

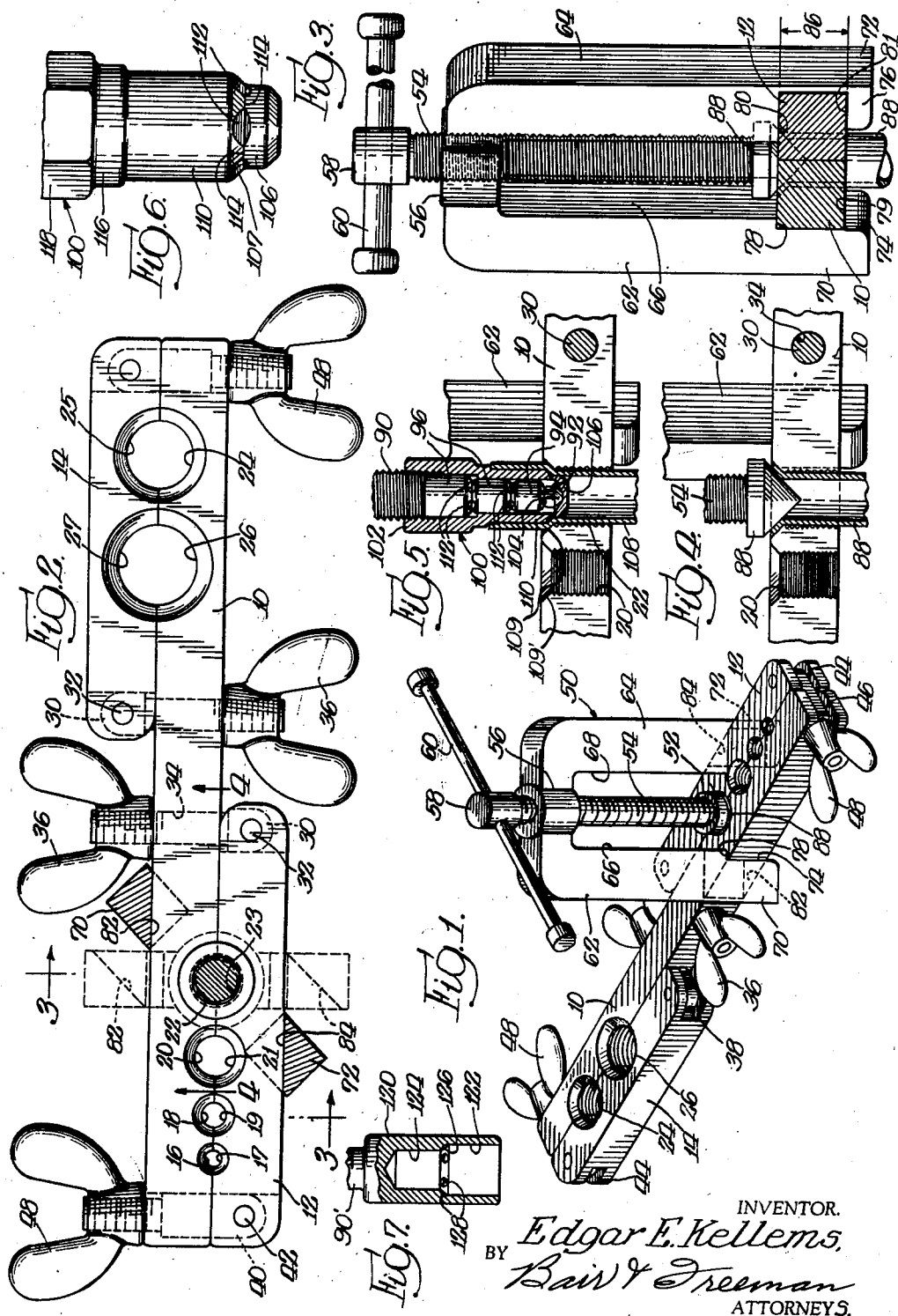
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FLARING AND SWEDGING TOOL

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FLARING AND SWEDGING TOOL

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6 Claims. (Cl. 153—79)

My invention relates to tools for working ductile tubing and especially tools of the nature of flaring and swedging tools which are designed to form the cut end of a piece of ductile tubing into some particular shape.

This application is a division of my co-pending application, Serial No. 286,234, filed July 24, 1939, now Patent No. 2,278,932.

Among the objects of my invention is to provide a new and improved flaring and swedging tool which in addition to clamping bars for holding tubing to be flared or swedged includes a yoke of considerable length upon which can be secured swedging anvils of a variety of sizes, the yoke being securable in place upon the clamping bars thereby making it possible to apply to the bars a yoke of almost any convenient length suitable for making long swedging flares in tight corners or restricted spaces where it would be otherwise impractical to perform the operation due to the limitations of space.

Another object is the provision in a flaring and swedging tool of a swedging tool anvil adapted to form a cylindrical enlargement on the end of ductile tubing suitable for the insertion of a second length of tubing therein which includes notches in the nature of kneading recesses which work the ductile tubing gradually out from a smaller to a larger diameter in order to produce a more smooth and even expanded portion.

There is also included in the objects the provision of a swedging anvil for relatively small sizes of tubing over which can be placed a series of anvil-like caps of different sizes for swedging relatively larger sizes of tubing.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing, in which:

Figure 1 is a perspective view showing the device assembled for a tube spreading operation.

Figure 2 is an enlarged top view of the device with the yoke shown in section.

Figure 3 is a view partly in section taken on the line 3—3 of Figure 2.

Figure 4 is a fragmentary view taken on the line 4—4 of Figure 2.

Figure 5 is a modified form of the device showing a swedging anvil in use thereon.

Figure 6 is an enlarged view of the outside element of the swedging anvil.

Figure 7 is a view partly in section showing a swedging tool for reducing the diameter of tubing ends.

In order to disclose a means by which my improved swedging tool may be used I have selected a set of clamping bars and yoke of the sort shown and described in my co-pending application, Serial No. 286,234, filed July 24, 1939, now Patent No. 2,278,932, wherein a set of clamping bars is provided including a long central bar 10 to which is secured at one end a shorter clamping bar 12 and at the other end a similarly short clamping bar 14.

At the left end of the long clamping bar as viewed in Figure 2 there is provided a series of recesses 16, 18, 20 and 22 which are the counterparts of recesses 17, 19, 21 and 23, respectively, in the short bar 12 designed for holding tubing of different smaller sizes.

Similarly, at the right hand end are recesses 24 and 26 in the long bar cooperable respectively with recesses 25 and 27 in the short bar for larger sizes of tubing. The short bars in each case are secured to the long bars by means of a screw 30 pivotally mounted upon a pin 32 in the short bar which is adapted to extend through a hole 34 in the long bar wherein it is secured by an adjustable wing-nut 36.

A slot 38 is provided in each case in the short bar to permit the bar to be pivoted about the screw. At the outer end in each case there is provided a similarly pivoted screw 40 on a pivot pin 42 mounted in a slot 44 in the short bar and adapted to be swung into a similar slot 46 of the long bar wherein it is held in place by a wing-nut 48.

A yoke 50 is provided upon which is mounted a tube spreading anvil 52 as shown in Figures 1, 3 and 4, in a manner illustrative of the mounting of my improved swedging tool, the tool or anvil being in turn secured upon a stem 54 threadedly mounted in a cross piece 56 of the yoke. At the outer end the screw is provided with a head 58 within which is loosely secured a cross bar 60 used for manually rotating the screw.

In addition, the yoke is provided with legs 62 and 64, herein shown long for a purpose which will appear later, wherein portions inward from the ends have faces 66 and 68 respectively spaced a distance apart slightly less than the combined width of the pair of clamping bars at either end. The legs likewise have outer portions 70 and 72 at the ends provided with faces 74 and 76 respectively spaced a distance apart very

slightly greater than the combined width of a pair of clamping bars.

By having these inner and outer portions of the legs spaced apart as described there is formed a shoulder 78 on the leg 62 and a similar shoulder 80 on the leg 64 which abut against the top surface of the clamping bars when the yoke is applied thereto.

Moreover, in the leg 62 there is provided a diagonal depression 82 extending as shown by the dotted position in Figure 2 in a direction away from the clamping bar 10 from left to right of that view. Similarly there is a diagonal depression 84 in the leg 64 which in the dotted position extends away from the clamping bar 12 in a direction from right to left of that figure.

It will become apparent that the bottoms of these depressions are relatively parallel to each other and are so formed that the perpendicular distance between them is substantially equal to the combined width of two clamping bars. The depressions in the legs of course have a length 86 slightly greater than the thickness of a clamping bar so that the bar may be received readily into the depression and the upper edges are coincident with the shoulders 78 and 80 which thereby are utilized as guides for sliding the recesses over the bars.

The depressions, moreover, are located inward from the lower ends of the legs a slight distance so that lips 79 and 81 respectively on the legs 62 and 64 are provided near the ends which are designed to engage the underside of the clamping bars as shown in Figure 3.

When it is desired to apply a yoke to either end of the clamping bars the anvil need by withdrawn an amount only sufficient to allow the tip or point of it to pass, or almost pass, over the end of a length of tubing 88 secured by the clamping bars. The yoke is then placed immediately above the bars on the top side as viewed in Figures 1, 2 or 3. The bar is then located so that the point of the anvil fits into the end of the tube and this position is made possible by reason of the fact that the distance between the faces 74 and 76 is slightly greater than the combined width of the clamping bars.

The yoke is moved toward the bars until the shoulders 78 and 80, previously described, abut the top surfaces of the bars, at which point, in the embodiment shown, the yoke is rotated in a right hand direction so that the depressions 82 and 84 surround the corresponding edges of the bars, without however dislodging the anvil from its axial alignment with the tube to be flared.

In this position the yoke becomes clamped to the bars since the lips near the ends engage the undersides of the bars while the side edges of the bars are pressed against the bottoms of the recesses, thereby holding the yoke against the bars while the anvil is screwed into the end of the tubing to spread it into the form of a flare or swedge.

After the swedge is completed it is necessary only to loosen the flaring screw and then rotate the yoke in a reverse direction until the faces 74 and 76 are parallel with the sides of the clamping bars. The yoke is removed by withdrawing it directly upward from the bars on the same side from which it was applied.

The yoke thus described is extremely well adapted to swedging tools which are in fact a particular form of tube spreading or flaring tool, the outstanding difference being that in a swedging tool the end of the tubing is flared over a

greater length and is at the same time flared into the form of a cylindrical enlargement having an inside diameter sufficiently great to admit the end of a tube of the same size wherein it is ordinarily sweated or soldered in place.

Since tubes when swedged must have an enlargement made of substantial length it is necessary to withdraw the spreading anvil a correspondingly great distance to provide for it. In order, therefore, to withdraw the anvil a correct distance it is well to have a yoke of sufficient length to permit such movement and it is only with a yoke which can be applied from the free or open side of a pair of clamping bars such as disclosed by the applicant that the use of a long yoke becomes convenient and practical.

In the swedging element herein provided, as shown especially in Figures 5 and 6, a screw 90 is used in place of the screw 54 of the regular flaring tool device but is mounted in the yoke 50 in the same manner. The free end of the screw 90 is provided with a series of stepped cylindrical portions 92, 94, 95 and 98, each larger than the next preceding cylindrical portion so that a smaller cylindrical portion having a diameter approximately equal to the inside diameter of a tube of a given size may act as a pilot entering the tube while the next larger portion having a diameter approximately equal to the outside diameter of the tube forms a spreading member which enlarges the end of the tube to such a diameter that it will receive the end of an unflared piece of similarly sized tubing.

To make the swedging tool adapted to a variety of sizes so as to accommodate all of the different sizes of tubes which can be clamped between the bars shown in Figure 2, the screw 90 in addition to the various cylindrical portions integral with it is adapted to be provided with die-like caps 100 having a screw-threaded upper end 102 with the same thread size as the screw 90.

The cap is likewise provided with a lowermost cylindrical portion 106 which as shown in Figure 5 acts as a pilot for the tubing 108 there shown in a flared condition, and a succeeding cylindrical portion 110 of slightly larger diameter for spreading the tubing 108 to a proper dimension. In the center of the bottom of the portion 106 there is a recess 104 designed to receive the end of portion 92 and assist the threaded upper end in centering the cap on the screw.

To further facilitate the spreading operation there are provided between each pilot portion and spreading portion a series of peripheral notches 112 which may be in any convenient number and which when spaced about the somewhat curved shoulder between cylindrical pilot and spreading portions form intermediate each pair of notches a series of solid sections 114.

In operation, when the element 100 is forced into the end of a piece of ductile tubing the cylindrical pilot portion 106 will first enter within the inside diameter of the tube after which the rounded shoulder will start spreading the tubing. As the element progresses into the end of the tubing the end reforms around the cylindrical portion 110. Similarly a portion 116 may form the guide for a hexagonal swedging portion 118 since the particular cross-sectional shape of the swedging element is not material.

In order to prevent reforming of the tubing too tightly against the element the alternate notches 112 and solid sections 114 are effective in supplying a kneading action upon the walls of the tubing as the element progresses inward, flex-

ing the walls a slight amount so that the tubing is worked while the swedging action is taking place. The tubing thus worked loosely hugs the larger cylindrical portion next behind the pilot and the flared portion may be easily removed.

It will be further noted that the notched portion of the tool is made in the form of a flare as at 107 for example, in Figure 6, cooperating with corresponding flared ends 109, 109' in the tube clamping recesses 20 and 22 respectively, for example, thereby making a decided flare at the point where the tube is spread.

Moreover, by providing the die-like caps with right hand threads of the same dimension as the threads of the screw 90 these threads are permitted to perform a double function, one holding the cap in place and the other of advancing the die through the yoke.

Furthermore, all of the threads being right handed and the depressions 82 and 84 in the yoke 50 being likewise cut on such a bias that clamping is accomplished by rotating the yoke in a right hand direction the flaring operation may become simultaneously one of securely clamping the yoke to the bars, thus minimizing the chance of dislodgment.

A modified form of tool designed for outside swedging or reducing the size of a tube at the end is shown in Figure 7. An element 120 is designed to be attached to a screw 90' and is provided with a large aperture corresponding in diameter to the outside diameter of a tube to be swedged, and a smaller aperture 124 corresponding in diameter to the inside diameter of a tube. Separating the two apertures is a flared shoulder 126 provided with notches 128 for working the tubing end to the smaller size. The element is manipulated to swedge tubing by use of the notches in much the same manner as the elements designed for swedging from the inside out. This type of swedging is especially adaptable when it is desired to have no enlargements where one piece of swedged tubing is joined to another.

There has therefore been provided a flaring and swedging tool of simple construction wherein all of the parts cooperate one with another in such a manner that a very small number of individual parts are needed in order to assure the positive working of the tool and in preserving the operable parts in accurate alignment.

The tool is furthermore so constructed that it can be made in proper dimensions to accommodate different kinds of tube spreading operations which can be performed with a maximum of convenience under conditions which render the operation of such a tool ordinarily extremely difficult and in some cases prohibitive. In addition a novel type of swedging element or die has been disclosed which is suitable for use on any of a variety of tools designed for holding tubing and the operating tool while the swedging action is taking place.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure, or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a swedging tool, a swedging element having a stem adapted to be advanced rotatably through a swedging operation into the end of a tube, said element including a pilot portion of diameter substantially equal to the inside diam-

eter of the tubing and a portion adjacent thereto having an outside diameter larger than the pilot portion substantially equal to the outside diameter of the tubing, an annular fillet separating said last portion from the pilot portion, and a sequence of circumferentially spaced depressions in the fillet spaced from the large end of the fillet for kneading the tubing at the plane wherein the diameter is spread from smaller to larger dimension as the swedging element is extended rotatably into the tubing.

2. In a swedging tool, a swedging element having a stem non-rotatably attached thereto adapted to be advanced rotatably through a swedging operation into the end of a tube, said element including a smooth cylindrical pilot portion of diameter substantially equal to the inside diameter of a selected size of tubing and an enlarged smooth cylindrical forming portion for the inside of the expanded portion of the tube substantially equal to the outside diameter of the tubing, an annular fillet separating said enlarged cylindrical portion from said pilot portion and a plurality of notches peripherally disposed in the fillet and spaced from the free end of the pilot portion providing alternate ridges therebetween for progressively kneading the wall of the tubing during the spreading operation and for spreading the enlarged portion to a size slightly greater than the enlarged swedging element to facilitate removal of the swedged tubing therefrom.

3. In a swedging tool for tubing of a plurality of sizes the combination of a yoke and a stem having a threaded portion mounted in the yoke adapted to advance said stem progressively into swedging position when rotated, said stem including a swedge at the end integral therewith, and having a cylindrical end portion smaller in diameter than the inside diameter of said threads and a die-like cap having an internally threaded portion of the same dimension as the threads on said stem securable thereto by means of said threaded portion, said cap having on the outside surface a pilot portion substantially equal to the inside diameter of one size tubing and a cylindrical spreading portion substantially equal to the outside diameter of said tubing with the wall thereof parallel to the wall of the end portion of said swedge, said cap having on the inside a depression in the end wall surrounding the stem and the bottom thereof adjacent the pilot portion, said depression having a wall in contact with the end portion of said swedge for strengthening the mounting of said cap thereon.

4. A swedging tool for tubing of a plurality of sizes comprising the combination of a stem and a die-like cap, said stem including a swedge at the end integral therewith having a pilot portion substantially equal in diameter to the inside of one size of tubing and a cylindrical spreading portion substantially equal in diameter to the outside of said one size of tubing, said die-like cap having an internally threaded recess of the same dimension as the threads on said stem securable thereto by means of said threaded portion, said cap having on the outside surface a pilot portion substantially equal to the inside diameter of another size tubing and a cylindrical spreading portion substantially equal to the outside diameter of said other size tubing, said cap having on the inside a depression with the bottom thereof in a position adjacent said pilot portion and said spreading portion, a part of said bottom being fitted around the end of said swedge in contact therewith for strengthening the mounting of said cap thereon.

5. A swedging tool for changing the diameter at the end of a length of tubing comprising a swedge adapted to be rotated relative to the tube including a cylindrical guide portion of one diameter for engaging a wall of the tubing, a second cylindrical portion of another diameter adapted to engage the wall of the tubing after the change in diameter has taken place and an inclined annular fillet separating said portions having notches formed integrally therein and confined substantially to the fillet, said notches having a position such that they are adapted to contact with the portion of said tube where the change in diameter is taking place, said notches being adapted to knead the tubing wall during the swedging operation to effect said change in diameter.

6. In a swedging tool for reducing the diameter of the end of a length of tubing, a swedge having a cup-like stem adapted to be advanced rotatably

through a swedging operation against the end of a clamped tube, said swedge having a large outer cylindrical hole extending inwardly from the free end and having a diameter not less than the diameter of the outside of the tubing to serve as a guide and having an inner smaller cylindrical hole in axial alignment with the outer hole and substantially equal in diameter to the inside diameter of the tubing, an inclined annular fillet joining together adjacent circular ends of the walls of said holes and for reducing the diameter at the end of said length of tubing, said annular fillet having a series of notches spaced from the walls of said holes and about the circumference of the fillet for engagement with the tube during a swedging operation and adapted to knead the wall of the tubing to facilitate the reduction in size while the swedge is advanced through the swedging operation.

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