Jan. 16, 1940. H. M. LOCHRANE 2,187,661

VALVE TAPPET

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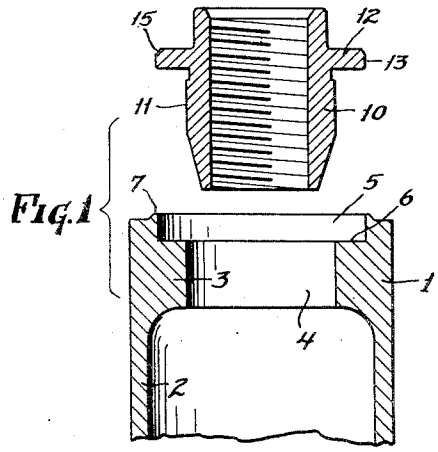


Fig. 1

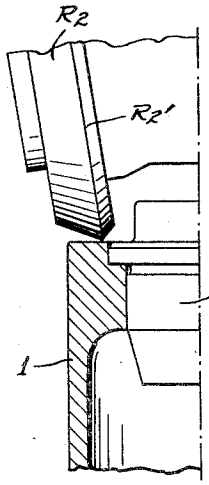


Fig. 3

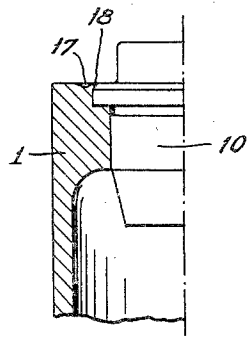


Fig. 4

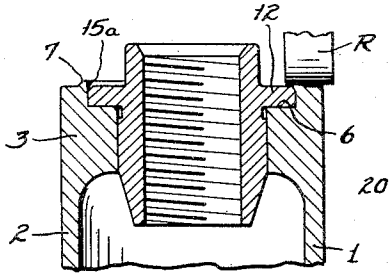


Fig. 2

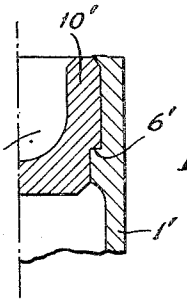


Fig. 5

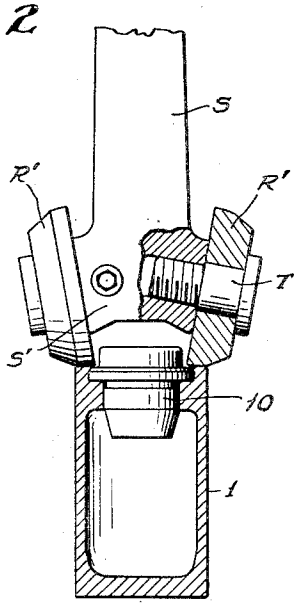


Fig. 6

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VALVE TAPPET

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2 Claims. (Cl. 123—90)

This invention relates to a method of securing threaded and other inserts into main body members of valve tappets, and the principal object is to provide a new and more efficient method of so doing.

Another object is to provide a method of securing tappet parts together, which will not require welding or other operations involving such a degree of heat as might change the molecular structure of the metal and without requiring tensile distortion of the metal of either part, while still effecting a strong and permanent joint between the parts.

Other objects and features of the invention will become apparent from the following description relating to the accompanying drawing. The essential characteristics are summarized in the claims.

In the drawing, Fig. 1 is an exploded central sectional view showing an exemplary form of insert, and the upper portion of a tappet barrel adapted to receive the insert; Fig. 2 is a fragmentary central sectional view, showing at one side of the center line the insert of Fig. 1 in seated position and, on the other side, the completed attachment between the insert and barrel; Fig. 3 is a view similar to the left-hand portion of Fig. 2, showing a slight modification in the configuration of the barrel and insert surfaces and a portion of a suitable tool for effecting the attachment of said parts; Fig. 4 is a fragmentary view corresponding to Fig. 3, showing the completed joint; Fig. 5 is a view similar to the right-hand portion of Fig. 2, showing a different type of insert and completed joint between it and the barrel, and Fig. 6 is a side elevation, showing a tool adapted for carrying out the present method, the view also showing in cross-section and elevation a complete tappet barrel and its insert.

Referring to Fig. 1, this shows the upper end portion of a tappet body casting 1, for the type of tappet now known as "barrel type" in which there is no perceptible enlargement at the cam-engaging end. The casting, as shown, has a relatively thin wall at 2, a thickened annular portion 3 integral therewith, an insert-receiving bore 4 and counterbore 5 being suitably formed, as shown. The bottom surface 6 of the counterbore forms a shoulder on which a portion of the insert rests in a manner to prevent relative collapse of the insert and barrel.

Adjacent the counterbore 5, and continuously surrounding it, is a slight rib 7, forming stock for the joining means.

The insert, shown at 10, may comprise an internally threaded sleeve having a cylindrical portion at 11 adapted to substantially fit the bore 4 in the barrel, a cylindrical flange at 12 having a generally cylindrical surface 13 adapted to substantially fit the counterbore 5 when the flange 12 rests on the shoulder 6. The flange 12, as shown, has a slightly bevelled peripheral surface at 15, which forms an annular gap 15a at the top of the assembled parts, as illustrated in Fig. 2, (left side).

The annular space 15a is wedge-shaped in cross-section, the wedge, in case the barrel is cast-iron, being preferably formed so that its sides diverge from each other at an angle not greater than thirty degrees. In the event of a steel barrel, the angle between the inner and outer surfaces of the annular wedge may be wider.

After assembly, as aforesaid, suitable contact pressure is brought to bear on the upstanding rib 7, so as to squeeze the metal of the rib downwardly until it expands inwardly and fills the recess 15a as shown at the right of Fig. 2. In that figure metal is seen to project slightly above the upper generally planar limit of the tappet as a result of a slight excess of stock.

Any suitable means may be used for compressing the metal of the rib into the groove, for example this may comprise a plain roller, such as diagrammatically indicated at R, Fig. 2. A rolling action is preferred, being gradual rather than sudden.

It will be noted that the metal is not stretched at any point or bent beyond its elastic limit. As illustrated in Figs. 1 to 6, there is substantially no radial tool pressure brought to bear in forming the joint, but endwise pressure only. The rib, where this is present, is merely enlarged and caused to occupy a new position with respect to the barrel, in which position the metal of the barrel is in radially stressed abutment with the insert, while interlocking therewith in cooperation with the shoulder surfaces (as at 6). Moreover, the metal of the barrel is, by the above operation, cold forged and materially toughened, even though comprising cast-iron.

The operation may be carried out by the use of relatively inclined peening rollers on a common rotary mounting, coaxial with the barrel support or socket (not shown). An exemplary roller mounting is illustrated at S in Fig. 6, in the form of a stem adapted to engage an adjustable tool chuck, as in a drill press. The rollers R1 are held on an enlarged head S1 of the stem, as by suitable screws T, shouldered to allow free rotation of the rollers in contact with the top end of the barrel.

The rollers, as shown, have slightly spherical working faces, so as to operate properly even though the stem S is slightly eccentric to the axis of the body chuck or holder; it being understood that the body 1 may be supported in a suitable socket as on a rotary table of the drill press.

Fig. 3 shows a somewhat different type of roller R2, the same having a double conical working face terminating at the apex line R2'. This is designed to operate on a planar upper face of the barrel, as illustrated. Such roller operates to squeeze a portion of the upper face material into overlying and radially stressed abutment with the relatively undercut surface of the insert, filling the groove between the same and the adjacent barrel surface, as previously described. The character of the finished joint is illustrated in Fig. 4, 17 being a trough effect formed by the sharp apex of the roller in moving the barrel metal to 18. The joint is substantially the same in operative effect as the joints previously described.

Fig. 5 shows substantially the same joint effect between the insert 10' and barrel 1' as previously described. In this case it will be noted that the insert has a flange corresponding to 12, forming a shoulder at 6', the flange merely being wider, axially of the insert 10'. The insert is of the type employed to operate overhead-valve push rods and has a spherical socket 20, for receiving the lower spherical end of such push rod (not shown).

The metal of the barrel may be pressed into place around the rim of the insert by an appropriate die or dies, (not shown), instead of being spun into place, but this in general is not as satisfactory as progressively working the metal into place, as by spinning.

It is manifest that the joints effected by the above described method, in any described form, are permanent in operation and easy to inspect for accuracy. The metal of the barrel at the joint, being cold worked and compressed, is stronger if anything than the adjacent unworked metal, and is at no part under tension, although it is backed up by radially outer parts of the barrel that may be under tension in withstanding the reaction forces.

I claim:

1. A valve tappet comprising a cast iron hollow body casting having a relatively thickened annular upper end provided with a substantially cylindrical axial bore and a counter-bore outwardly thereof and forming an annular shoulder, a metallic insert having a body portion extending axially within the cylindrical axial bore of the casting and projecting outwardly of the tappet body, said insert having an annular flange lying within the counter-bore of said casting and resting on said shoulder, and means on the outer edge of the wall of the counter-bore laterally displaced to overlie the outer peripheral rim of said insert flange and to press the said insert flange against said shoulder whereby to permanently secure said body casting and insert together in operative assembly.

2. A valve tappet comprising a cast iron hollow body casting having a relatively thickened annular upper end provided with a substantially cylindrical axial bore and a counter-bore outwardly thereof and forming an annular shoulder, an internally threaded adjusting screw retainer having a body portion extending axially within the cylindrical axial bore of the casting and projecting outwardly of the tappet body, said insert having an annular flange lying within the counter-bore of said casting and resting on said shoulder, and a laterally displaced radially inwardly extending annular lip integrally carried on the outer edge of the wall of the counter-bore constructed and arranged to overlie the outer peripheral rim of said insert flange and to press the said insert flange against said shoulder, whereby to permanently secure said body casting and insert together in operative assembly.

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