Aug. 24, 1948. F. HUNZIKER 2,447,909

TOOL FOR BEADING OR EXPANDING METALLIC TUBE ENDS

Filed Jan. 31, 1946

Fig. 5

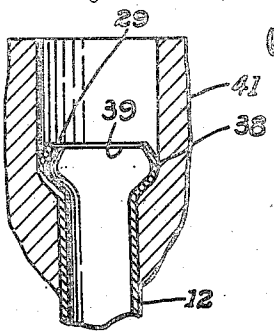


Fig. 1

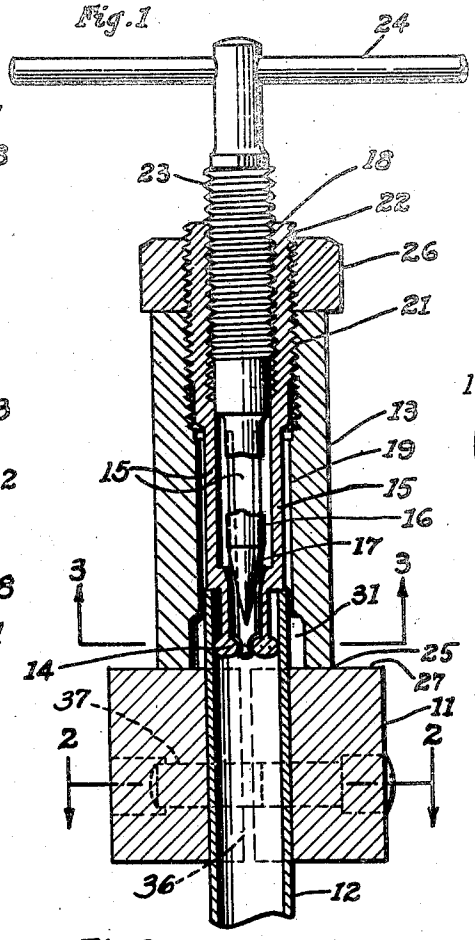


Fig. 3

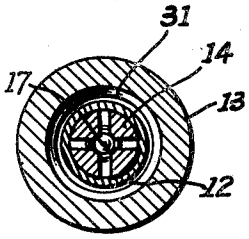


Fig. 6

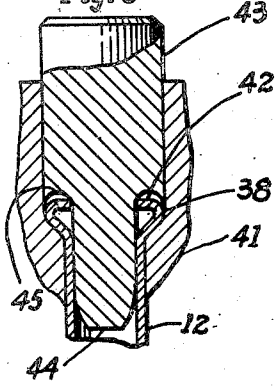


Fig. 4

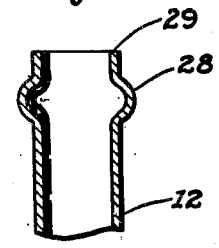


Fig. 7

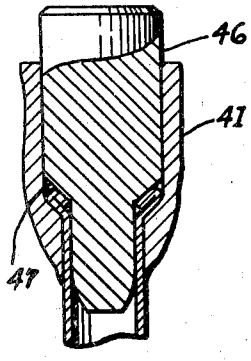
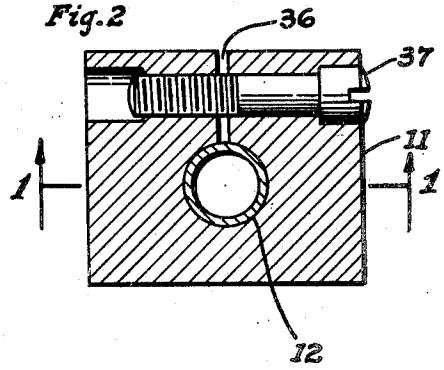


Fig. 2



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TOOL FOR BEADING OR EXPANDING METALLIC TUBE ENDS

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4 Claims. (Cl. 153—80)

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My invention relates to metal forming and concerns particularly apparatus for beading or expanding tubing.

It is an object of my invention to provide an improved, simple, easily operated tube beading or expanding tool.

A further object of my invention is to form beads in the end of tubing or at points spaced from the end of the tubing without thinning the tube wall.

A further object of the invention is to expand the diameter and shorten the length of tubing while leaving the wall thickness unchanged.

Still another object of the invention is to limit accurately the bead diameter of tubing being beaded and to bead tubing without affecting the normal diameter of the unflared portion of the tubing.

Still another object of the invention is to provide for clamping the portion of the tubing which is not to be beaded or expanded and to feed the tube metal from the free end toward the portion to be beaded or expanded.

Other and further objects, features and advantages of the invention will become apparent as the description proceeds.

In carrying out the invention in accordance with a preferred form thereof, I provide a clamping block, preferably a split block, for holding the portion of the tubing adjacent that portion which is to be beaded and I provide a hollow block adapted to fit around the portion of the tubing protruding from the clamping block. The hollow block is provided with a plurality of collet fingers with collet bulbs at the end thereof surrounded by the mouth of the hollow block and means are provided for forcing the collet fingers outward in order to produce the desired bead at or near the end portion of the tubing protruding from the clamping block.

A better understanding of the invention will be afforded by the following detailed description considered in conjunction with the accompanying drawing in which Fig. 1 is a longitudinal medial sectional view of a tube beading tool forming an embodiment of my invention showing a portion of tubing upon which the beading operation has not yet been performed. Fig. 2 is a view of a cross-section of the apparatus of Fig. 1 represented as cut by a plane 2—2 as seen by looking in the direction of the arrows indicated in Fig. 1. Fig. 3 is a view of a cross-section of the apparatus of Fig. 1 represented as cut by a plane 3—3 as seen by looking in the direction of the arrows indicated in Fig. 1. Fig. 4 is a longitudinal medial sectional view of the end portion of tubing which has been beaded with the apparatus of Fig. 1 arranged and adjusted as indicated in Fig. 1. Fig. 5 is a longitudinal sectional view illustrating a first step in forming a double flare in the tubing, the end of which has been single beaded by means of the apparatus of Fig. 1. Fig. 6 is a view corresponding to Fig. 5 illustrating a further step in the formation of a double flare in the tube end shown in Fig. 5, and Fig. 7 is a view which corresponds to Figs. 5 and 6 illustrating the final step in the formation of a double conical flare.

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Like reference characters are utilized throughout the drawing to designate like parts.

The apparatus shown by way of illustration in Figs. 1, 2 and 3 of the drawing comprises a clamping block 11 adapted to receive and secure a portion of a length of tubing 12 near the end thereof, and a hollow rotatable block 13 provided with longitudinally and radially movable collet bulbs 14 carried by collet fingers 15. In order to produce a bead in a portion of the end of the length of tubing 12 adjacent the position of the collet bulbs 14, means are provided for forcing the collet bulbs 14 outward radially. Preferably such means take the form of a rod or stem 16 having a conical tip or collet expander 17, the stem preferably being threaded into the upper portion of the hollow block 13 whereby the collet fingers 15 may be spread by driving the stem 16 downward.

Although my invention is not limited thereto, preferably the apparatus is so arranged that the collet fingers 15 may be moved longitudinally or axially with respect to the stem 16 as well as radially in order that the axial length of the bead formed in the tube 12 and the distance of the flared portion from the end of the tube may be adjusted or varied as desired. For this purpose the collet fingers 15 are preferably composed of resilient spring material such as spring steel, for example, and are secured to or form continuations of a sleeve or bushing 18 which is both internally and externally threaded. The hollow block 13 has a bore 19, the upper portion of which is provided with an internal thread 21 adapted to mate with the external thread 22 of the sleeve 18. The collet expander stem 16, in turn, preferably has an enlarged diameter threaded shank 23 adapted to mate the internal thread of the sleeve 18. Suitable means for rotating the stem 16 are provided, such as the cross-pin handle 24, for example. In order to fix the collet bulbs 14 in their axial position with respect to the block 13 in the lower end 25 thereof, when the desired

adjustment has been obtained, a lock nut 26 is preferably provided which is adapted to mate the external thread 22 of the sleeve 18. The thread 22 of the sleeve 18 is made of sufficient length so that it projects from the upper end of the block 13 to provide sufficient length for engagement with the lock nut 26.

The lower end surface 25 of the hollow block 13 and the upper surface 27 of the split clamping block 11 are preferably formed as smooth plane surfaces, perpendicular to the axis of the hollow block 13, the stem 16 and the tubing 12.

When it is desired to produce a curved substantially arcuate cross-section bead such as the bead 28, displaced from the end 29 of a length of tubing 12, as illustrated in Fig. 4, the tube 12 is clamped within the block 11 with a sufficient length of tubing projecting from the upper surface 27 of the block 11. To allow for the shortening of this portion of the tubing upon the formation of the bead 28, and to leave the bead 28 the desired distance from the upper end 29 of the tube, the collet finger carrying sleeve 22 is adjusted axially within the hollow block 13 so as to bring the collet bulbs 14 opposite the portion of the tubing to be beaded. The collet expander stem 16 is then rotated so as to drive the conical tip 17 against the collet bulbs 14 causing them to be expanded outwardly a short distance. The stem 16 is then retracted slightly to relieve the collet bulbs and the hollow block 13 is rotated to bring the collet bulbs 14 opposite a different portion of the internal surface of the tubing 12, whereupon the stem 16 is again forced inward and this operation is continued until the desired degree of bead has been produced around the periphery of the end portion of the tubing 12. Owing to the fact that the collet bulbs 14 are not allowed to rotate, being rigidly secured upon the fingers 15, the effect of the operation is to draw the upper end of the tubing 29 downwardly expanding the portion 28 without material effect on the wall thickness.

In order to fix accurately the outer diameter of the beaded portion 28, the hollow block 13 is preferably provided with an enlarged mouth 31 having an internal diameter corresponding to the desired external diameter of bead 28; however, the invention is not limited thereto as by providing an enlarged mouth 31 of adequate diameter, the same tool may be employed for producing beads of different diameters up to the maximum provided by the diameter of the mouth 31.

The clamping block 12 may be split all the way across or may be provided with a hinge on one side and a quick-lock and release fastening device on the other side if desired. This is preferably done in case the tubing is to be beaded at both ends. Nevertheless, for sake of simplicity in the drawing, I have shown a clamping block 12 with a single split 36 on one side and a suitable tightening arrangement such as a cap screw 37 for drawing up the block 11 in order to secure the tubing 12 tightly while it is being beaded.

If it is desired to produce a bead 28 at the distance from the tube end 29, illustrated in Fig. 4, the apparatus is adjusted, as shown in Fig. 1, before driving the expander tip 17 between the collet bulbs 14 and rotating the hollow block 13. If it is desired to produce the bead nearer the end of the tubing, the sleeve 18 carrying the collet fingers 15 and the bulbs 14 is locked in position higher in the hollow block 13. Also if it is desired to produce a longer bead than is illustrated in Fig. 4, the sleeve 18 is progressively changed in adjustment so as to bead different portions of the tubing 12 along its length.

In case it is desired to produce a double-flare in the end of the tube a single arcuate section flared bead is first produced near the end of the tube such as the bead illustrated at 38 in Fig. 5. This is accomplished by setting the sleeve 18 so that the collet bulbs 14 will come relatively near the upper end 29 of the tubing 12. Preferably the flare is such that the internal diameter at the edge 39 is greater than the internal diameter of the main portion of the tubing 12 producing a partial flare. The partially flared tube is then placed in a die, such as the die 41 illustrated in Fig. 5, and the upper portion 42 of the flared bead 38 is turned to a substantially transverse plane position, as illustrated in Fig. 6, by means of a punch 43 having a stem portion 44 adapted to enter the tube 12 with a re-entrant curved shoulder 45 for turning the portion 42 of the flared bead. For completing the double-conical flare a second punch 46 is employed having a conical shoulder 47 as illustrated in Fig. 7. The terms "beads" and "beading" as used in this application refer specifically to the construction and operation of a preferred embodiment of the invention illustrated. It will be understood that essentially I have invented a tool that expands tubing, and under certain conditions as when the end of a tube is worked upon, although the tube is expanded, a true bead will not be produced.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the claims.

I claim:

1. An expanding tool comprising in combination a split block for clamping a length of tubing with the end portion of the tubing to be expanded extending from the block, a hollow block adapted to fit around the protruding tube end with an enlarged mouth around the portion of the tube end to be expanded, an internally and externally threaded sleeve carrying a plurality of collet fingers with collet bulbs at the end thereof surrounded by the mouth of said hollow block, said hollow block being internally threaded at the end away from said mouth to receive said threaded sleeve, a lock-nut for fixing the axial position of said collet bulb in said mouth and a conical-tip expander having an operating handle and a threaded shank fitting in said threaded sleeve whereby rotation of said handle serves to force said conical-tip against said collet bulbs to expand the latter and to expand the tubing.

2. An expanding tool comprising in combination a split block for clamping a length of tubing with the end portion of the tubing to be expanded extending from the block, tube engaging means comprising a hollow block adapted to fit around the protruding tube end with an enlarged mouth around the portion of the tube end to be expanded, said tube engaging means also including a plurality of collet fingers supported within said hollow block with collet bulbs at the ends of the fingers positioned within the mouth of said hollow block, a threaded opening in said tube engaging means axially spaced from the enlarged mouth, and a conically-tipped expander

having an operating handle and a threaded shank threaded in the opening in said tube engaging means, whereby rotation of said handle serves to force said conical-tip against said collet bulbs to expand the latter and to expand the tubing.

3. An expanding tool comprising tube engaging means including a hollow block having an enlarged mouth adapted to fit around the end of tubing to be expanded and a plurality of collet fingers supported within said hollow block, said collet fingers having collet bulbs at their ends disposed within the enlarged mouth of said hollow block, an internal thread in a portion of the tube engaging means, and a conically-tipped expander having a threaded shank fitting in the internal thread in said tube engaging means, whereby rotation of said expander serves to force the conical-tip against said collet bulbs to expand the latter and to expand the tubing.

4. An expanding tool comprising tube engaging means including a block having a mouth at one end adapted to fit around the end of the tubing to be expanded and a plurality of collet

fingers extending toward said mouth with bulbs at the end of said fingers, said tube engaging means having an internally threaded portion substantially concentric with said mouth, and a rotatable rod with a conical-tip and a threaded shank fitting in said internal thread, whereby the rotation of said rod serves to force said conical-tip against said collet bulbs to expand the latter and to expand the tubing.

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