,864,305	6/1932	Holmes.	
1,893,962	1/1933	Rowan	29—220
2,507,240	5/1950	Badger	29—220 X

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