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A. F. OBERLEY ET AL

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VALVE SEAT PULLER

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Fig. 1

Fig. 2

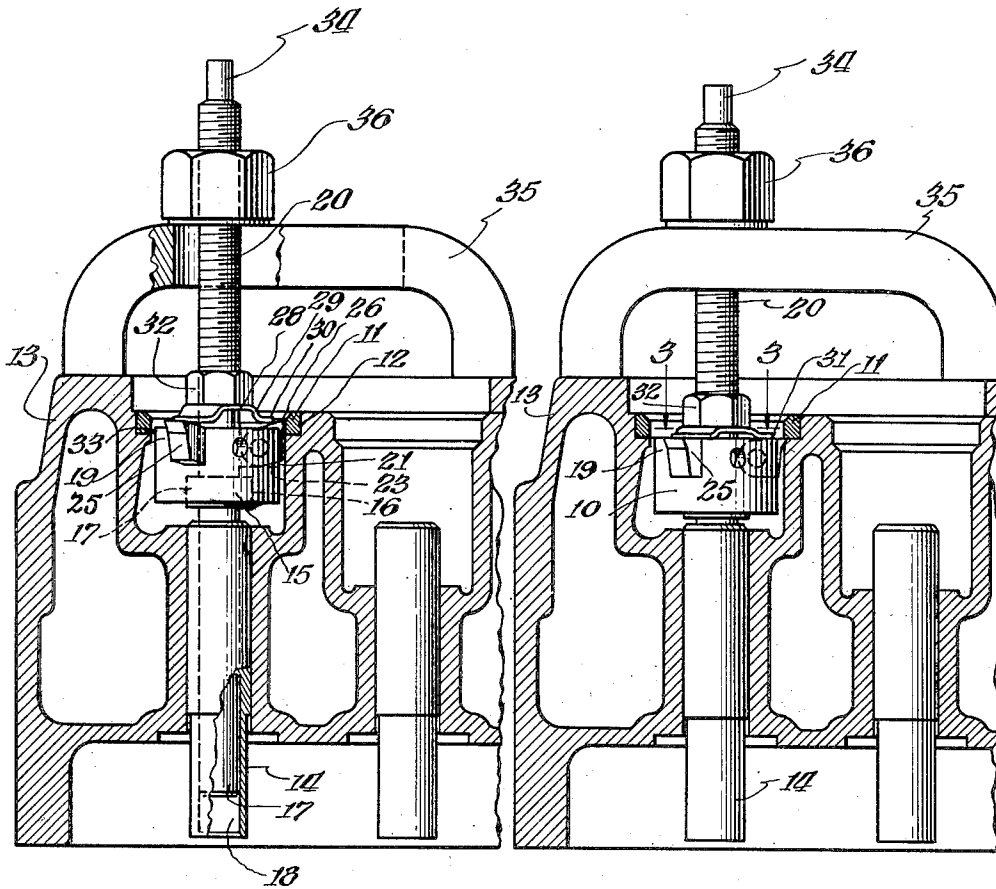
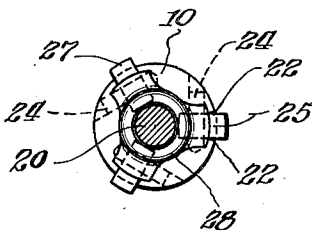


Fig. 3



Inventors:
Alton J. Oberley
Albert C. Schrimshaw
By: Paul O. Pippel
Attorney

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VALVE SEAT PULLER

Alton F. Oberley, Fort Wayne, Ind., and Albert C. Schrimshaw, Payne, Ohio, assignors to International Harvester Company, a corporation of New Jersey

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6 Claims. (Cl. 29—214)

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This invention relates to tools and more particularly to extractor tools for withdrawing valve-seat insert rings or the like from their counterbores in cylinder heads, cylinder blocks, or the like, of internal combustion engines.

It has become common practice to provide hardened steel rings as valve seat inserts surrounding the valve ports of internal combustion engines. These insert rings are held in their operative position by a frictional or drive fit with the engine block counterbores which serve as seats for them. Inasmuch as the insert rings become worn after a period of use and must be replaced and since they are rigidly held on their seats it becomes necessary to exert a considerable amount of force to remove the deteriorated insert rings. It is, therefore, an object of the present invention to provide an inexpensive and efficient extractor tool for the removal of insert rings or the like from engine blocks.

The foregoing and other important objects and desirable features inherent in and encompassed by the invention together with many of the purposes and uses thereof, will become readily apparent from a reading on the ensuing description in conjunction with the annexed drawing, in which,

Fig. 1 is a vertical fragmentary sectional view, with parts broken away, showing the relative position of the extractor tool as it is being inserted through the insert ring to be removed;

Fig. 2 is a view similar to Fig. 1 showing the extractor tool gripping the insert ring prior to dislodgment of the ring from its counterbored seat, and

Fig. 3 is a cross sectional view taken substantially along line 3—3 of Fig. 2.

Referring to the drawing, wherein like reference characters represent like elements throughout the various views, there is shown an extractor tool having a cylindrical body portion 10. The diameter of the body portion is less than the internal diameter of the insert ring 11 to be pulled so that it may readily pass through the ring. The insert ring 11 is rigidly supported in a counterbore 12 formed in an engine block 13, partially shown in Figs. 1 and 2. Concentric with and below the counterbore 12 is a valve-stem guide or bushing 14 of conventional type.

The lower end 15 of the body portion 10 is provided with a recess 16 for rigidly receiving the head 17 of a downwardly projecting spindle 17. The spindle 17 is insertable in the bore 18 of the valve-stem guide 14, as shown in Fig. 1, to center the body portion 10 and prevent trans-

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verse relative movement of the same with respect to engine block 13. Projecting from the opposite or upper end 19 of the body portion 10 is an upwardly extending threaded shank 20 which is in longitudinal alignment with the guide spindle 17.

Three circumferentially spaced grooves or recesses 21 are formed in the body portion 10. Each recess 21 is defined by side walls 22 and a bottom wall 23. Pivotally supported between each pair of side walls 22 by means of a pivot pin 24 is a gripping pawl 25. The pawls 25 have wedge-shaped projections or teeth 26 formed thereon, the outer marginal edges 27 of which are curved and relatively sharp for a purpose which will be explained hereinafter.

Loosely fitting on the shank 20 is disk or washer 28 having three circumferentially spaced spring legs 29 extending therefrom. The free end 30 of each leg 29 respectively abuts the top surface 31 of one of the pawls 25 as shown in Figs. 1 and 2. A rotatable member 32, in the form of a nut in the present invention, is screwed on the shank 20 to maintain the spring legs 29 in abutting engagement with the pawls 25. It will be apparent that the pawls 25 are continually urged to the expanded or gripping position illustrated in Fig. 2. The pawls 25 are prevented from pivoting downwardly beyond the expanded position by coming in contact with the bottom walls 23 of the recesses 21.

In operation, the spindle 17 is inserted into the valve-stem guide 14 and the wedge-shaped teeth 26 of the pawls 25 are brought to a point just below the insert ring 11. It will be obvious that the pawls 25 will pivot inwardly to a retracted position, as shown in Fig. 1, against the resilient force of the spring legs 29 as the body portion 10 is moved downwardly through the insert ring 11. By rotating the nut 32 in a direction to effect movement of the same toward the body portion 10 the yieldable force exerted by the spring legs 29 is increased and, conversely, an opposite turning of the nut will decrease the spring force. Hence, by screwing the nut 32 toward the body portion 10 after the teeth 26 are positioned directly adjacent the lower surface of the insert ring 11 the pawls 25 are forced outwardly with a relatively greater force causing the wedge-shaped teeth 26 to engage the juncture 33 of the lower surface of the insert ring 11 and the counterbore 12. A wrench or other suitable means may then be used to grasp the outer end 34 of the shank 20 to rotate the body portion 10 and the pawls 25 and undercut or

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groove the metal below the insert ring 11. The undercutting procedure described above, of course, does not have to be followed if a chamfer or undercut is already provided below the insert ring 11 as is customary in many internal combustion engines.

In order to effect an upward longitudinal pull on the body portion 10, an inverted U-shaped bridge-forming member 35 is slidably positioned on the shank 20 and engages the engine block 13 on diametrically opposite sides of the counter-bore 12. A nut 36, threaded on the shank 20 above the bridge-forming member 35, is easily screwed downwardly against the member 35 to force the body portion 10 upwardly. As the body portion 10 moves upwardly the pawls 25 are expanded even further into wedging engagement with the insert ring 11 to the fully expanded position shown in Fig. 2. Continued raising of the body portion 10 will withdraw the insert ring 11 from the engine block.

The embodiment of the invention chosen for the purposes of illustration and description herein is that preferred as the result of selective tests based upon the requirement for achieving the objects of the invention and developing the utility thereof in the most desirable manner, due regard being had to existing factors of economy, simplicity of design and construction, and the improvements sought to be effected. It will be appreciated, therefore, that the particular structural and functional aspects emphasized herein are not intended to exclude, but rather to suggest, such other adaptations and modifications of the invention as fall within the spirit and scope of the invention as defined in the appended claims.

We claim:

1. An extracting tool for removing a valve-seat insert ring or the like from engine blocks having valve stem guides comprising a cylindrical body portion adapted to pass through the insert ring to be pulled and having a plurality of circumferentially spaced recesses formed therein; a longitudinally disposed spindle projecting from one end of said body portion insertable in the valve stem guide to centralize said body portion; a longitudinally disposed threaded shank projecting from the opposite end of said body portion; a pawl pivotally mounted within each recess, each pawl being adapted to pivotally move between a first position wherein a substantial portion of said pawl projects transversely beyond the cylindrical surface of said body portion to engage the insert ring and a second position wherein a relatively small part of the pawl extends beyond said cylindrical surface; resilient means positioned on said shank and engageable with said pawls for continually urging said pawls to said first position, said resilient means comprising a disk having a plurality of depending radially spaced spring legs formed therein for abutting said pawls; stop means for limiting the pivotal movement of said pawls to establish said first position; adjustable means for varying the yieldable force of said resilient means; a bridge-forming element slidably mounted on said shank and adapted to bear on the engine block; and rotatable means mounted on said shank for engaging said bridge-forming element and being operative to longitudinally withdraw said body portion from the engine block.

2. An extracting tool as set forth in claim 1 in which, the major part of the portion of each pawl projecting transversely beyond the cylin-

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drical surface of said body portion when said pawls are in said first position is wedge-shaped and has a sharp marginal edge.

3. An extracting tool for removing a valve-seat insert ring or the like from engine blocks having valve stem guides, comprising a body portion adapted to pass through the insert ring to be pulled; a spindle projecting from one end of said body portion insertable in the valve stem guide to centralize said body portion; a threaded shank projecting from the opposite end of said body portion; a plurality of pawls pivotally supported by said body portion adapted to swing between an outward position wherein said pawls engage the insert ring and an inward position wherein said pawls may pass through the insert ring; spring means positioned on said shank for continually urging said pawls to said outward position including a disk having a plurality of depending radially spaced spring legs formed therein for abutting said pawls; adjustable means for varying the resilient force of said spring means; and means operatively engaging the engine block and cooperative with said threaded shank for withdrawing said body portion from said engine block.

4. An extracting tool for removing a valve-seat insert ring or the like from engine blocks, comprising a body portion adapted to pass through the insert ring to be pulled; a plurality of gripping elements pivotally supported by said body portion adapted to swing between an expanded position wherein said gripping elements engage the insert ring and a retracted position wherein said gripping elements may pass through the insert ring; spring means positioned adjacent one end of said body portion and abutting said gripping elements for continually urging said gripping elements to said expanded position said spring means including a disk having a plurality of depending radially spaced legs formed therein for engaging said gripping elements; adjustable means for varying the resilient force of said spring means; and means operatively engaging the engine block and said body portion for withdrawing said body portion from said engine block.

5. An extracting tool as set forth in claim 4 in which, each gripping element has a wedge-shaped tooth formed thereon provided with a curved, sharp marginal edge.

6. An extracting tool for removing a valve-seat insert ring or the like from engine blocks having valve stem guides comprising a cylindrical body portion adapted to pass through the insert ring to be pulled and having a plurality of circumferentially spaced recesses formed therein; a longitudinally disposed spindle projecting from one end of said body portion insertable in the valve stem guide to centralize said body portion; a longitudinally disposed threaded shank projecting from the opposite end of said body portion; a pawl pivotally mounted within each recess, each pawl being adapted to pivotally move between a first position wherein a substantial portion of said pawl projects transversely beyond the cylindrical surface of said body portion to engage the insert ring and a second position wherein a relatively small part of the pawl extends beyond said cylindrical surface; resilient means positioned on said shank and engageable with said pawls for continually urging said pawls to said first position, said resilient means comprising a disk having a plurality of depending radially spaced spring legs formed therein for

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abutting said pawls; stop means for limiting the pivotal movement of said pawls to establish said first position including a wall of each recess; adjustable means for varying the yieldable force of said resilient means; a bridge-forming element slidably mounted on said shank and adapted to bear on the engine block; and rotatable means mounted on said shank for engaging said bridge-forming element and being operative to longitudinally withdraw said body portion 10 from the engine block.

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