

Aug. 24, 1965

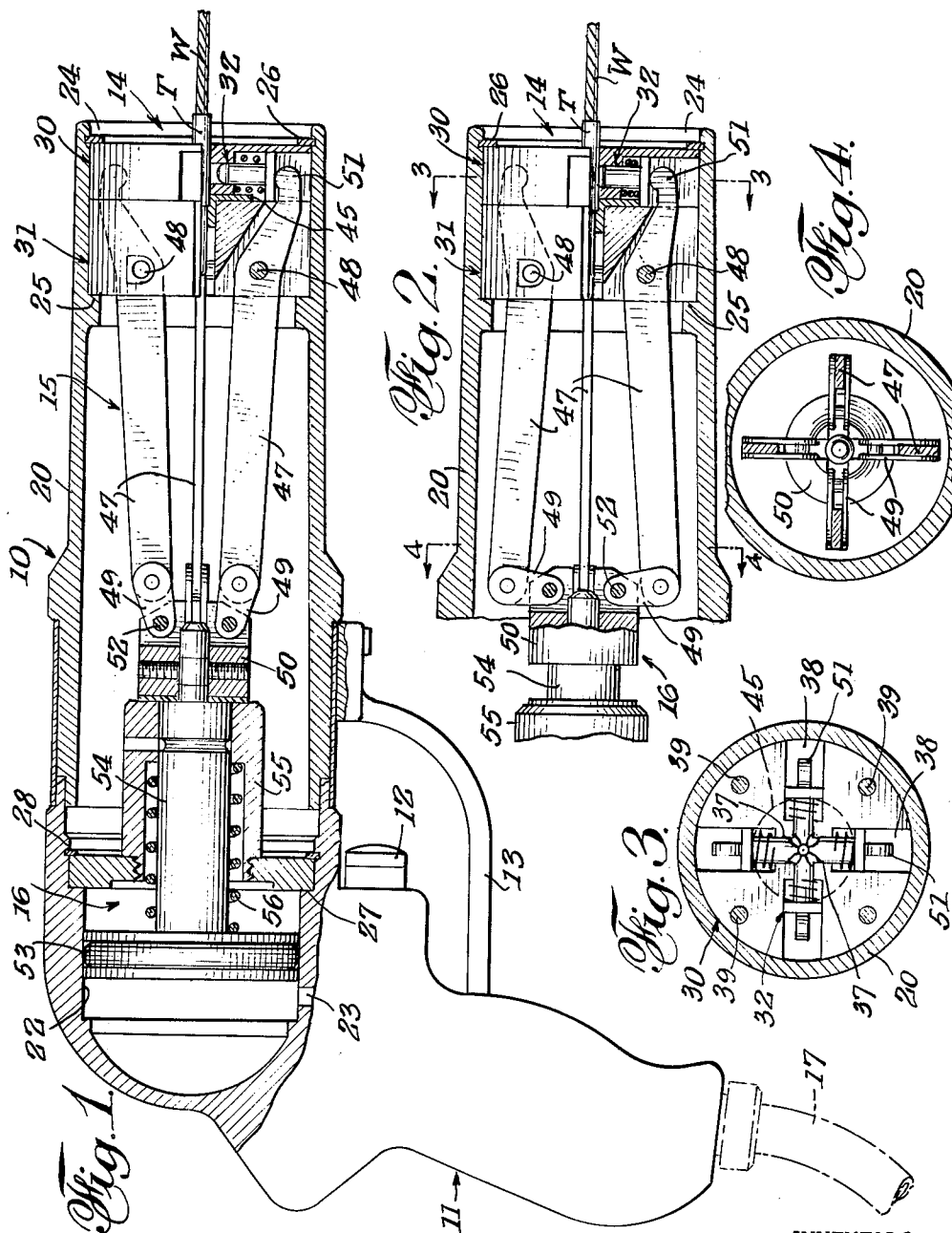
R. D. HARRISON ETAL

3,201,969

TERMINAL-CLINCHING TOOL

Filed Jan. 16, 1961

2 Sheets-Sheet 1



INVENTORS
 ROY D. HARRISON
 FLOYD A. SHARP
 BY C. G. Stratton

ATTORNEY

Aug. 24, 1965

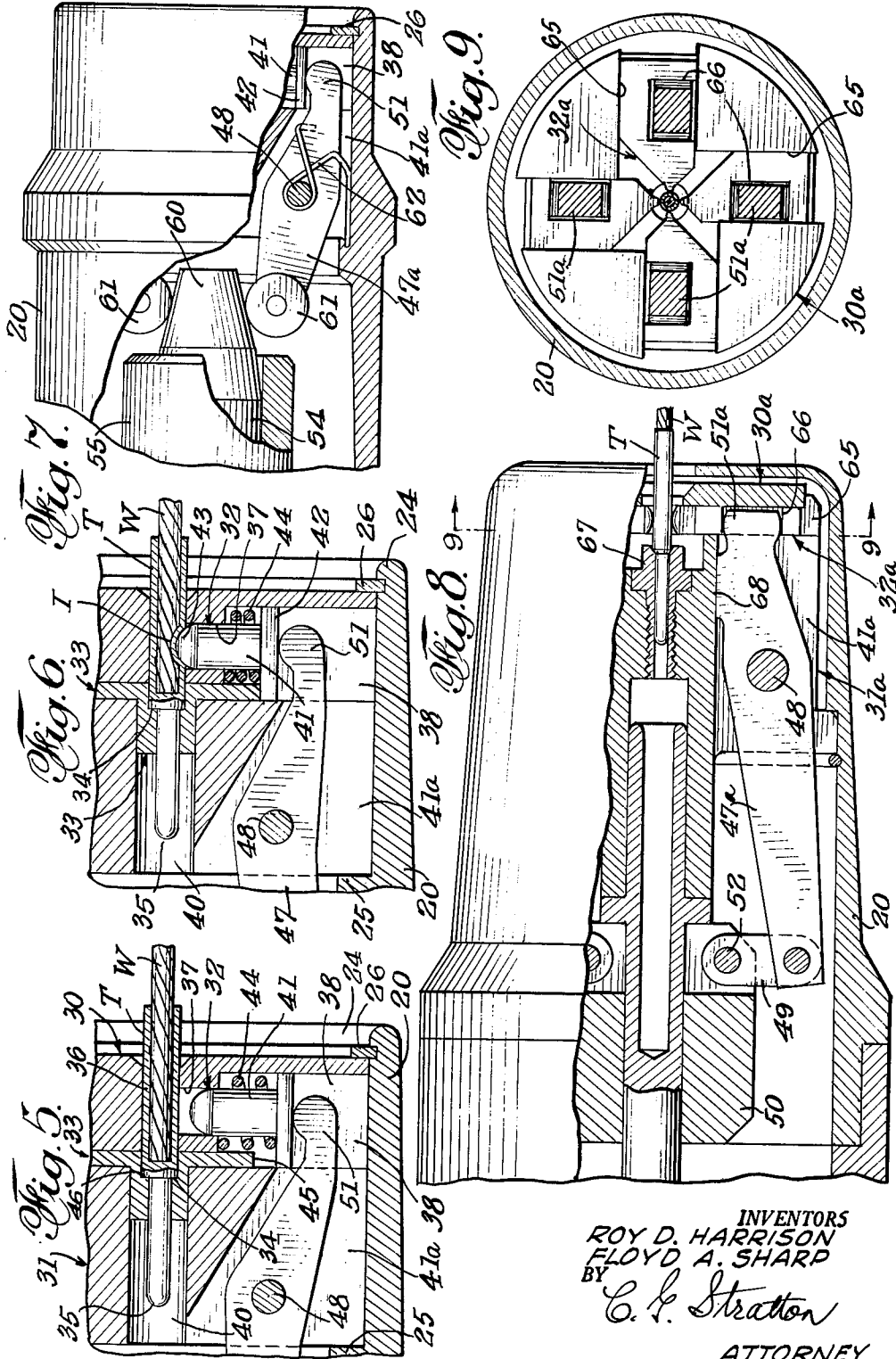
R. D. HARRISON ETAL

3,201,969

TERMINAL-CLINCHING TOOL

Filed Jan. 16, 1961

2 Sheets-Sheet 2



INVENTORS
ROY D. HARRISON
FLOYD A. SHARP
BY
C. L. Stratton
ATTORNEY

1

2

3,201,969

TERMINAL-CLINCHING TOOL

Roy D. Harrison, Inglewood, and Floyd A. Sharp, Downey, Calif., assignors, by mesne assignments, to Pendleton Tool Industries, Inc., a corporation of Delaware

Filed Jan. 16, 1961, Ser. No. 83,046
8 Claims. (Cl. 72-402)

This invention relates to a tool for clinching a tip or terminal onto the end of a bared electrical conductor wire.

An object of the present invention is to provide a tool of the type referred to that has a single-action operation, whether by manual or power force application, so that the tip is indented on at least one of the sides to cause the indentations thus formed to clinch onto the stranded wire ordinarily used as a conductor, and firmly affix the tip to the wire. It will be understood that solid wire conductors of malleable metal, copper, for instance, will receive a tip in substantially the same manner, and that such tips may have various purposes, as for preventing fraying of the wire end, providing a wire with a pin jack end, and for any purpose where a tip or terminal securely affixed to a wire end is desired.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description and which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, preferred embodiments of the present invention, which are given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a longitudinal sectional view, with the hand-grip thereof in side elevation, of one form of terminal-clinching tool according to the present invention, the tool being shown in its normal non-operated position.

FIG. 2 is a longitudinal sectional view of the clinching end of the tool in the tip-clinching position thereof.

FIGS. 3 and 4 are cross-sectional views as taken on the respective lines 3-3 and 4-4 of FIG. 2.

FIG. 5 is an enlarged and fragmentary sectional view showing the clinching portion of the tool in greater detail and in the position of FIG. 1.

FIG. 6 is a similar view showing the clinching portion of the tool in the position of FIG. 2.

FIG. 7 is a broken longitudinal sectional view, partly in side elevation, of a modification.

FIG. 8 is a similar view of another modification.

FIG. 9 is a cross-sectional view as taken on the line 9-9 of FIG. 8.

The terminal-clinching tool that is illustrated comprises, generally, an elongated tubular body 10, a pistol grip 11 extending from one end of said body and provided in the usual way with an operating trigger or button 12 protected by a guard 13, terminal-clinching means 14 at the opposite end of said body 10, means 15 to move the means 14 to clinching position, and means 16 to actuate the means 15 whether by manually-applied force on the button 12 or by pressure fluid (air or liquid) controlled by said button. In cases where the applied force is pneumatic pressure, air may be brought to the tool by means of a flexible hose 17 connected to the end of the pistol grip and a normally-closed venting valve (not shown) may be embodied in said grip and controlled by button 12 to open and provide actuating power to the means 16.

Percussive force may also be used to actuate the means 16, the grip 11 serving as a holder for a squib or cartridge for this purpose.

The body 10 is shown as an elongated tube 20 with a closed end 21. As shown in FIGS. 1 and 8, said tube 20 may be formed of longitudinally separable sections as an aid to assembling the means 15 and 16 therein. In the form of FIGS. 1 to 4, a cylinder 22 is provided in tube 20, the same receiving pressure air through a port 23 upon depression of button 12. The means 14 is shown as being assembled from the end 24 of tube 20 that is opposite to the closed end 21, against an annular inner shoulder 25, and held in position as by means of a snap ring 26 applied from said tube end 24. The means 16 is shown located against an annular inner shoulder 27 at the end of cylinder 22 and held in place by a snap ring 28.

The pistol grip may be conventionally formed in different ways, depending on the type of power that may be used for actuating the means 16.

The terminal-clinching means 14 shown in FIGS. 1 to 7 is coaxial with the tubular housing and comprises, generally, an indenter housing 30 at the outer end of said means, a housing extension 31 inward of the indenter housing 30, said housing and extension, together, being located between the mentioned snap ring 24 and shoulder 25, a set of clinching or indenting dies 32, and a stop 33 to limit the indenting movement of the dies 32. The above generally described clinching means 14 may have a set of four dies 32, as in FIGS. 1 to 4, or the number of dies may vary, one being the minimum. FIGS. 5 and 6 suggest an uneven number of dies, three, for instance.

As best seen in FIGS. 5 and 6, the means 14 operates on the side tubular wall of a tip or terminal T so as to indent the same, as at I and, thereby, clinch the wire W entered into the tip. Such tips may be formed with a shoulder 34 or not, as desired, the same or the end 35 of the tip serving to locate the tip in the means 14.

The indenter housing 30 is provided with a central bore 36 through which the tip T may be introduced, a transverse guide bore 37 for each die 32 and intersecting said bore 36, and a radial opening 38 extending outwardly from each guide bore 37.

The housing extension 31 may be connected to the housing 30 as by bolts and dowel pins 39 (FIG. 3), said extension having a central bore 40 coaxial with the bore 36, and a set of radial openings 41a in register with the openings 38 of the housing 30.

Each indenting die 32 is formed with a shank 41 slidably engaged in a transverse bore 37 and with an end 42 slidably movable in a radial opening 38 and of a shape to be non-rotationally held thereby. As a consequence, the indenting die ends 43 on the inner ends of shanks 41 are, at all times, oriented to impress a longitudinal indent I in the side of a tip T in the bore 36. Said dies 32 are biased outwardly by coil springs 44 that act against the inner faces of the ends 42 of the dies.

The stop 33 is shown as located between the housing 30 and the extension 31 but may be otherwise located, provided that the same has stopping engagement with the dies 32 when moved from the position of FIGS. 1 and 5 to the position of FIGS. 2 and 6. In this case, the stop is formed with a peripheral rim 45 that limits the inward movement of the dies by engagement of the ends 42 with said rim.

The stop 33 may be changed, as well as the dies 32, depending on the size of the tip T and the depth of indent desired. Also, the stop shoulder 46 in said stop 33 may be provided according to the outer shape, size and length of the tip T to be indented.

The means 15 to exert denting pressure on the dies

against the bias of the springs 44 is shown as a set of levers 47, one for each die, a pivot 48 in the housing extension 31 for each lever, a set of toggle links 49, one connected to the inner end of each lever 47, and a block 50 carrying said links and movable in a direction toward the means 14 to cause the levers 47 to rock in a direction so their operative ends 51 will depress the dies 32 to cause indenting of the tip T.

As can be seen from FIG. 1, where the block 50 is retracted, the lever 47 and links 49, with respect to the pivots 48 of the levers and the pivots 52 of the links, are slightly off a dead center disposition, and the lever ends 51 are spread apart with the dies 32 correspondingly retracted. But little power is needed to project the block 50 from this retracted position, since the only resistance to projection of the dies is the bias of springs 44. It will be noted that as the block 50 is projected, the angles between the levers 47 and the respective links 49 reduce. Since the angular movement of the links around their pivots 52 is substantially greater than the angular movement of the longer levers 47 around their pivots 48, a power advantage is obtained that causes the lever ends 51 to operate with greater force than is necessary for projecting the block 50. This force is further increased by proportioning the levers 47 so their ends 51 are shorter than the ends connected to the links 49. It will be clear that the final part of the movement of the means 15 is the most powerful part and that the dies 32 will indent a tip T in the manner shown in FIG. 6.

The means 16 for projecting block 50 and, thereby, actuating the means 15, is shown as a piston 53 in the cylinder 22, a stem 54 on the end of said piston and carrying block 50 on its end, a guide housing 55 for said stem and carried between shoulder 27 and snap ring 28, a return spring 56 to restore the tool to non-operated position after an indenting operation. Said spring is shown as housed in guide housing 55 and acting against the piston 53.

The toggle linkage above described is exemplary of power means to operate the tool. As shown in the modification of FIG. 7, such means may comprise a wedge cam 60 on the end of stem 54, the same engaging rollers 61 on the levers 47a to rock the latter on pivots 48 and perform tip indenting, as before. Said levers 47a may be retracted by springs 62 upon retraction of the cam 60, which is here shown as having a two-stage taper whereby the power on levers 47a is increased near the end of the indenting movement thereof.

The modification shown in FIGS. 8 and 9 has the indenter housing 30a formed to have a plurality of guides 65 for a set of dies 32a. The latter are provided with recesses 66 into which fit the operating ends 51a of the levers 47a. The latter, as before, are carried on pivots 48 in a housing extension 31a and, in this case, the latter carries a tip guide 67 comparable to the central portion of the stop 33. The stop for the levers 47a, in this modified form, is provided by the faces 68 that define the bottom of the openings 41a in which the levers are disposed.

Except for variations and changes in the manner of mounting the indenter means, the modification of FIGS. 8 and 9 may be based on the form of FIG. 1 or 7. It will be noted that all springs are omitted from this latter form of the invention.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the constructions are, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular forms of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. An indenting tool, comprising:

a body,

indenter means removably mounted on said body and having a bore to receive a workpiece to be indented and a guideway extending transversely of and opening at one end to said bore,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said bore for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from said bore,

said die having a transverse thrust face,

means for moving said die between said positions including a lever pivotally mounted on said body and having one end releasably engaging said thrust face, whereby rocking motion of said lever is effective to move said die between said extended and retracted positions,

power means on said body operatively connected to said lever for rocking the latter,

said indenter means and die being removable as a unit from said body, and

means releasably securing said indenter means to said body.

2. An indenting tool, comprising:

a body,

indenter means on said body having a bore to receive a workpiece to be indented and a guideway extending transversely of and opening at one end to said bore,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said guideway for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from said bore,

means for moving said die between said positions including a lever pivotally mounted intermediate its ends on said body and operatively connected at one end to said die, whereby rocking motion of said lever in one direction is effective to extend said die into said bore,

a dual angle cam mounted on said body for movement along a direction line extending generally longitudinally of said lever and including a cam surface engaging the other end of said lever for rocking the latter in said one direction upon movement of the cam in a given direction along said direction line, said cam surface including a first surface portion inclined at a first acute angle relative to said direction line and engageable with said lever during initial travel of said cam in said given direction and a second surface portion inclined at a second acute angle relative to said direction line and engageable with said lever during final travel of said cam in said given direction, and

said first angle being greater than said second angle.

3. An indenting tool, comprising:

a generally tubular body having an opening in its forward end,

an indenter housing removably positioned in said forward end of said body,

said housing having a bore opening through said forward end of said body for receiving a workpiece to be indented and a guideway extending transversely of said bore in a plane parallel to the axis of the bore, the inner end of said guideway opening into said bore and the outer end of said guideway opening rearwardly through the rear surface of said housing,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said bore for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from said bore,

means for moving said die between said extended and

5

retracted positions including a lever pivotally mounted within said body to the rear of said housing for rocking motion in said plane and having a forward end projecting into the outer end of said guideway and disposed in releasable operative engagement with said die, whereby said die is moved between said extended and retracted positions in response to rocking motion of said lever,

power means on said body operatively connected to said lever for rocking the latter,
said indenter housing and said die being removable as a unit from said body, and
means releasably securing said housing in said body.

4. An indenting tool, comprising:

a generally tubular body having an opening in its forward end,

an indenter housing removably positioned within said forward end of said body,

a housing extension positioned within said forward end of said body to the rear of said indenter housing, said housing extension having a bore opening through the forward surface thereof,

said indenter housing having a bore aligned with and opening at its rear end to said bore in said housing extension and at its forward end to the exterior of said body through said body opening,

a workpiece guide removably positioned in the forward end of said bore in said housing extension, whereby said guide is removable from said housing extension when said indenter housing is removed from said body,

said guide having a central opening for receiving the end of a workpiece inserted through said bore in said indenter housing and an annular, forwardly presented shoulder surrounding said central guide opening for axially locating the workpiece in the bore in said indenter housing,

said indenter housing having a guideway in a plane parallel to the axis of said bores, the inner end of said guideway opening into said bore in said indenter housing and the outer end of said guideway opening rearwardly through the rear surface of said indenter housing,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said indenter housing bore for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from the latter bore,

means for moving said die between said extended and retracted positions including a lever pivotally mounted on said housing extension for rocking motion in said plane and having a forward end projecting into the outer end of said guideway and disposed in releasable operative engagement with said die, whereby said die is moved between said extended and retracted positions in response to rocking motion of said lever,

power means on said body operatively connected to said lever for rocking the latter,
said indenter housing and die being removable as a unit from said body, and
means releasably securing said indenter housing in said body.

5. A tool according to claim 4 wherein:

said workpiece guide has a forward, laterally projecting shoulder overlying the rear open side of said guideway, and said die includes a rearwardly projecting shoulder engageable with said guide shoulder to limit inward movement of said die in said guideway.

6. A tool according to claim 4 including:

coacting stop means on said lever and housing extension for limiting inward movement of said die in said guideway under the action of said lever.

6

7. An indenting tool, comprising:

a generally tubular body having an opening in its forward end,

an indenter housing removably positioned in said forward end of said body,

said housing having a bore opening through said forward end of said body for receiving a workpiece to be indented and a guideway extending transversely of said bore in a plane parallel to the axis of the bore, the inner end of said guideway opening into said bore and the outer end of said guideway opening rearwardly through the rear surface of said housing,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said bore for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from said bore,

means for moving said die between said extended and retracted positions including a lever pivotally mounted within said body to the rear of said housing for rocking motion in said plane and having a forward end projecting into the outer end of said guideway and disposed in releasable, operative engagement with said die, whereby said die is moved between said extended and retracted positions in response to rocking motion of said lever,

power means operatively connected to said lever for rocking the latter,

said indenter housing and said die being removable as a unit through said forward opening in said body, and

means releasably securing said housing in said body.

8. An indenting tool, comprising:

a generally tubular body having an opening in its forward end,

an indenter housing removably positioned within said forward end of said body,

a housing extension positioned within said forward end of said body to the rear of said indenter housing,

said housing extension having a bore opening through the forward surface thereof,

said indenter housing having a bore aligned with and opening at its rear end to said bore in said housing extension and at its forward end to the exterior of said body through said body opening,

a workpiece guide removably positioned in the forward end of said bore in said housing extension and retained in the latter bore by said indenter housing, whereby said guide is removable from said housing extension when said indenter housing is removed from said body,

said guide having a central opening for receiving the end of a workpiece inserted through said bore in said indenter housing and an annular, forwardly presented shoulder surrounding said central guide opening for axially locating the workpiece in the bore in said indenter housing,

said indenter housing having a guideway in a plane parallel to the axis of said bores, the inner end of said guideway opening into said bore in said indenter housing and the outer end of said guideway opening rearwardly through the rear surface of said indenter housing,

an indenting die slidable in said guideway between an extended position wherein one end of said die projects into said indenter housing bore for indenting a workpiece therein and a retracted position wherein said one end of said die is retracted from the latter bore,

means for moving said die between said extended and retracted positions including a lever pivotally mounted on said housing extension for rocking motion in said plane and having a forward end projecting into the outer end of said guideway and disposed in releasable, operative engagement with said die, whereby

7

said die is moved between said extended and retracted positions in response to rocking motion of said lever,
power means on said body operatively connected to said lever for rocking the latter,
said indenter housing and die being removable as a unit through said forward body opening, and
means releasably securing said indenter housing in said body.

2,605,467
2,767,401
2,887,916
2,985,047
2,991,675
3,026,520
3,086,574

8/52
10/56
5/59
5/61
7/61
3/62
4/63

Lind et al. ----- 1—187
Haberstump ----- 1—187
Freedom ----- 81—15
Van Oort ----- 81—15
Ustin ----- 81—15
Albrecht ----- 1—187
Ustin ----- 153—1

5

FOREIGN PATENTS

10 722,278 1/55 Great Britain.

References Cited by the Examiner

UNITED STATES PATENTS

2,369,180 2/45 Rosenthal ----- 81—15
2,467,012 4/49 Deuschle ----- 81—15

CHARLES W. LANHAM, *Primary Examiner*.
MORRIS M. FRITZ, WALTER A. SCHEEL, MICHAEL V. BRINDISI, *Examiners*.