United States Patent

Tutino

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[54] HYDRAULIC VALVE LIFTER TOOL

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[51] **Int. Cl.** **B23p 19/04**

[58] **Field of Search** .....29/213 E, 214, 263, 280, 272

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[57] **ABSTRACT**

A hydraulic valve lifter tool, for removing a hydraulic valve lifter from an automobile engine block, having a cylindrical hollow two-prong expander head with a pair of semi-circular grasping lips formed at the prong edges for insertion within the inner-face circumferential edge of the hydraulic valve lifter and wherein is located an internal expander cam plunger having a tapered cam surface which is pulled against the inner edge of the grasping lips of said expander head by an elongated rod handle for expanding its prong edge grasping lips radially outwardly within the inner face circumferential groove of the hydraulic valve lifter. The rod handle threadedly engaged to the cam plunger and including a locking collar having a hexagonal inner bore slidably coupled with the outer hexagonal configuration of the rod handle and which includes two opposed locking index keys longitudinally extending on each side of the rod for inseration within two of four key slots of the expander head. The rod includes a circular reduced diameter portion for rotation of the collar on the rod in aligning the index keys in the key slots. The tool includes an additional elongated hollow circular bore tube wrench sleeve that is interposed between the collar and the expander head and which sleeve has on one end two opposed locking index keys for insertion within two of the four expander head key slots and, on the other end, four key slots for receiving the index keys of the locking collar for extracting the hydraulic valve lifter from a fully enclosed automobile engine block.

7 Claims, 5 Drawing Figures

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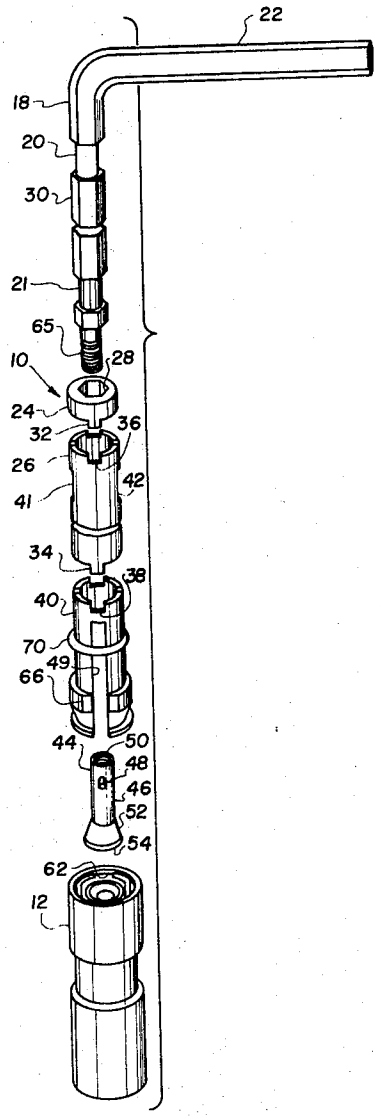


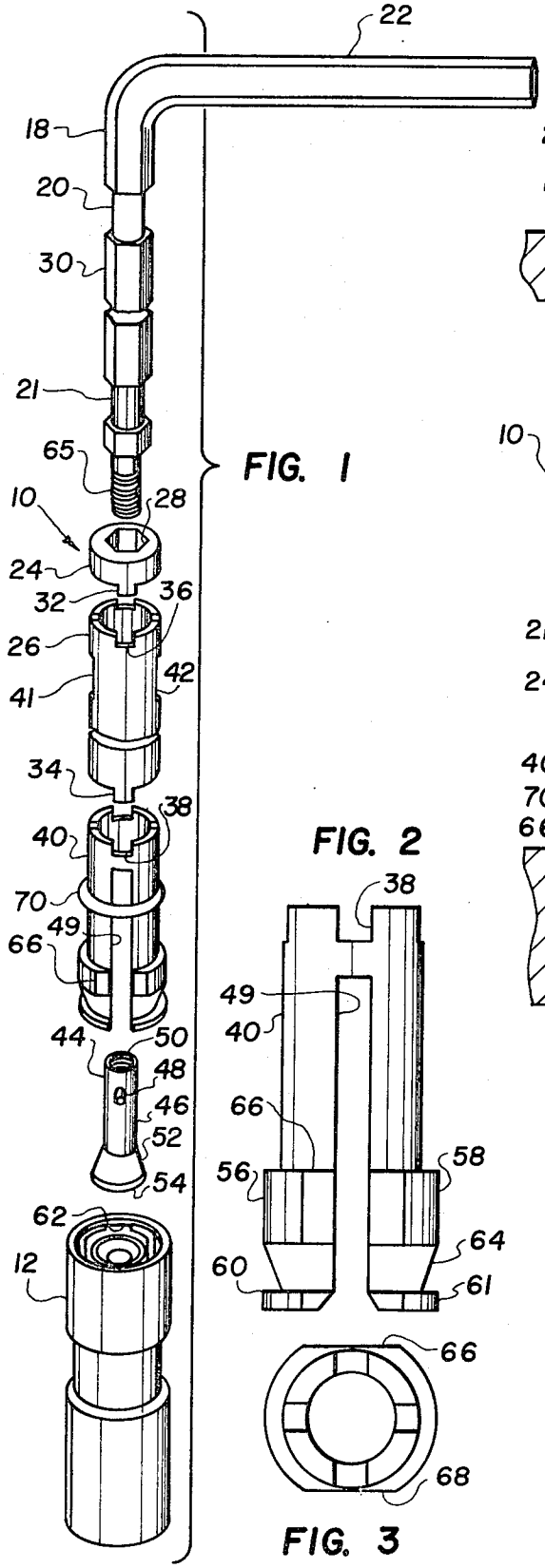


FIG. 1

FIG. 2

FIG. 3

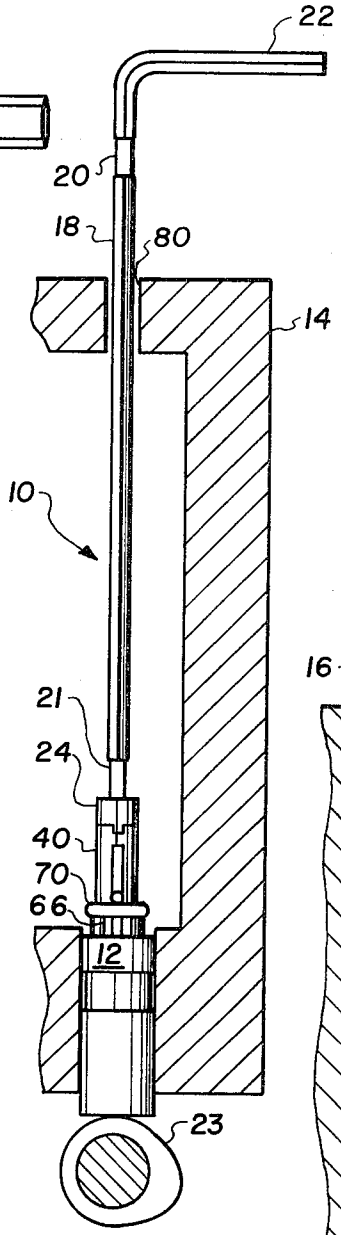
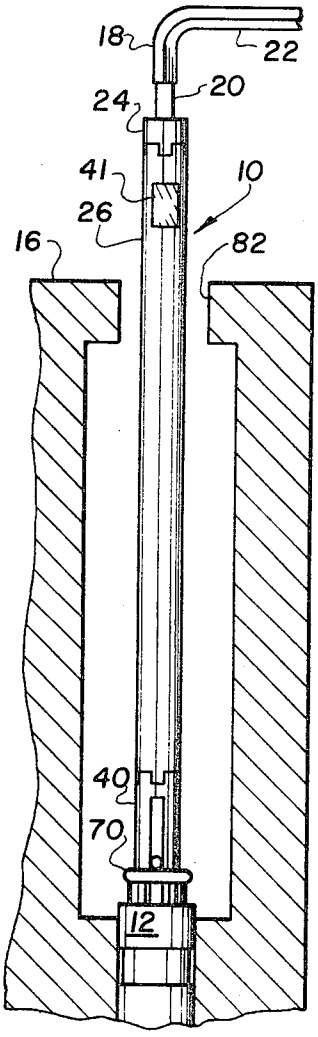


FIG. 4

FIG. 5



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HYDRAULIC VALVE LIFTER TOOL

BACKGROUND OF THE INVENTION

This invention relates generally to a hydraulic valve lifter tool for lifting the hydraulic valve lifter from an automobile engine block and, more particularly, to a hydraulic valve lifter tool which is used for lifting a hydraulic valve lifter from either a fully enclosed automobile engine block or from an engine block with a removable center intake manifold plate without damaging the hydraulic valve lifter or damaging the tool itself.

Heretofore, the hydraulic valve lifter tools were unsatisfactory since they could not twist in both rotational directions or pull without damaging the hydraulic valve lifter or the tool itself. In rotating the tool, if the turning action is in the wrong direction it could cause the loosening of the grip of the tool on the hydraulic valve lifter or the stripping of the attaching threads. That is, the heretofore tools could not solve the problem of pulling out the valve lifter without damage to the tool or hydraulic valve lifter. In addition the heretofore tools could not be used for removing a hydraulic valve lifter which is completely enclosed within the engine block and the same tool to be used for removing the hydraulic valve lifter from an engine block wherein the center intake manifold plate could be removed.

SUMMARY OF THE INVENTION

This invention provides for a hydraulic valve lifter tool for removing the valve lifter of an automobile engine from either a completely enclosed engine block or from an engine block wherein the center intake manifold plate can be removed.

Therefore, an object of this invention is to provide for a hydraulic valve lifter tool that can be used to remove a hydraulic valve lifter from an automobile block without damaging the tool itself or the hydraulic valve lifter.

Another object of this invention is to provide for a hydraulic valve lifter tool that is readily adjustable to remove a hydraulic valve lifter from either a completely enclosed engine block or from one wherein the center intake manifold plate of the engine block can be removed.

An additional object of this invention is to provide for a hydraulic valve lifter tool wherein the tool is provided with a protective locking collar for use as a means of rotating the hydraulic valve lifter back and forth and pulling it without damaging the delicate threaded attaching means or cam means which are used for locking the tool to the hydraulic valve lifter.

Another object of this invention is to provide a hydraulic valve lifter tool that is versatile in that it can be used in extracting out of the engine blocks the hydraulic valve lifters in the majority of present-day automobiles.

A further object of this invention is to provide for a hydraulic valve lifter tool which includes locking means permitting the twisting of the tool in a clockwise or counterclockwise direction without loosening the grip it has on the hydraulic valve lifter and which also includes grasping lips which are insertable within the inner face circumferential edge of the hydraulic valve lifter in an assembled state and expandable radially outwardly, therein making the holding action substantially foolproof.

Other objects and any additional advantages will be more readily understood by those skilled in the art after a detailed consideration of the following specification taken with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded view somewhat in perspective showing the hydraulic valve lifter tool in line with a hydraulic valve lifter in accordance with a preferred embodiment of the present invention;

FIG. 2 is an enlarged side view of one element of the invention shown in FIG. 1;

FIG. 3 is an end view of the element shown in FIG. 2;

FIG. 4 is a side view showing the hydraulic valve lifter tool in operation for removing a hydraulic valve lifter from an engine block which has a removable center intake manifold; and,

FIG. 5 shows the hydraulic valve lifter tool in the operation of removing a hydraulic valve lifter from an engine block which is fully enclosed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, there is shown a hydraulic valve lifter tool **10** for extracting a hydraulic valve lifter **12** from either an automobile engine block **14** that has a removable center intake manifold plate or from a fully enclosed automobile engine block **16**. The hydraulic valve lifter tool **10** includes an elongated extracting rod **18** having a hexagonal cross-sectional configuration with a pair of longitudinally spaced circular reduced diameter portions **20** and **21**. The extracting rod **18** is bent at the upper portion to form a handle **22** which is used in removing the hydraulic valve lifter **12** from the block **14** shown in contact with a cam **23** in FIG. 4 or from the block **16** shown in FIG. 5 when the tool **10** is positioned within the interior of the hydraulic valve lifter **12** as hereafter more fully described.

The valve lifter tool **10** further includes a locking collar **24** and an elongated hollow circular bore tube wrench sleeve **26**. The locking collar **24** is used without the tube wrench **26** in removing the hydraulic valve lifter **12** when the intake manifold plate of the engine block such as block **14** can be removed, shown in FIG. **4**, while the combination of both the locking collar **24** and the tube wrench **26** are used for removing the hydraulic valve lifter **12** when the automobile engine block, such as block **16**, is completely enclosed, shown in FIG. **5**.

As shown in FIG. **1**, the locking collar **24** includes a hexagonal interior bore **28** which slides along the hexagonal exterior configuration **30** of the extracting rod **18** of the tool **10**. The locking collar **24** can be rotated about reduced portion **20** or reduced portion **21** for positioning the locking collar **24** in locking the tool **10** within the hydraulic valve lifter **12** in the extracting operation of the tool, as hereinafter more fully described.

Both the locking collar **24** and the tube wrench **26** include a pair of opposed locking index keys **32** and **34** respectively. The locking index keys **32** are used to insert within key slots **36** of the tube wrench **26** and the locking index keys **34** are used for insertion within the key slots **38** of a cylindrical hollow two-prong expander head **40** which is part of the tool **10**. On the external circumference of the tube wrench **26** there is located

opposed wrench flats 41 and 42 which are used as a wrenching means as hereinafter more fully described.

The tool 10 further includes an internal expander cam plunger 44 which makes up the complete tool unit with the rod 18, collar 24 and expander head 40 for extracting the hydraulic valve lifter 12 from an engine block having removable center intake manifold plate, or which makes up the complete tool unit with the rod 18, collar 24, expander head 40 and tube wrench 26 for extracting the lifter 12 from a completely enclosed engine block. The cam 44 includes an elongated body portion 46 having an aligning shear pin stop 48 externally thereof and a threaded internal bore 50. The cam 44 includes a tapered camming surface 52 and a straight-end portion 54 for preventing it from being locked into the expander head 40.

As best shown in FIGS. 2 and 3, the expander head 40 includes a pair of opposed prongs 56 and 58. The prongs 56 and 58 include a pair of semi-circular circumferential grasping lips 60 and 61 formed at the prong edges which are used for insertion within innerface circumferential edge 62 of the valve lifter 12, shown in FIG. 1. The expander head 40 includes sloping surfaces 64 which are used as a means of contacting the corner surfaces of the edge 62 to increase the surface contact of the lips 60 and 61 with the edge 62 of the hydraulic valve lifter 12 and thereby increase the holding power of the tool on the said hydraulic valve lifter 12.

As shown in FIG. 3, the expander head 40 also includes a pair of opposed flat surfaces 66 and 68 which are used as wrenching means for holding the expander head 40 as the rod 18 is rotated within the cam plunger 44 as it is pulled tightly into the expander head 40 while the tapered surface 52 of the cam plunger 44 is pulled against the inner edges of the grasping lips 60 and 61 for expanding the two prongs 56 and 58 radially outwardly for insertion of the external circumference of the lips 60 and 61 within the edge 62 of the valve 12.

In the operation of the tool 10 in extracting the hydraulic valve lifter 12 from an automobile engine block where the cover can be removed, such as in FIG. 4, the tool 10 can be used without the tube wrench sleeve 26. In this operation the cover of the automobile engine block is removed and the rod 18 is inserted, without the locking collar 24, expander head 80 and the cam 44, through the engine block push rod hole 80. Then the collar 24 is fitted upwardly, as viewed in FIG. 4, onto the rod 18 and the expander head 40 assembled as a unit with the cam 44, is threaded onto the rod 18. That is, the cam 44 with the expander head 40 threadedly engage the rod 18 by means of its threaded end portion 65, contacting the threaded internal bore 50 of the cam 44. An O-ring 70 is used to keep the cam 44 and the expander head 40 assembled as one unit.

With the collar 24 disengaged from the tube wrench 26, the rod 18 is rotated to draw the cam 44 within the expander head 40. The aligning shear pin stop 48 extends through the cam plunger 44 and thus limits the insertion of the rod 18 within the cam plunger 44. In addition, the aligning shear pin stop 48 extends on each side of the cam 44 through opposed slots 49 of the expander head 40 to prevent rotation of the cam 44 as the rod 18 is threaded into cam 44.

In the next step, the expander head 40 with the cam 44 is pressed within the hydraulic valve lifter 12. It should be noted that the hydraulic valve lifter 12 need not be disassembled in connecting the tool 10 within the lifter 12.

With the collar 24 still disengaged, the cam 44 is held in position by a wrench tool engaging the wrench flats 66 and 68 of the expander head 40 for tightening the rod 18 into the cam 44 by rotating the rod 18 by means of its handle 22. It should also be noted that the flats 66 and 68 are on the circumferential ends of the grasping lips 60 and 61 so as to permit their expansion as the cam 44 is drawn within the expander head 40 in the tightening operation.

To extract the hydraulic valve lifter 12 and to prevent the stripping of the threaded end portion 65 of the rod 18 and the threaded internal bore 50 of the cam 44, the locking collar 24 is dropped onto the expander head 40 for engagement of the opposed locking index keys 32 of the collar 24 into the key slots 38 of the expander head 40. If the collar 24 and the expander head 40 do not fit in this position, the collar is rotated 60° in one or the other direction and then dropped into place for engagement of the keys 32 within the slot 38. The 60° rotation is due to the hexagonal configuration 30 of the rod 18 and the hexagonal bore 28 of the collar 24. If the collar 24 and the expander head 40 still do not fit while in this position, the rod 18 may be tightened until the keys 32 of the collar 24 can drop into the slots 38 of the expander head 40.

It should again be noted that the camming action of the cam surface 52 is caused by applying a wrench on the flat surfaces 66 and 68 and rotating the rod 18 by its handle 22 until the lips 60 and 61 of the expander head 40 grasp the internal edge 62 of the hydraulic valve lifter 12. After the collar 24 is engaged with the expander head 40, the tool 10 is now in position for rotation by the rod handle 22 in either one or the other direction without fear of it being unscrewed from the expander head 40 since all the work or power used in the rotational movement of the tool 10 is taken up by the keys 32 of the collar 24 engaging the slots 38 of the expander head 40. Once the hydraulic valve lifter 12 is loosened from the engine block 14 it will be pulled out by the handle 22, disengaged from the tool 10 and removed.

In the operation of extracting the hydraulic valve lifter 12 from a fully enclosed engine block, as shown in FIG. 5, the tube wrench 26 is used in cooperation with collar 24. Since the center intake manifold plate of the engine block cannot be removed, the engine block has an enlarged push rod opening 82 for insertion of the assembled tool 10 with the tube wrench 26 within the engine block 16, as shown in FIG. 5. The tube wrench 26 is used as an extension so as to be able to operate from the position shown in FIG. 5 without having to insert any portion of the operator's hand within the engine block.

In this position, the tool unit 10 is in assembled position and the expander head 40 is pressed onto the hydraulic valve lifter 12 before the collar 24 is inserted onto the tube wrench 26. The unit is pushed into the hydraulic valve lifter 12 and only the tube wrench 26 is used for rotation of the rod 18 within the cam 44 by means of a wrench engaging its wrench flat surfaces 41

and 42. The cam 44 is pulled into the expander head 40 for expanding its two prongs 56 and 58 for tightening of the grasping lips 60 and 61 within the edge 62 of the hydraulic valve lifter 12, in the same manner as hereinbefore explained for the operation of the unit described for FIG. 4. Once this is done, the collar 24 is again rotated but within the reduced diameter portion 20 of the rod 18 and connected to the tube wrench 26 in the manner described when the collar 24 was dropped directly within the expander head 40. In this position, the whole unit can be rotated backwards and forwards to loosen the hydraulic valve lifter 12. The lifter 12 can then be pulled without damage through the opening 82 in one unit.

As hereinbefore described, the valve lifter tool 10 provides a quick removal of the hydraulic valve lifter 12 from either an engine block that has a removable center intake manifold plate or from a fully enclosed engine block without damage to the tool itself. It should be noted that the unit is a compact tool having very few parts which can be damaged by any rough handling of the operator.

While the present invention has been described in preferred embodiments, it will be obvious to those skilled in the art that various modifications can be made therein within the scope of the invention.

What is claimed is:

1. A hydraulic valve lifter tool for extracting a hydraulic valve lifter from an automobile engine block wherein said hydraulic valve lifter includes an inner-face circumferential edge, said tool comprising an expander head means, grasping lips formed at the edge of said expander head means for insertion within the inner-face circumferential edge of said hydraulic valve lifter, and attaching means operable for expanding the grasping lips of said expander head means radially outwardly within the inner-face circumferential edge of the hydraulic valve lifter in securely holding said valve lifter in an assembled state in the operation of extracting the valve lifter from the automobile engine block, wherein said attaching means is an internally expandable cam plunger having tapered camming surface and said tool further comprises an elongated rod handle threadedly engagable with said cam plunger whereby said rod handle is rotated to draw the camming surface of said cam plunger within said expander head for expanding the grasping lips of said expander head radially outwardly in grasping said valve lifter and whereby said rod handle is pulled to remove the hydraulic valve lifter from the engine block and wherein said rod handle is of an elongated hexagonal exterior configuration and said tool further comprises a locking collar having hexagonal interior bore for longitudinal engagement with said rod, locking index key means integral to said locking collar and key slots formed in said expander head engagable for locking said rod relative to said expander head through the hexagonal configuration of said rod and said collar in protecting the threadable engagement of said rod with said cam plunger, when said rod handle is pulled.

2. A hydraulic valve lifter tool for extracting a hydraulic valve lifter from an automobile engine block wherein said hydraulic valve lifter includes an inner-face circumferential edge said tool comprising an expander head means, grasping lips formed at the edge of said expander head means for insertion within the inner-face circumferential edge of said hydraulic valve lifter, and attaching means operable for expanding the grasping lips of said expander head means radially outwardly within the inner-face circumferential edge of the hydraulic valve lifter in securely holding said valve lifter in an assembled state in the operation of extracting the valve lifter from the automobile engine block, wherein said attaching means is an internally expandable cam plunger having tapered camming surface and said tool further comprises an elongated rod handle threadedly engagable with said cam plunger whereby said rod handle is rotated to draw the camming surface of said cam plunger within said expander head for expanding the grasping lips of said expander head radially outwardly in grasping said valve lifter and whereby said rod handle is pulled to remove the hydraulic valve lifter from the engine block, and wherein said rod handle includes a circular reduced diameter portion for rotation of said locking collar in aligning the index key means of said locking collar with the key slots of said expander head when said index key means is not aligned with said key slots.

3. The structure of claim 2, wherein said expander head includes a slot longitudinally to the tool and said cam plunger includes a shear pin transversely to the tool and operable within the slot of said expander head in holding said cam in longitudinal alignment as said rod handle is rotated in drawing said cam plunger into said expander head.

4. The structure of claim 3, wherein said expander head includes wrench flats at the circumferential ends of said grasping lips to be held by a wrench tool so as to operably permit the expansion of said lips radially outwardly as said rod handle is rotated to draw the cam plunger within said expander head in the tightening operation of said lips within the inner-face circumferential edge of the hydraulic valve lifter.

5. The structure of claim 2, further comprising a tube wrench sleeve longitudinally interposed on said rod between said locking collar and said expander head, said tube wrench sleeve including at one end key slots for cooperation with the locking index keys of said locking collar and on its opposite end, locking index keys for cooperation with the key slots of said expander head so as to provide for a longer tool in inserting within a fully enclosed engine block and operable without the engine block for removing the hydraulic valve lifter from said block.

6. The structure of claim 5, wherein said tube wrench sleeve includes wrench flats at its uppermost end portion to be held by a wrench tool so as to operably permit the expansion of said lips radially outwardly as said rod handle is rotated to draw the cam plunger within said expander head in the tightening operation of said lips within the inner face circumferential edge of the hydraulic valve lifter.

7. The structure of claim 3, further comprising an O-ring encircling said expander head between the ends of said prongs and said shear pin for contacting said shear pin and holding said cam plunger and said expander head assembled as one unit before the initial engagement of said rod with said cam plunger.

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