May 6, 1952 W. M. GETTY 2,595,668

PISTON REFORMING TOOL

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Fig. 1.

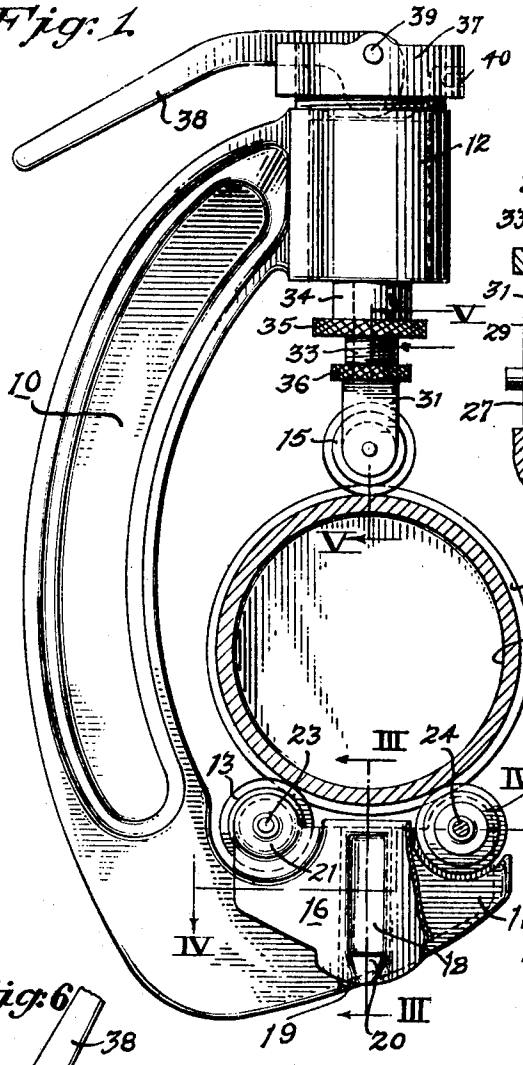


Fig. 5.

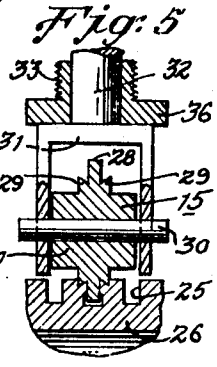


Fig. 2.

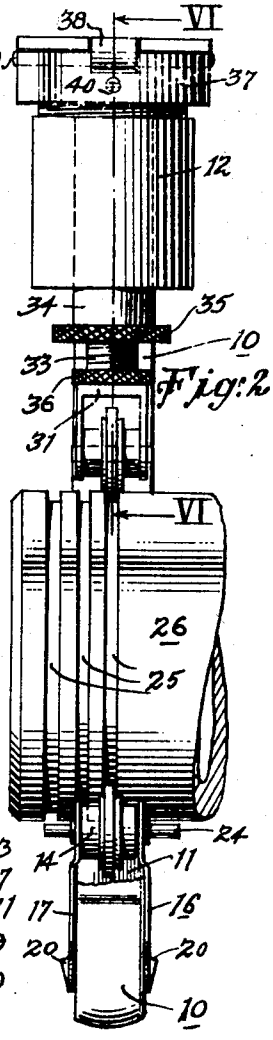


Fig. 3.

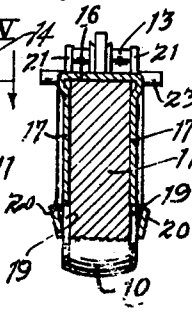


Fig. 6.

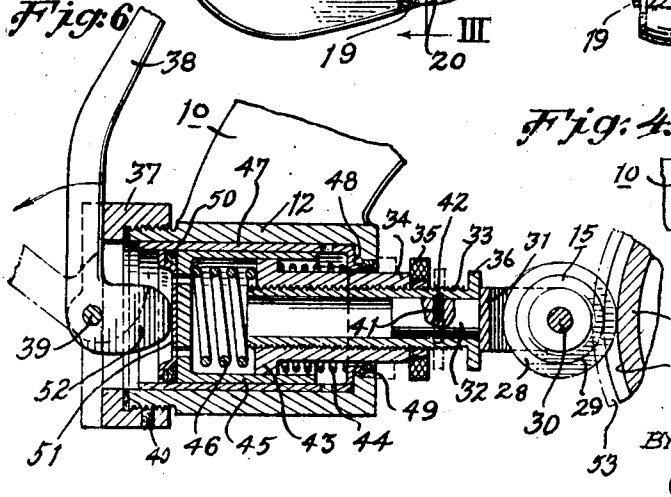
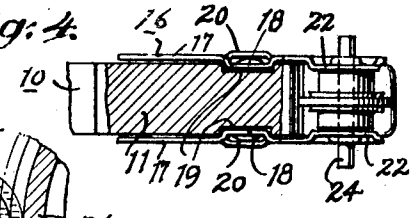


Fig. 4.



INVENTOR
WILLIAM M. GETTY
BY
W. N. Whitmore
ATTORNEY.

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PISTON REFORMING TOOL

William M. Getty, San Mateo, Calif.

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5 Claims. (Cl. 80—5)

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My present invention relates to a piston reforming tool and more particularly to a device for reforming or resizing the sealing ring retaining grooves of a piston for internal combustion engines.

An object of the invention is to provide a new and novel type of tool by which the circumferential piston ring retaining grooves of a piston may be swaged or reformed to compensate for piston ring wear.

Another object of the invention is to provide an improvement in a tool of the above character which is particularly adapted for the reforming of piston ring grooves in a piston that has become slightly elliptical in cross-section by the time new piston rings are required.

Another object of the invention is to provide a novel piston ring groove reforming tool of novel construction that will produce a uniform swaging or reforming of the piston ring groove even though the piston may have become deformed and is not truly circular in cross-section.

Other objects and advantages of the invention will be in part evident to those skilled in the art and in part pointed out in connection with the accompanying drawing, wherein there is shown by way of illustration and not of limitation a preferred embodiment of the invention.

In the drawing;

Figure 1 is a vertical view of my improved tool with parts broken away to shown details of its construction,

Figure 2 is a side view of the device as shown in Figure 1 of the drawing,

Figure 3 is a sectional view taken along line III—III of Figure 1, looking in direction of arrows,

Figure 4 is a fragmentary sectional view taken along line IV—IV of Figure 1, looking in direction of arrows,

Figure 5 is a sectional view taken along line V—V of Figure 1, looking in direction of arrows, and

Figure 6 is a slightly enlarged sectional view taken in a vertical plane along line VI—VI of Figure 2, looking in direction of arrows.

In carrying out my invention I provide a spanner member or frame having a fixed tool supporting anvil and an oppositely disposed overhanging adjustable tool supporting head upon which there are removably mounted piston ring groove reforming rollers. These groove reforming rollers are provided in complementary sets having different dimensions as to groove width and depth which can be interchangely positioned

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in an operative position upon the spanner member or frame in a convenient manner and without the use of special tools.

As is shown in Figures 1 and 2 of the drawing, the spanner or frame member, designated by the numeral 10, has a projecting lower jaw that forms a supporting anvil 11 and at its upper end it has a cylindrical tool supporting head 12. As here shown, the anvil portion 11 is cut away at each side of a center line extending axially through the head 12 to accommodate two spaced groove reforming rollers 13 and 14, which, as will hereinafter appear, correspond with a third roller or tool 15 that is moveably mounted upon the head 12. The groove reforming rollers or tools 13 and 14 are carried by a saddle 16 that is adapted to be removably positioned upon the anvil 11. This saddle 16 provides two spaced bearing supports upon which the rollers or tools 13 or 14 are mounted so that they may freely rotate when the tool is in operation upon a piston. As shown, the saddle 16 has cheeks 17 that extend downwardly along each side of the anvil 11 and these cheeks 17 have vertically extending indented portions or ribs 18 that are adapted to slide in slots 19 formed in the sides of the anvil 11. In this manner the saddle 16 is also held to position the rollers 13 and 14 at equally spaced points with respect to the axis of the head 12. These indented portions or ribs 18 of the saddle 16 are shown as terminating at their lower ends with an outward flaring 20 that will facilitate a positioning of the saddle member upon the anvil 10 by pressure applied to these points. At the same time the sides or cheeks 17 of the saddle 16 are spaced to spring slightly and thus provide a tight fit which will prevent its inadvertant displacement from the anvil 11 when in use. In these figures on the drawings the spanner or frame 10 with its ring groove reforming tools 13, 14 and 15 is shown as operating upon a ring groove 25 of a piston 26. The piston 26 has three similar piston ring grooves but in the cases where the ring grooves 25 are not of similar dimensions it will be understood that the reforming rollers 13, 14 and 15 will be removed, as a set, and replaced by other similar groove reforming rollers having dimensions more appropriate for the particular ring groove upon which they are to operate.

The last above described features of the saddle member 16 are further illustrated in Figures 3 and 4 of the drawings. It will here be seen that the saddle member 16 has two sets of opposed ears 21 and 22 between which the groove reforming rollers 13 and 14 are respectively mounted upon shafts 23 and 24.

Upon now referring to Figure 5 of the drawing it will be noted that the groove reforming roller 15 is formed as a single unit with a hub portion 27 and a centrally disposed portion of larger diameter 28 that will have a micrometric dimension in thickness that will correspond with the width desired for a reformed ring groove. At each side of the portion 28 there are other shouldered portions 29 that are undercut to provide metal swaging edges that will cut into and/or cause the metal of the piston wall at each side of its ring groove to flow inwardly and against the sides of the larger extending portion 28 of the roller 15 when the spanner is rotated about the piston 26. At this point it will be noted that the tool or roller 15 is mounted on a shaft 30 that is carried by a yoke-like member 31 which has an integrally formed stub shaft 32 that is adapted to be seated in a threaded tubular support 33 which, as will hereinafter appear, is yieldingly mounted within the head 12 of the spanner 10. In this figure of the drawing the angle of the shouldered or undercut portions 29 of the roller 15 and the deformation of the piston 26 are shown as somewhat exaggerated in order to illustrate the principle upon which the tool operates. However, it will be understood that under normal conditions the amount of swaging required to reform a particular ring groove may be almost imperceptible to the naked eye. The angle of inclination of the undercut shouldered portions of the roller 15 is also not too critical. It has been found that when the shouldered portions are undercut to approximately 7.0 degrees from the axis about which they operate, the rollers will produce very satisfactory results. At this point it should be stated that the reforming rollers 13 and 14 of each set of a particular dimensions are idetnical in form and while the use of a single groove reforming roller with two flat rollers has been previously proposed, it has been found that more uniform results can be obtained when the three reforming rollers, arranged as shown, are each provided with the piston wall swaging or reforming features above described.

Before proceeding with the further description of the invention with respect to the remaining figure of the drawing, reference is again made to Figures 1 and 2, wherein it will be noted that the sleeve 33 upon which the roller 15 is mounted is threaded into slideable collar 34 that is adapted for axial movement centrally within the cylindrical head 12 of the spanner frame 10. This threaded sleeve 33 also carries a knurled lock nut 35 by means of which the adjustment of the threaded sleeve may be firmly secured at any point desired. To facilitate this adjustment the threaded sleeve 33 is also shown as having a knurling 36 about its extending lower end. The cylindrical head 12 is also shown as having a cap 37 that is threaded upon its extending upper end. This cap 37 in turn carries a cam operating lever 38 that is pivotally mounted upon a transversely extending pin 39, and to secure the cap 377 against rotation, there is a set screw 40 that can be tightened to prevent rotation of the cap after it has been threaded upon the head 12.

Upon now referring to Figure 6 of the drawing, it will be noted that the stub shaft 32 of the yoke-like member 31 has a transversely extending spring retaining recess 41 which carries a ball 42 that seats in a circumferential groove formed in the interior of the threaded sleeve 33. This spring-pressed ball 42 operates in the well known manner to retain the yoke-like member against an inadverent dropping thereof when the tool is removed from a piston. It will also be noted that the threaded sleeve 33 extends substantially through the slideable collar 34 and thus provides for a wide range of adjustment for pistons of different diameters. At its inner end the slideable collar 34 has an enlarged head 43 against which a spring 44 operates to retain it in a retracted position within the head 12 of the spanner frame 10. This enlarged head 43 of the slideable collar 34 slides freely within an inverted cup member 45 and disposed within this cup-like member there is a relatively heavier compression spring 46 through which an operating force is exerted upon the swedging roller 14 when the tool is in operation. In this arrangement, the slideable collar 34 and the inverted cup-like member 45 telescope within each other and the inverted cup-like member 45 is in turn disposed to slide freely within a lining member 47 that is carried within the head 12 of the tool. As shown, this lining member 47 has an inwardly extending flange 48 at its lower end that will serve as a bearing for the slideable collar 34. At the lower end of the head 12 there is a dust excluding packing 49 which, together with a similar packing 50 at its upper end will prevent the entrance of metallic particles into the above described operating elements of the head 12. At its upper end the inverted cup-like member 45 is porvided with a wear-resisting plate 51 that is flanged to retain the packing 50.

Engaging this wear resisting plate 51 there is a cam portion 52 that is carried by the cam operating lever 38. With this arrangement it will be seen that when the cam operating lever 38 is moved into the position here shown, the spring 46 will be compressed and thus exert a yieldable operating force upon the slideable collar 34 which will be in turn transmitted to the swedging roller 15.

While the manner in which the tool described above will operate will be clear to those skilled in the art, it is considered that the following features should be more specifically pointed out. As has been pointed out above, my improved piston groove reforming tool includes, in addition to the spanner or frame member 10 a plurality of sets of the piston groove reforming rollers, 13, 14 and 15 in which each of the rollers will be of similar dimensions to conform with a particular size of ring groove. These sets will include a saddle member 16 with its two groove reforming rollers 13 and 14 permanently mounted thereupon and a comparable groove reforming roller 15 which will be permanently mounted in a yoke-like member 31. The yokes 31 will all have similarly dimensioned stub shafts 32 that will fit snugly into the threaded sleeve 33 of the tool and each of the saddles 16 will be of similar construction so that they may be snapped on and removed from the anvil forming extension at the opposite end of the spanner frame 10. The groove reforming rollers 13, 14 and 15 are of one piece with the hub, piston swaging shoulders 29 and the groove width determining central portion 28 formed as a single unit. This insures accuracy and by mounting each of these rollers in the manner described the changing of one set for another upon the tool is greatly facilitated. It has also been found

that with the saddle-like arrangement which carries the two groove reforming rollers 13 and 14 with its rollers spaced as shown, greater accuracy can be obtained in the reformation of the ring groove. This is because the rollers tend to track more accurately and thus prevent any weaving of the piston ring groove which might otherwise be caused by an uneven flowing of the metal at the sides of the ring groove.

In addition to these features my improved tool also differs from other arrangements of this character by the fact that the swaging rollers 13 and 14 and the roller 15 are operated under a yielding force. This produces a substantially uniform swaging action around the circumference of the piston even though it may have become slightly elliptical in cross-section due to piston wear that results from the off-center application of forces exerted through the piston rod when the internal combustion engine is in operation.

With the tool equipped as above and having a particular piston 26 to be reconditioned the operator will choose the set of reforming rollers 13, 14 and 15 that will produce a reforming of the piston ring groove 25 to a particular piston ring size. This set will then be mounted upon the spanner or frame 10 as shown. The operator will release the cam lever 38 so that the spring 44 carried in the head 12 will cause the roller 15 to be retracted. In this condition the heavier compression spring 46 will be fully extended, but will exert no force tending to move the roller 15 outwardly. Now by the use of a shim, designated by the numeral 53 in Figure 6 of the drawing, the swaging shoulders 29 of the roller 15 will be adjusted to make contact therewith while piston 26 is resting upon the swaging rollers 13 and 14. Then after adjusting the threaded sleeve 33 until a contact is made with the shim 53 the roller 15 will be secured by a tightening of the lock nut 35 against the slideable collar 34. The shim 53 is then removed and the cam lever 38 can be returned to its operating position as shown. Under these conditions the cam portion 52 will operate through the pressure plate 51 and the inverted cup 45 and compress the heavier spring 46 which will exert a yielding pressure upon the slideable sleeve 34 and establish the required pressure contact between the swaging rollers 13, 14 and 15 and the outer surface of the piston 26. Then as the spanner or frame 10 is turned about the piston 26 the swaging rollers 13, 14 and 15 will operate to displace metal of the piston at the sides of the piston ring groove 25 in which these rollers are operating. This operation is continued until the ring groove 25 has been reformed to a width corresponding to the dimensions of the gauging portion 28 of the groove reforming rollers. After this the lever 38 may be again released to permit an application of the tool to another groove for a repetition of the operation.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In a piston groove reforming tool, the combination of a spanner member having an extending anvil portion at one end and an oppositely disposed cylindrical tool supporting housing at its other end, a saddle member having spaced and aligned metal swaging rollers adapted and arranged to be clipped upon anvil portion of said spanner member, support mounted within said cylindrical housing and having a swaging roller at its outer end moveable in a line substantially bisecting the distance between the centers of the swaging rollers carried by said saddle member, a normally inactive compression spring means mounted within said tool supporting housing for biasing said support in an operative direction, a cam means carried by said tool supporting housing operating to compress said spring means when the tool is in operation, and means for adjusting the position of said spring means with respect to a piston when uncompressed, whereby a definite pressure will be exerted thereby upon said support when said cam means is in its operative position.

2. In a piston reforming tool, the combination of a spanner member having an anvil portion at one end and a cylindrical tool supporting housing at its other end, said anvil portion having saddle positioning grooves extending along each of its sides, a saddle member having a central portion with extending ribs adapted and arranged to engage the grooves along the sides of said anvil portion, a pair of metal swaging rollers mounted in spaced relation upon said saddle member and rotatable about axes extending at a right angle to the plane of said spanner member, a third metal swaging roller, a yoke upon which said third metal swaging roller is mounted moveable within the tool supporting housing of said spanner member, a normally inactive spring means for biasing said yoke to position said metal swaging roller in operative contact with the wall of a piston positioned over said pair of swaging rollers, a cam means for compressing said spring means a predetermined amount when the tool is in operation, and means for adjusting the position of said metal swaging roller with respect to a piston when said spring means is uncompressed, whereby a pre-determined metal swaging force will be exerted upon said cylinder by said swaging rollers when said cam means is in its operative position.

3. In a piston reforming tool, the combination of a spanner member having an outwardly extending anvil portion at one end and a tool supporting housing at its other end, said anvil portion having saddle positioning grooves extending along each of its sides, a saddle-like member having a central portion with extending ribs adapted to be positioned upon said anvil portion with its ribs disposed in the grooves along the sides of said anvil portion, a pair of metal swaging rollers mounted upon said saddle member and rotatable about axes extending at a right angle to the plane of said spanner member, a third metal swaging roller carried by an adjustable support mounted within the housing of said spanner member, a normally inactive spring means within said housing for biasing said adjustable support and positioning said third metal swaging roller in operative contact with the wall of a piston, a cam means for compressing said spring means a pre-determined amount, and means for adjusting the position of said metal swaging roller with respect to said spring means when uncompressed, whereby said spring means will maintain a pre-determined operating force

upon said swaging rollers when said cam means is in its operative position.

4. In a piston ring groove reforming tool, the combination of a spanner member, a pair aligned and spaced groove reforming rollers at one end of said spanner member, a cylindrical housing at the other end of said spanner member, a slideable collar mounted for axial movement in said cylindrical housing, a normally inactive compression spring for biasing said slideable collar in an operative direction, a second spring means for maintaining said slideable collar in contact with said normally inactive compression spring, a threaded sleeve adjustably mounted within said slideable collar, a yoke-like member mounted upon the outer end of said adjustable sleeve, a groove reforming roller mounted upon said threaded sleeve, means for locking said threaded sleeve in fixed relation with said slideable collar, a closure cap at the outer end of said cylindrical housing, and a lever operated cam means carried by said closure cap adapted and arranged to compress said compression spring and establish a pre-determined pressure upon said slideable collar, whereby a definite pressure will be transmitted through said yoke-like member and upon the groove reforming roller carried thereby when the tool is in operation.

5. In a piston ring groove reforming tool the combination of a spanner member, a pair of groove reforming rollers mounted upon one end of said spanner member, a cylindrical housing at the other end of said spanner member, a slideable collar mounted within said cylindrical

housing for axial movement relative to said pair of groove reforming rollers, a compression spring for biasing said slideable collar in an operative direction toward said pair of groove reforming rollers at the other end of said spanner member, a second spring for maintaining said slideable collar in contact with said first compression spring, a threaded sleeve adjustably mounted within said slideable collar, means mounted upon the outer end of said adjustable sleeve having a groove reforming roller, a lever operated cam mounted upon the outer end of said cylindrical housing adapted and arranged to compress said compression spring a pre-determined amount, and means for positioning said threaded sleeve upon said slideable collar, in a fixed position with respect to said compression spring, whereby a definite operating pressure will be transmitted to the groove reforming roller carried thereby when the tool is in operation.

WILLIAM M. GETTY.

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