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TOOL FOR UPSETTING INTERNALLY THREADED RIVETS

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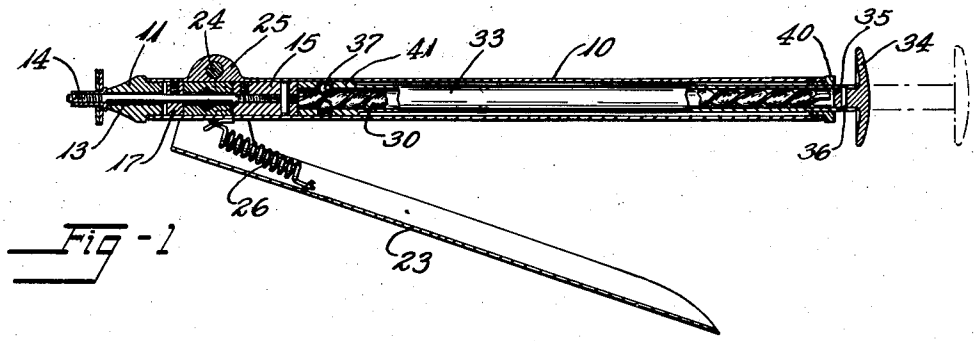


Fig-1

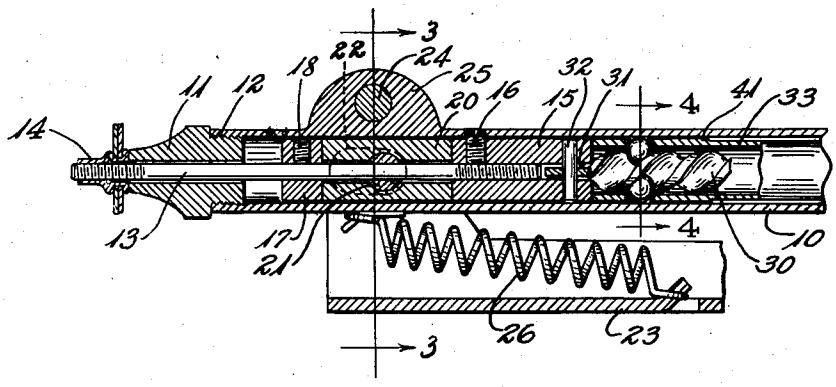


Fig-2

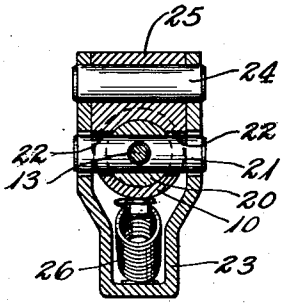


Fig-3

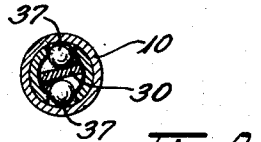


Fig-4

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TOOL FOR UPSETTING INTERNALLY THREADED RIVETS

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3 Claims. (Cl. 218—19)

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This invention relates to tools for upsetting internally threaded tubular rivets.

For use in upsetting internally threaded tubular rivets from one face of the work, it has been proposed to provide hand-operated tools in which a threaded mandrel and an anvil through which the mandrel extends are provided with means for rotating one relative to the other to engage the threads of the mandrel in the threads of the rivet, and means have been proposed to move the mandrel and the anvil relative to each other axially of the mandrel to upset the rivet. Such means as have heretofore been proposed for providing the relative rotational movement have been either slow in operation or of constructions requiring a great amount of machine work involving excessive cost.

It is an object of the present invention to overcome the foregoing and other difficulties by providing efficient and inexpensive means for quickly effecting entrance and withdrawal of the threaded mandrel relative to the rivet.

Other objects are to reduce operating friction of the rotating mechanism, to provide positive operation, and generally to provide an efficient tool at low cost.

These and other objects will appear from the following description and the accompanying drawings.

Of the drawings,

Fig. 1 is a longitudinal sectional view of a tool constructed in accordance with and embodying the invention with the mandrel inserted in a rivet before upsetting of the rivet.

Fig. 2 is a similar view of the rivet-engaging end of the tool with the rivet upset, showing the mechanism drawn to a larger scale.

Fig. 3 is a cross-sectional view, taken on line 3—3 of Fig. 2.

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 2.

Referring to the drawings, the numeral 10 designates a tubular body in the end of which a hollow anvil 11 is secured, as by threads 12. A threaded draw rod 13 extends slideably and rotatably through the anvil with its threaded end exposed for engaging the threaded bore of the rivet 14. The inner end of the draw rod is also threaded to engage the threaded bore of a block or collar 15 slideably and rotatably fitted in the tubular body and fixed to the rod against relative rotation by a set-screw 16. A second collar 17 is secured to the draw rod 13, as by a set screw 18 and is also slideably and rotatably fitted within the bore of the tubular body 10. The collars 15

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and 17 are spaced apart and between them a collar 20 is slideably mounted within the tubular body and about the draw rod.

For moving the draw rod axially of the body to collapse a rivet threaded upon the draw rod by engagement with the anvil, a cross-pin 21 extends through the collar 20 and through opposite clearance slots 22 in the walls of the tubular body with its ends engaging openings in the limbs of a forked lever 23. The lever 23 is pivoted on a pin 24 extending through an ear 25 of the tubular body. A tension coil spring 26 is secured between the body 10 and the lever 23 to hold the rod 13 normally in retracted position. The lever arm is normally non-parallel to the tubular body 10 and may be moved toward the body to advance the draw rod against the spring pressure. The arrangement is such that in the advanced position of the draw rod it may be threaded into a rivet and as the lever is pressed toward the tubular body, the draw rod is retracted and the rivet upset.

For rotating the draw rod to thread it into and out of the rivet, a worm 30, formed from a flat strip of metal twisted to provide an auger-like screw having a pitch angle of about forty-five degrees, is provided within the tubular body extending axially thereof. One end of the worm 30 is retained in a cross-slot 31 of the collar 15, as by a cross-pin 32 extending therethrough so as to be rotatable with the collar relative to the body 10. A tubular plunger or thrust member 33 is slideably fitted in the bore of the tubular body 10 and about the worm 30. A plunger handle 34 is secured to the outer end of the plunger as by a dowel 35 thereon entering the bore of the plunger and connecting cross-pin 36 therethrough, the arrangement being such that the handle is secured to the plunger against relative rotation.

For driving the worm 30, a pair of balls 37 are mounted for free rotation in sockets formed diametrically opposite each other in the walls of plunger 33. These balls engage in opposite grooves of the worm 30 and cause the worm to rotate when the plunger 33 is moved axially.

The worm 30 does not require machining as the twisting of a straight strip of sheet metal provides smooth oppositely facing grooves defined by the twisted marginal lands of the worm. The balls 37 are preferably of smooth hardened steel such as the balls used in ball bearings.

A guide collar 40 is secured in the end of the tubular body, as by threads and surounds the plunger 33 in sliding engagement therewith. The inner end of the plunger is slightly enlarged,

as at 41 providing a shoulder preventing full withdrawal of the plunger by contact with the guide bushing.

The steel balls 37 are in diameter substantially twice the thickness of the wall of the tubular plunger so as to present substantially a hemisphere within the bore of the plunger so that the force applied to the worm is resisted tangentially of the bore of the plunger and little if any radial reaction force is applied to the balls which transfer the thrust load of the plunger to the worm.

As the worm is provided by twisting a flat strip of sheet metal it will present substantially the original cross section of the strip at any plane normal to its axis and its faces presented for contact with the balls will be substantially radial to its axis. A cross-section of the worm at any position normal to its axis will be substantially of rectangular shape. Due to these conditions the worm and the balls will roll together in substantially line contact with a minimum of friction. By the use of oppositely disposed balls a balanced couple is provided eliminating bending of the worm.

The entire construction is such that a minimum amount of machining operations is required in manufacture of the tool.

In using the tool, the operator grasps the body 10 of the tool against rotation with one hand and at the same time with the same hand centers the threaded bore of a rivet over the projecting end of the draw rod.

The lever 23, connected to the tubular body may also be held by the operator to assist in preventing rotation of the body 10. With the body 10 so held and the plunger 33 drawn outwardly of the tubular body 10 and held by the other hand of the operator grasping the handle 34, a rivet is placed over the projecting end of the threaded draw rod 13, using the thumb and forefinger of the hand holding the body 10. The plunger 33 is then advanced toward the anvil and, as the body 10 and handle 34 are held against substantial relative rotation by the hands of the operator the draw rod is rotated and secured into the rivet.

The rivet is then entered in an aperture of the work while the tool is still held by the operator. Then while holding the body 10 of the tool with one hand to steady it, the operator moves the lever 33 toward the body 10, thereby withdrawing the draw rod and upsetting the rivet.

After upsetting of the rivet, with the body 10 of the tool grasped in one hand, the operator grasps the handle 34 and draws the plunger outwardly of the tubular body 10 thereby rotating the draw rod to screw it out of the rivet.

Variations may be made without departing from the scope of the invention as it is defined by the following claims.

We claim:

1. A tool for upsetting hollow internally threaded rivets, said tool comprising a tubular body having at one end thereof a hollow anvil secured thereto for seating against the head of a rivet, a threaded draw rod extending through said anvil axially of said body in slideable and rotative relation to the anvil to engage in the threaded bore of the rivet, a worm secured to said draw rod for rotation and sliding movement therewith and extending from the point of securement within and axially along said body toward the other end thereof, a tubular plunger having a circumferentially continuous cylindrical wall throughout its length having smooth inner and outer surfaces telescopically mounted about said worm within said tubular body in slideable and rotative relation to said tubular body and to said worm and draw rod for sliding movement of said plunger relative to said body and worm in a direction axially thereof, said plunger having recesses in said cylindrical wall thereof, and spherical driving members carried by said plunger and seated in said recesses for free rotation therein in all directions and projecting into the path of said worm in driving relation to the worm for translating axial movement of said plunger to rotative movement of said worm, said draw rod and worm and plunger being locked together and mounted for limitless rotation thereof in said tubular body when said plunger is restrained against axial movement.

2. A tool for upsetting hollow internally threaded rivets, said tool comprising a tubular body having at one end thereof a hollow anvil secured thereto for seating against the head of a rivet, a threaded draw rod extending through said anvil axially of said body in slideable and rotative relation to the anvil to engage in the threaded bore of the rivet, a worm secured to said draw rod for rotation and sliding movement therewith and extending from the point of securement within and axially along said body to substantially the other end thereof, said worm being of substantially rectangular cross-section at any position therealong and having the characteristics of a helix of sheet material, a tubular plunger having a circumferentially continuous cylindrical wall throughout its length having smooth inner and outer surfaces telescopically mounted about said worm within said tubular body in slideable and rotative relation to said tubular body and to said worm and draw rod for sliding movement of said plunger relative to said body and worm in a direction axially thereof, said plunger having diametrically opposed recesses in said cylindrical wall thereof, spherical driving members carried by said plunger and seated in said recesses for free rotation therein in all directions and projecting into the path of said worm in driving relation to the worm for translating axial movement of said plunger to rotative movement of said worm, said draw rod and worm and plunger being locked together and mounted for limitless rotation thereof in said tubular body when said plunger is restrained against axial movement, and means for retracting said draw rod and worm as a unit.

3. A tool for upsetting hollow internally threaded rivets, said tool comprising a tubular body having at one end thereof a hollow anvil secured thereto for seating against the head of a rivet, a threaded draw rod extending through said anvil axially of said body in slideable and rotative relation to the anvil to engage in the threaded bore of the rivet, a worm secured to said draw rod at a position spaced axially inward from said anvil for rotation and sliding movement with the draw rod and extending from the point of securement within and axially along said body toward the other end thereof, a tubular plunger having a circumferentially continuous cylindrical wall throughout its length having smooth inner and outer surfaces telescopically mounted about said worm within said tubular body in slideable and rotative relation to said tubular body and to said worm and draw rod for sliding movement of said plunger relative to said body and worm in a direction axially thereof, said plunger having recesses in said

cylindrical wall thereof, spherical driving members carried by said plunger and seated in said recesses for free rotation therein in all directions and projecting into the path of said worm in driving relation to the worm for translating axial movement of said plunger to rotative movement of said worm, said draw rod and worm and plunger being locked together and mounted for limitless rotation thereof in said tubular body when said plunger is restrained against axial movement, and means for retracting said draw rod and worm as a unit, said means including an axially shiftable force-transmitting sleeve within said tubular body and encircling said draw rod intermediate said anvil and said point of securement in rotative and axially fixed relation to said draw rod and worm and held against rotation relative to said body to permit the limitless rotation of the draw rod and worm and plunger as a unit and to compel retraction of the draw rod and worm.

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