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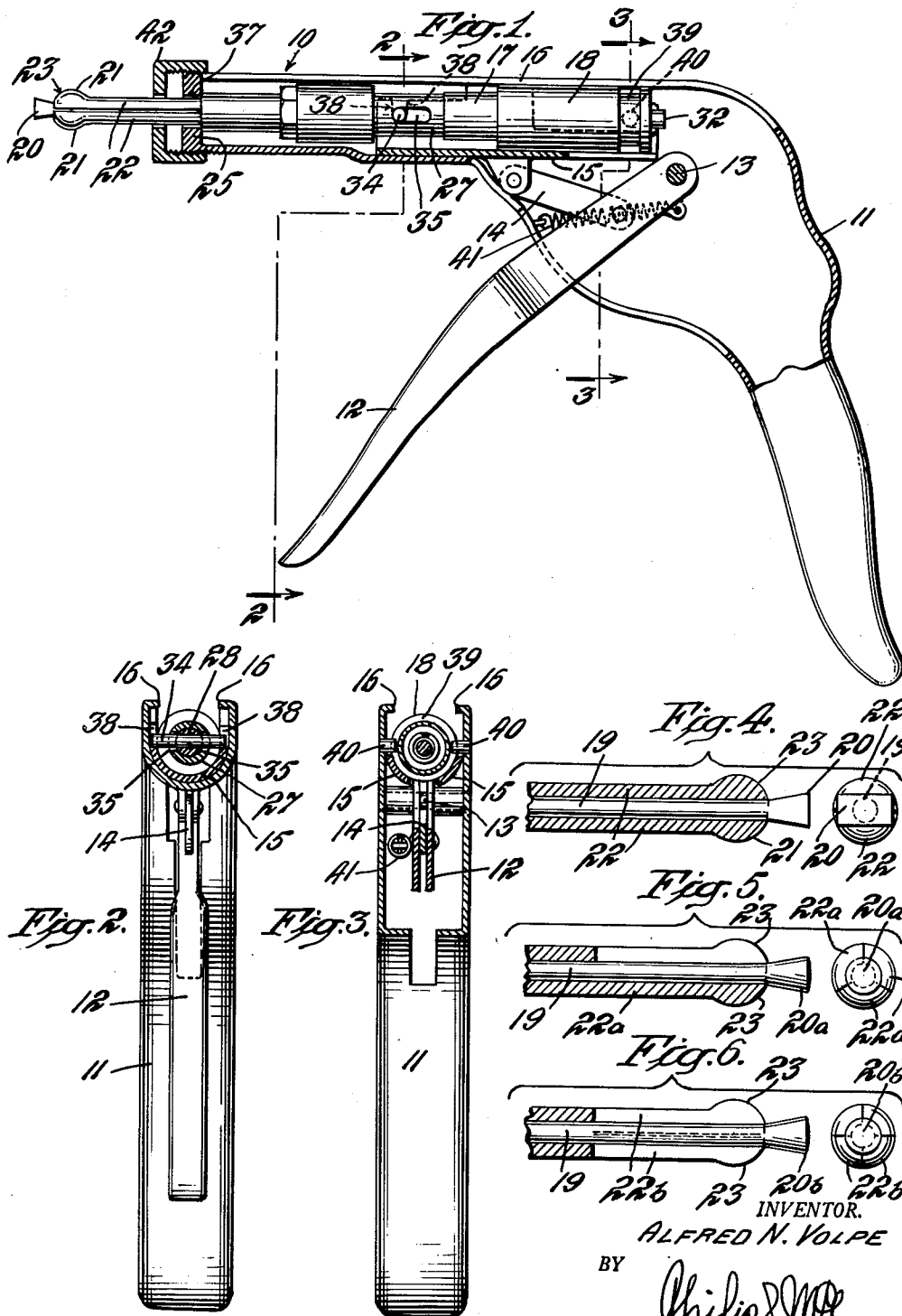
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TOOL FOR UPSETTING HOLLOW RIVETS

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2 SHEETS—SHEET 1



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## TOOL FOR UPSETTING HOLLOW RIVETS

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The invention disclosed in this patent is a tool for upsetting hollow rivets.

Objects of the invention are to provide a simple form of mechanism which can be operated with a pistol grip, hand tool action or any other form of power to upset hollow, drilled or punched rivets which in fastening can be reached only from the one side.

Particularly it is a purpose of the invention to provide such a device in an inexpensive form of construction, which will be positive and powerful in its action and entirely reliable and practical for the purposes intended.

Special objects of the invention are to provide the unit outlined in a form which can be quickly adapted to various sizes and forms of rivets.

Other desirable objects and the novel features through which the purposes of the invention are attained are set forth or will appear in the course of the following specification.

The drawings accompanying and forming part of the specification illustrate certain present practical embodiments of the invention. Structure, however, may be modified and changed as regards the immediate disclosure, all within the true intent and broad scope of the invention as hereinafter defined and claimed.

Fig. 1 in the drawings is a broken and part longitudinal sectional view of a hand grip form of tool embodying the invention;

Figs. 2 and 3 are cross sectional views of the same on substantially the planes of lines 2—2 and 3—3, respectively, of Fig. 1;

Figs. 4, 5 and 6 are broken sectional and end views showing different forms of rivet expanders usable in the tool;

Figs. 7, 8 and 9 are enlarged broken longitudinal sectional views illustrating the three phases of first passing the collapsed expander through the rivet, Fig. 7, then pulling back the wedge or expanding element to spread the expansible or expander element, Fig. 8, and then drawing back both these elements, Fig. 9, to effect the spreading and upsetting of the inner end of the rivet.

In Fig. 1 the tool is shown as of the gun type, having a tubular barrel 10, a pistol form of grip 11 and a trigger lever 12.

The latter is shown pivoted in the body of the grip at 13 and connected by pivoted link 14 with a carriage 15 sliding in the barrel.

The barrel is shown as open at the top and as having inturned flanges 16, Fig. 2, slidably confining the carriage in place.

This open top character of the barrel enables the quick substitution of different upsetting units which can be used in the tool.

These replaceable upsetting units consist in each instance of a plunger 17 slidably operating in an abutment sleeve 18 confined in the back portion of the barrel and carrying a rod 19 which projects from the front end of the barrel and is equipped with a wedge-like piece 20 for opening

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up a surrounding expansible rivet heading member 21.

These two elements, that is, the wedging expanding member 20 and the expansible heading member 21, may be in various sizes and shapes to suit the work to be performed.

Thus in Figs. 1 and 4, the member 20 is shown as a flat sided wedge piece arranged to expand a single split surrounding sleeve member 22.

Fig. 5 shows the wedge piece 20a as a conical element designed to expand the three-way split form of sleeve 22a.

In Fig. 6 the wedge piece is of conical form and the expansible sleeve 22b is split in four segments.

In all forms illustrated the expansible element has an enlarged ball shaped head 23 for flanging out and heading over the inner end of the rivet, substantially as indicated at 24 in Fig. 9.

The split expansible sleeve 22 is shown as having a free sliding bearing at its outer end through the guide 25 in the end of the barrel and as having a detachable screw mounting at 26 at its inner end in the coupling sleeve 27 which is slidably guided over the forward stem portion 28 of the wedge carrying plunger 17.

In similar fashion the wedge carrying rod 19 is shown as detachably screwed at 29 into the stem portion 28, which is an integral extension of plunger 17, so that different expanding and expansible elements 20 and 21, respectively, may be screwed into place in the sliding sleeve and plunger members 27 and 17.

The wedge carrying plunger 17 is normally projected by a spring 30 interposed between the back of the plunger and the end of the abutment or retainer sleeve 18, said spring being disposed about the reduced rearward stem portion 32 of the plunger which is guided through the end of the retainer sleeve and carries a cotter pin 33 or other stop element engageable with the end of the sleeve to limit the return stroke to the normal or rest position of the plunger and wedge piece carried thereby.

The sleeve 27 which carries the ball shaped rivet upsetting head 23, has a limited sliding movement over the forward stem portion 28 of plunger 17 determined by the cross pin 34 fixed in the stem portion 28 and having its projecting ends engaged in longitudinal slots 35 in opposite sides of the sleeve.

Figs. 1 and 7 illustrate the normal position of parts with the plunger thrust forward by spring 30 and the cross pin 34 carried by the plunger at the forward end of slots 35 in sleeve 27.

The retainer sleeve 18, with the wedge plunger 17 slidably engaged therein, and the expansible header sleeve 27 slidably engaged over the plunger, constitute a unit assembly which with the appropriate wedge rod 19 and split sleeve 22 screwed thereto at 29 and 26, can be quickly and easily inserted in or removed from the pistol grip

body of the tool, through the open top of the barrel.

In such placing and removal operation the wedge 20 and rivet expanding or upsetting element 21 in the fully projected, collapsed or non-expanded condition shown in Figs. 1 and 7, will pass freely through the opening 37 in the guide 25.

In mounting it in place the unit may then be rocked downwardly to carry the projecting ends of the cross pin 34 into seated engagement in notches 38 in the sides of the sliding carriage 15 and to engage the annularly grooved portion 39 of the retainer sleeve 18 over anchor pins 40, Fig. 3, on opposite side walls of the pistol grip handle.

Removal of the rivet upsetting unit may be effected just as readily by tipping the inner end of the unit upwardly to release the abutment or retainer sleeve 18 from the holding pins 40 and to clear the cross pin 34 from the notches 38 in the sliding carriage 15.

An extension spring 41 is shown connected with the trigger or grip lever 12 for the return of the grip and the operating slide to the forward position shown in Figs. 1 and 7.

A screw cap 42 is shown adjustably engaged over the end of the barrel to provide an adjustable buck or abutment for engagement with the head of the rivet.

Operation and use of the tool will be clear from consideration of Figs. 7, 8 and 9, which show first the wedge and expansible upsetting element in the projected and collapsed condition passed through the hollow rivet and the bucking cap 42 engaged with the head of the rivet; then the grip lever 12 is operated to retract the slide 15, and through pin 34, plunger 17 will pull back the wedge 20 to spread or open up the split expander 21. In this expanding action, as shown in Fig. 8, the cross pin 34 will have traveled to the back end of slots 35 to take up lost motion between the wedge plunger 17, 28, and surrounding expander sleeve 27. Thereafter the two elements, that is, the wedge piece 20 and the expander head 21, will travel as one, as shown in Fig. 9, to effect and complete the spreading and upsetting of the inner end of the rivet.

The entry of the tapered wedge 20 into the split expansible element 21 enlarges the diameter of the rivet upsetting, ball shaped head 23 such that the rivet end will be flared out to accomplish the fastening required.

The final impact of fully upsetting the rivet is accomplished by both wedge and expander head having been solidly connected through engagement of the cross pin 34 with the inner ends of slots 35.

By screwing the bucking cap 42 one way or the other over the end of the barrel, the tool may be adjusted for longer or shorter rivets or to determine the point of location of the expander head with respect to the inner end of the rivet at which the head will be spread to start the rivet heading operation.

While the cross pin 34 will thrust the split expansion sleeve outward to fully projected position against the guide 25 and said sleeve will normally rest in that position while the wedge starts its backward travel, it is contemplated that a spring 43 may be interposed between the wedge carrying plunger 17, 28, and the rear end of the heading member 21 to yieldingly hold the sleeve 27 thrust outward in the position shown in Fig. 7

while the plunger is travelling backward to the sleeve expanding position shown in Fig. 8.

The spring 30 is stronger than spring 43 so as to hold the plunger 17 projected with the cross pin 34 at the forward ends of slots 35 in the sleeve 27 and the latter accordingly pressed against the guide 25 which therefore serves as a front stop limiting the extent of projection of both the wedge 20 and the header 21, as shown in Figs. 1 and 7. Then when the plunger is retracted by the slide 15 through engagement of notches 38 with ends of cross pin 34, the weaker spring 43 will expand as shown in Fig. 8, to hold the header sleeve projected against the front stop 25, until pin 34 reaches the back ends of slots 35, whereupon the plunger and sleeve will both be retracted as a unit to accomplish the final upsetting action indicated in Fig. 9. The spring 41 acts to supplement the action of spring 30.

The tool is made of but relatively few parts and is strong and rugged, well adapted to the purposes intended and successfully accomplishing the results herein set forth.

With the rivet upsetting elements projecting as shown in Fig. 1, a rivet may be slipped into position thereon and the tool used to place the rivet in its seated position as shown in Fig. 7. Then all that is required is to pull the hand lever 12 back to the desired extent of heading over or upsetting the rivet. As soon as pressure on the hand lever is released the wedge plunger and expansion sleeve will be snapped forward to fully project these parts and collapse the sleeve so that the tool can be withdrawn and disengaged from the work.

While the invention has been illustrated here embodied in the form of a hand tool, it will be realized that the mechanism may be incorporated in other forms and operated by hand or power.

What is claimed is:

1. A blind rivet setting tool having an abutment for bucking engagement over the head of a hollow rivet, an expansible rivet header projecting through said abutment and arranged in collapsed condition to pass through a hollow rivet engaged by the abutment, a sleeve connected with said header, said sleeve having a longitudinal slot therein, a plunger longitudinally shiftable in said sleeve, a cross pin extending through said slot and into said plunger and engageable with opposite ends of said slot to provide a lost motion connection between said sleeve and plunger, a front stop for said sleeve, a wedge piece connected with said plunger and operable in said header to control expansion and contraction of the header, a compression spring within said sleeve and abutting an internal shoulder thereof and the forward end of said plunger and yieldingly holding the sleeve thrust forward against said front stop, a second spring stronger than said first spring engaged with the rear end of said plunger and yieldingly projecting the wedge piece connected with said plunger beyond the bucking abutment and the cross pin on the plunger at the forward end of the slot in the sleeve, said plunger having a shoulder engageable with the sleeve to project the header connected to the latter forwardly of the bucking abutment under the force of said stronger spring, and means for retracting said plunger against the force of said stronger spring and whereby said cross pin will be carried rearwardly by said plunger into engagement with the opposite rearward end of the slot in the sleeve to thereby retract said sleeve and the header carried thereby after said plunger has first imparted retractive movement to said wedge piece.

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2. A blind rivet setting tool having an abutment for bucking engagement over the head of a hollow rivet, an expansible rivet header projecting through said abutment and arranged in collapsed condition to pass through a hollow rivet engaged by the abutment, a sleeve connected with said header, said sleeve having a longitudinal slot therein, a plunger longitudinally shiftable in said sleeve, a cross pin extending through said slot in the sleeve into said plunger and engageable with opposite ends of said slot to provide a lost motion connection between said sleeve and plunger, a front stop for said sleeve, a wedge piece connected with said plunger and operable in said header to control expansion and contraction of the head, a compression spring within said sleeve and abutting an internal shoulder thereof and the forward end of said plunger and yieldingly holding the sleeve thrust forward against said front stop, a second spring stronger than said first spring engaged with the rear end of said plunger and yieldingly projecting the wedge piece connected with said plunger beyond the bucking abutment and the cross pin on the plunger at the forward end of the slot in the sleeve, said plunger having a shoulder engageable with the sleeve to project the header connected to the latter forwardly of the bucking abutment under the force of said stronger spring and means for retracting said plunger against the force of said stronger spring and whereby said cross pin will be carried rearwardly by said plunger into engagement with the opposite rearward end of the slot in the sleeve to thereby retract said sleeve and the header carried thereby after said plunger has first imparted retractive movement to said wedge piece, an abutment sleeve slidably confining said plunger, said abutment sleeve having an end wall, the plunger having a rod extension projecting through said end wall, the second mentioned stronger spring being engaged about said rod extension between the end of the plunger and said end wall and a stop on said rod extension at the outer side of said end wall and engageable with the latter to limit the extent of projection of said plunger.

3. A blind rivet setting tool having an abutment for bucking engagement over the head of a hollow rivet, an expansible rivet header projecting through said abutment and arranged in collapsed condition to pass through a hollow rivet engaged by the abutment, a sleeve connected with said header, said sleeve having a longitudinal slot therein, a plunger longitudinally shiftable in said sleeve, a cross pin extending through said slot in the sleeve into said plunger and engageable with opposite ends of said slot to provide a lost motion connection between said sleeve and plunger, a front stop for said sleeve, a wedge piece connected with said plunger and operable in said header to control expansion and contraction of the header, a compression spring within said sleeve and abutting an internal shoulder thereof and the forward end of said plunger and yieldingly holding the sleeve thrust forward against said front stop, a second spring stronger than said first spring engaged with the rear end of said plunger and yieldingly projecting the wedge piece connected with said plunger beyond the bucking abutment and the cross pin on the plunger at the forward end of the slot in the sleeve, said plunger having a shoulder engageable with the sleeve to project the header connected to the latter forwardly of the bucking abutment under the force of said stronger spring and means

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for retracting said plunger against the force of said stronger spring and whereby said cross pin will be carried rearwardly by said plunger into engagement with the opposite rearward end of the slot in the sleeve to thereby retract said sleeve and the header carried thereby after said plunger has first imparted retractive movement to said wedge piece, a mounting barrel supporting said bucking abutment at the forward end of the same, a carriage slidable in said barrel and having a notch to receive said cross pin, and said means for retracting the plunger including a lever connected with said slidable carriage.

4. A blind rivet setting tool having an abutment for bucking engagement over the head of a hollow rivet, an expansible rivet header projecting through said abutment and arranged in collapsed condition to pass through a hollow rivet engaged by the abutment, a sleeve connected with said header, said sleeve having a longitudinal slot therein, a plunger longitudinally shiftable in said sleeve, a cross pin extending through said slot in the sleeve into said plunger and engageable with opposite ends of said slot to provide a lost motion connection between said sleeve and plunger, a front stop for said sleeve, a wedge piece connected with said plunger and operable in said header to control expansion and contraction of the header, a compression spring within said sleeve and abutting an internal shoulder thereof and the forward end of said plunger and yieldingly holding the sleeve thrust forward against said front stop, a second spring stronger than said first spring engaged with the rear end of said plunger and yieldingly projecting the wedge piece connected with said plunger beyond the bucking abutment and the cross pin on the plunger at the forward end of the slot in the sleeve, said plunger having a shoulder engageable with the sleeve to project the header connected to the latter forwardly of the bucking abutment under the force of said stronger spring and means for retracting said plunger against the force of said stronger spring and whereby said cross pin will be carried rearwardly by said plunger into engagement with the opposite rearward end of the slot in the sleeve to thereby retract said sleeve and the header carried thereby after said plunger has first imparted retractive movement to said wedge piece, a mounting barrel supporting said bucking abutment at the forward end of the same, a carriage slidable in said barrel and having a notch to receive said cross pin and said means for retracting the plunger including a lever connected with said slidable carriage, an abutment sleeve slidably confining said plunger and said second mentioned stronger spring and companion members on said abutment sleeve and barrel for removably securing said abutment sleeve in definitely positioned relation in said barrel.

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