June 5, 1945. W. H. DEDRICK 2,377,406

BEADING TOOL

Filed Jan. 20, 1944

Fig. 1.

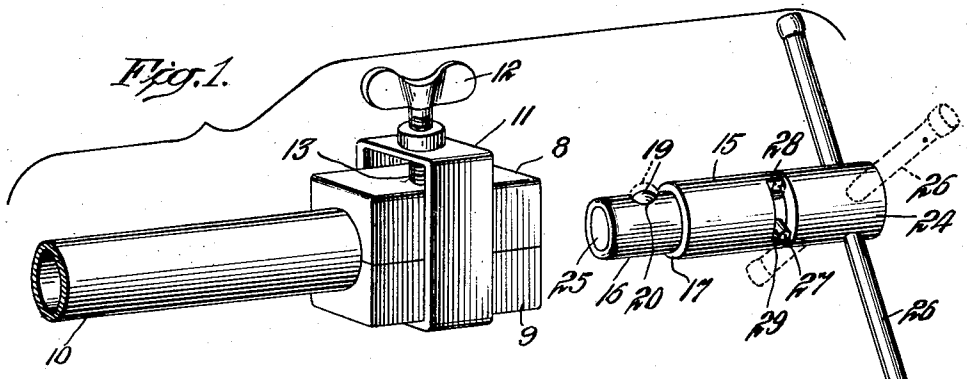


Fig. 2.

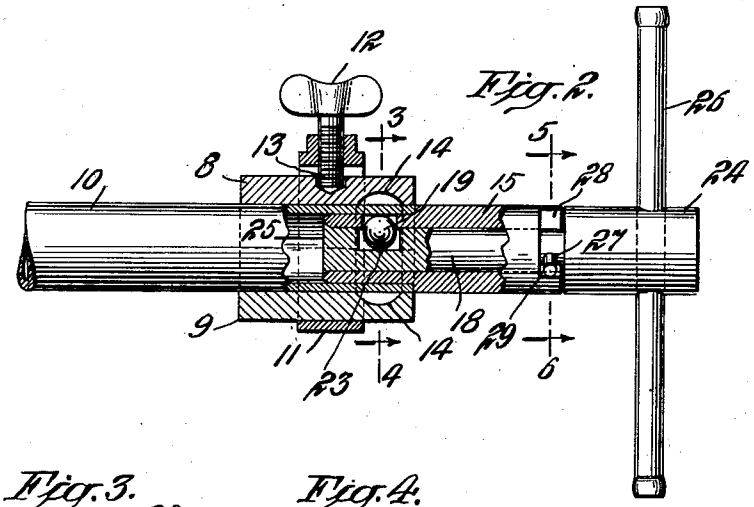


Fig. 3.

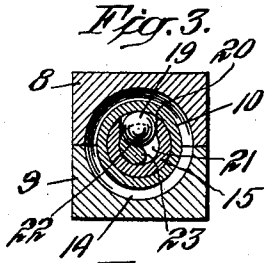


Fig. 4.

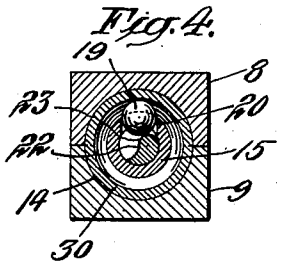


Fig. 7.

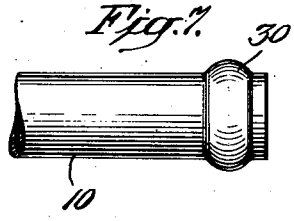


Fig. 5.

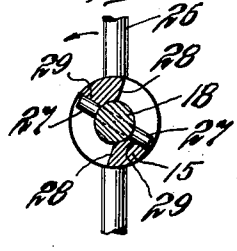
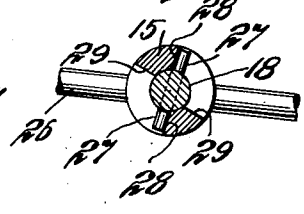


Fig. 6.



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BEADING TOOL

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Application January 20, 1944, Serial No. 519,048

3 Claims. (Cl. 153—73)

The invention here disclosed relates to the formation of beads on tubing.

Objects of the invention are to provide a tool by which beads may be raised on tubing, such as required in aircraft manufacture, and particularly without the necessity of removing the tubing from its locale.

Other objects of the invention are to provide a tool of such character, which will operate quickly and effectively and without injury to the tubing.

Additional 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 drawing accompanying and forming part of the specification illustrates a present practical embodiment of the invention, but it is realized that structure 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 drawing is a perspective view illustrating the component parts of the tool in separated relation, the die forming clamp applied to the tubing and the cooperative expander mechanism ready to be inserted into the tubing confined within the clamp, the end of the tubing appearing in section.

Fig. 2 is a broken longitudinal sectional view showing the parts combined for effecting the beading operation.

Figs. 3 and 4 are cross-sectional views on substantially the plane of line 3—4 of Fig. 2, showing how the beading roller is projected by relative rotation of the shaft member within the sleeve element of the tool.

Figs. 5 and 6 are cross-sectional views on substantially the plane of line 5—6 of Fig. 2 and illustrating the lost motion connection permitting limited relative rotation of the shaft within the sleeve member.

Fig. 7 is a broken side elevation illustrating the completed bead formed on the tubing.

The clamp portion of the device is shown as comprising a pair of blocks 8, 9, shaped to fit about and to completely enclose the tubing 10, and releasably secured in this relation by a surrounding yoke 11, and thumb screw 12, the latter centering in a seat 13, provided in one (8) of the blocks.

The clamp blocks have an internal annular groove 14, providing a die cavity for the formation of the bead.

The expander portion of the device comprises in the illustration a sleeve-like body 15, having a reduced end portion 16, to enter the tubing and a shoulder 17, to engage the end of the tubing, with a shaft member 18, rotatable within the sleeve to project a bead forming roller out into the die cavity 14 described.

The roller is here shown in the form of a ball 19, confined for partly projecting radial movement within an opening 20, in the side of the sleeve and adapted to seat in non-protruding relation within a pocket 21, in the inner shaft member. This ball receiving pocket has an inclined or curved bottom wall 22, to accommodate the ball in retracted position (Fig. 3) and which will act as a cam to project the ball when the shaft is turned in the sleeve, Fig. 4. In the latter position, it will be noted that a rounded bearing portion 23, at the end of the incline, stands in back of the ball, to firmly support it in the protruding bead forming position.

The shaft member is shown as having a head 24, at the outer end of the same for abutting engagement with the outer end of the sleeve member and the inner end of the shaft is shown as expanded or headed over at 25, to rotatably confine the shaft within the sleeve.

A handle rod 26, extending through the outer head portion of the shaft provides the means for turning this and the surrounding sleeve element.

Limitation of the turning movement of the shaft within the sleeve and by that, the extent of projection of the ball is effected in the illustration by a cross pin 27, on the shaft, engageable with shoulders 28, on the end of the sleeve. These forwardly located shoulders limit rotation of the shaft in the ball projecting direction, as indicated in the broken lines, Fig. 1, and oppositely disposed shoulders 29, are engageable by the cross pin to limit rotation in the opposite ball retracting direction. These circumferentially spaced stop shoulders 28 and 29 may be provided, as illustrated, by simply cutting diametrically opposite notches in the end of the sleeve to receive the cross pin 27 and of sufficient circumferential extent to allow the desired relative rotation of the shaft within the sleeve. The lost motion connection thus provided between the shaft and sleeve enables the operator to effect projection and permit retraction of the ball and to positively turn the entire instrument in the tubing, either in the bead forming direction or in the reverse direction.

The ball is thus positively projected by the cam

portions 22, 23, by the turning of the handle in the bead forming direction and is permitted to drop back into non-projecting, retracted position by turning of the handle in the reverse direction. Furthermore, if for any unknown reason the ball should stick in the outwardly projected position, after the handle has been turned back to permit retractive movement, the ball will be forced inward to its seated position in the pocket 21, by the outer inclined wall of the formed bead, as the tool is withdrawn from the end of the tubing.

The shoulder 17 on the sleeve, by engagement with the end of the tubing, provides a stop for locating the bead rolling element at a predetermined point, that is, a definite distance inward from the end of the tubing. For a similar purpose, the die blocks may be constructed with the annular die cavity therein at a point to line up with the ball when the die blocks are flush with the end of the tubing as in Fig. 2. Thus, it can be assured, that the die cavity will be in accurate registry with the bead projecting element.

The separable die structure is readily applicable to and removable from the tubing and this accurately determines the final shape of the bead 30, produced by the tool. Furthermore, this surrounding die supports and reinforces the tubing, while the bead is being formed, saving the tubing from any injury during such forming operation. The bead expressing element is shown as of complemental form to the die cavity and while this is generally preferred, it is realized that these may not be exactly complemental and that for certain results, they may actually be of different non-complemental formation. While necessarily rotatable within the tubing, the sleeve may have a frictional fit in the tubing, so as to act as a drag for creating or initiating the relative rotation of the shaft within the sleeve necessary to effect protrusion of the bead forming ball. The outer end portion of the sleeve being exposed, provides a means by which the sleeve may be held, if necessary, while effecting turning of the shaft in the sleeve either in the ball projecting or ball retracting direction. While of particular value for beading the tubing used in aircraft structures, it is realized that the invention is of wider application and useful for projecting beads on hollow articles of any character.

What is claimed is:

1. A beading tool, comprising a clamp engageable about tubing and having an internal bead receiving annular groove, a sleeve insertable in tubing confined by said clamp, a shaft rotatable in said sleeve and a roller for displacing the wall of the tubing out into said groove, said roller being guided and confined between said sleeve and shaft, the sleeve having an opening for the protrusion of said roller, the shaft having a retaining pocket for said roller with a cam shaped bottom which will project the roller through said opening upon relative rotation of said shaft in the sleeve, means rotatably confining said shaft against longitudinal shifting movement in said sleeve, handle means on the outer end of the shaft for effecting rotation of the same, a cross pin on said shaft at the outer end of the sleeve and said sleeve having diametrically opposite notches in the end of the same receiving the ends of said cross pin and providing circumferentially spaced pairs of shoulders engageable by the cross pin to limit rotation of the shaft within the sleeve, in the opposite directions and forming a positive coupling between the shaft and sleeve by which the sleeve may be turned from the shaft in both directions.

2. A beading tool, comprising a separable die engageable about tubing or the like and having an internal bead defining die cavity, relatively rotatable elements insertable in tubing confined within said die and a beading member carried by said relatively rotatable elements and projectible thereby in such relative rotation into cooperative relation with said die cavity, said relatively rotatable elements comprising a sleeve and a shaft rotatably held in definite longitudinal position in said sleeve, said sleeve having circumferentially spaced shoulders, a cross pin carried by the shaft and disposed between said shoulders to limit rotation of the shaft in the sleeve in both directions and to enable the sleeve to be rotated from the shaft, said shaft having a circumferential cam portion engageable with said beading member for effecting projection of the same to the extent provided by the relative rotation of the shaft within the sleeve, and means for effecting rotation of the shaft in both directions for accomplishing relative rotation of the shaft in the sleeve and the turning of said sleeve by said shaft.

3. A beading tool, comprising companion die elements engageable about tubing to be beaded and having an internal bead defining cavity, relatively rotatable tool elements insertable into tubing confined within said die elements, a bead projecting member conjointly carried by said relatively rotatable tool elements, means for projecting or permitting retractive movement of said bead projecting member upon relative rotation of said tool elements in opposite directions and means limiting the extent of relative rotation of said elements in opposite directions, said tool elements including a sleeve element and a shaft element rotatably confined in definite longitudinal relation therein, handle means for effecting rotation of said shaft element and said means for limiting the extent of relative rotation including circumferentially spaced cooperative shoulders on the sleeve and shaft elements engageable upon limited rotation of the shaft in the sleeve in opposite directions.

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