March 24, 1942. F. NEUKIRCH 2,277,410

FLARING TOOL

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Fig. 1

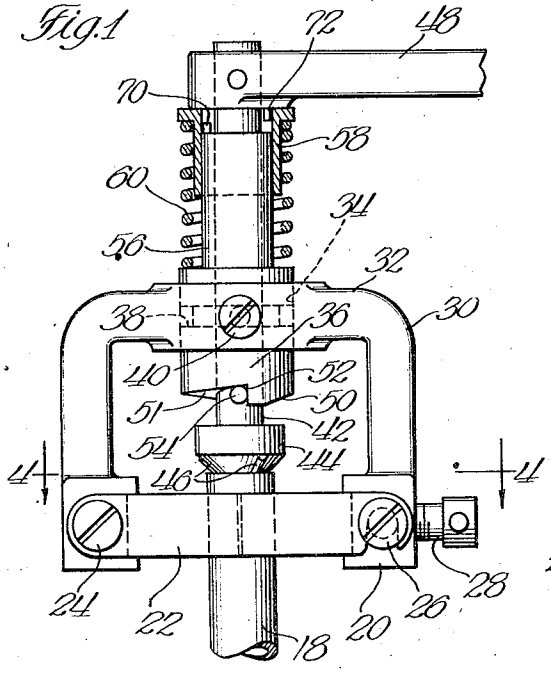


Fig. 2

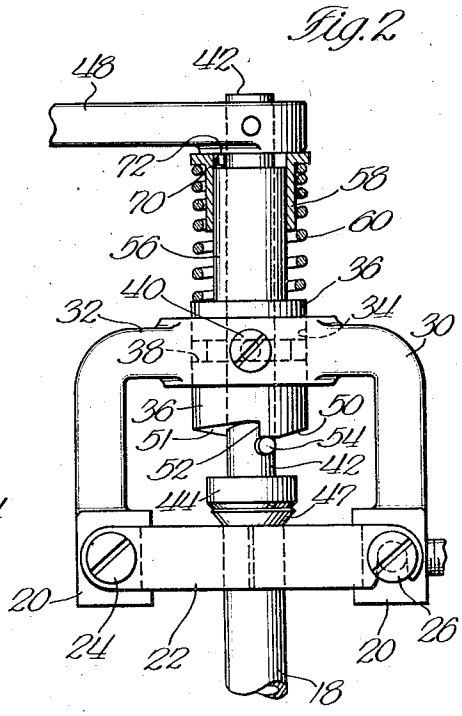


Fig. 3

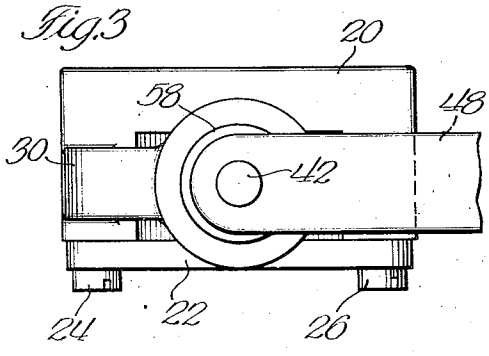
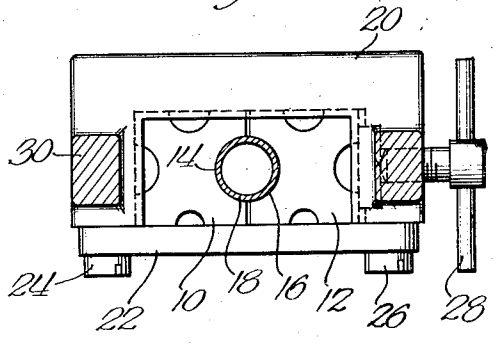


Fig. 4



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Fig. 5

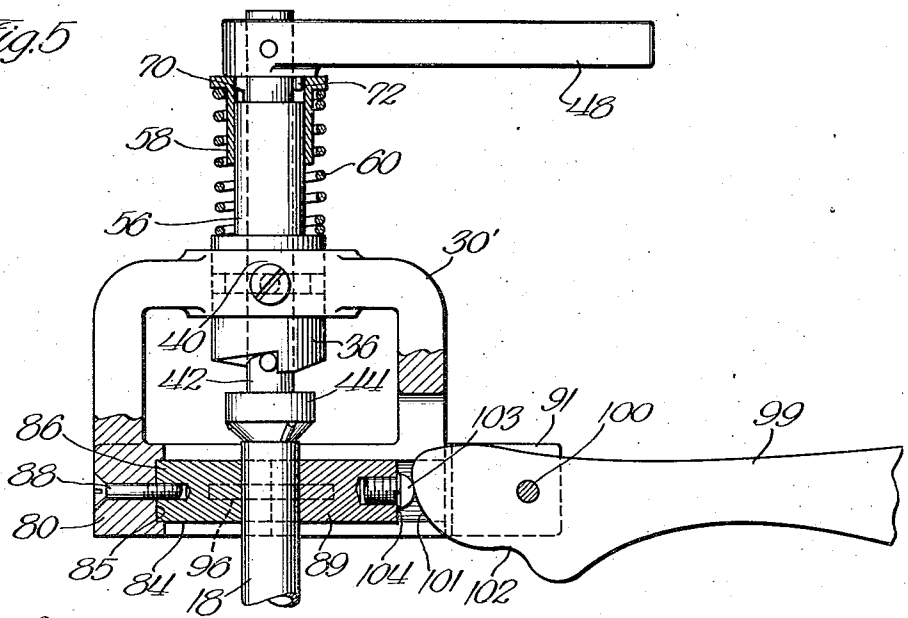


Fig. 6

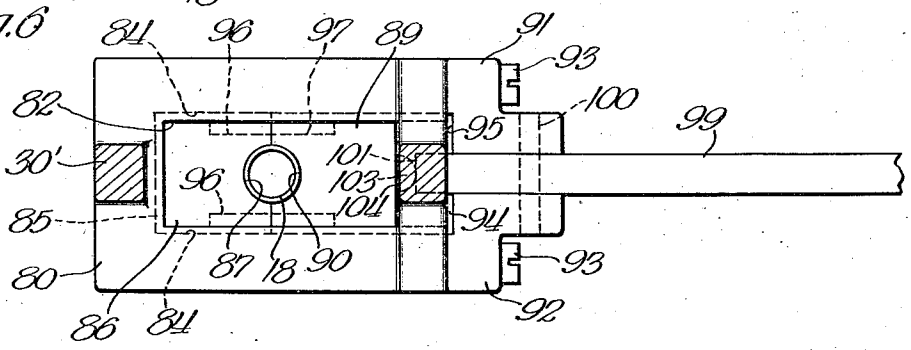
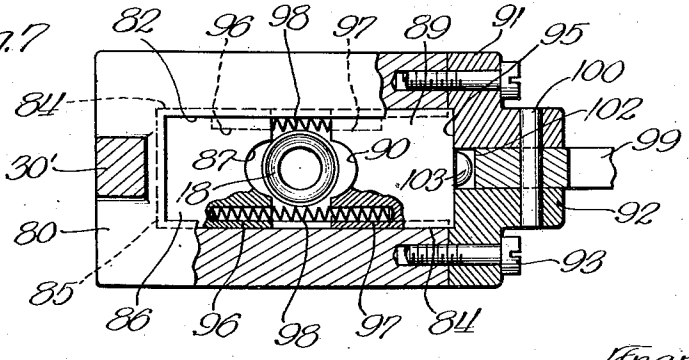


Fig. 7



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2,277,410

FLARING TOOL

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Application January 8, 1940, Serial No. 312,981

5 Claims. (Cl. 153—81)

My invention relates to flaring tools for copper, aluminum and similar ductile tubing and has for its object the provision of a new and improved quick-acting manually operated flaring tool for spreading a flare on the end of tubing by rotation of the tool through only a short angular distance.

Another object of my invention is to provide a convenient portable flaring tool of new and improved design capable of producing a flare on the end of tubing by rotation of a flaring anvil through a fraction of one complete turn and thereafter to continue rotation of the flaring anvil within the flare in order to smooth and polish the inside face of the flare without flaring it to any greater extent.

Another object still is to provide a hand operated flaring tool having a flaring anvil and shaft therefor which is designed to exert a thrust throughout a fixed distance so that a succession of flares of exactly the same size can be made upon several pieces of tubing, it being further among the objects of my invention to so construct the tool that after the flares are made the inside surfaces of them can be polished, whereupon the tool can be returned to an initial position by a short reverse rotation.

A further object is to provide a bench type flaring tool which is so constructed that the clamping blocks which hold the tubing to be flared are always positioned so that the tube holding recess is always in precise alignment with the flaring member so that the flare will be spread equally in all directions from the center outwards in the same way on successive pieces of tubing regardless of how great the number.

Still a further object is to provide a new and improved flaring tool which is designed for very quickly positioning the clamping block in accurate tube clamping position and which is also designed for quickly and rapidly disengaging the clamping blocks so that the flared end of tubing can be quickly released and withdrawn from the tube.

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 drawings, in which:

Figure 1 is an elevational view of the flaring tool partly in section, shown at the start of a flaring operation.

Figure 2 is an elevational view of the flaring tool partly in section, shown at the completion of a flaring operation.

Figure 3 is a top plan view.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 is an elevational view partly in section of a modified form of my device.

Figure 6 is a top view of my device with the bracket removed.

Figure 7 is a top view of the device partially in section showing the mounting of clamping blocks and lever.

In designing tools for flaring copper, aluminum and similar ductile tubing it is desirable to work the metal comprising the tube as little as possible in spreading a flare so that the metal will not become crystallized during the flaring process and thus weaken the joint eventually to be formed.

It is further desirable especially when a great many flares are to be produced to so design a tool that the flare can be made with as few rotations of the flaring anvil as possible, and also with the minimum amount of time expenditure on the setting up of the tool so that it is ready for a flaring operation and the separation of the tool after the flaring is complete.

In flaring tools heretofore available, screw threads and usually single pitch screw threads have been resorted to, usually to secure sufficient mechanical advantage and by use of flaring tools having a screw threaded shaft for the flaring anvil it is always necessary to rotate the shaft a number of times before the flaring anvil has projected itself far enough into the tube to produce a flare.

Conversely, in order to reset the tool a considerable number of rotations are necessary to unscrew the shaft to bring it back to the proper position for the next flare causing unnecessary loss of time.

It is further highly desirable to supply a tool which will produce a flare in having an inside surface as smooth and polished as possible so that there will be no projections tending to produce leaks when the tube is made up into a joint. When the tube is flared quickly by use of the tool herein described the polishing operation can be quickly performed with a minimum of time and effort and with the same flaring anvil, after the flare has been completed.

In order to accomplish these objects, I have shown a flaring tool comprising a pair of clamping blocks 10 and 12 having complementary re-

cesses 14 and 16, for example, in the edges for clamping a tube 18 to be flared. These clamping blocks are designed to fit within a vice 20 in any one of several positions. The vice is provided with a latch 22 pivoted at the point 24 on one side and designed to hook over a pin 26 at the opposite side. A tightening screw 28 is provided for pressing one block against the other in order to securely clamp the tube.

A yoke 30 is shown in the disclosed embodiment of my invention secured to the vice 20 though it may be otherwise mounted upon the clamping blocks. The yoke as shown has a somewhat U-shape with a bracket 32 overlying the recesses 14 and 16, shown in Figure 3. In the center of the bracket is an aperture 34 in axial alignment with the tubing 18 when clamped within the recesses as shown, and within the aperture is a sleeve 36. The sleeve is secured in the aperture in a freely rotating position by means of an annular channel 38 cut in its circumference and a friction screw 40 in the bracket which can be tightened or loosened as desired.

Centrally disposed within the sleeve is a shaft 42 which has at its lower end a movable flaring anvil or die 44 here shown equipped with rollers 46 for rolling out and polishing a flare 47 on the tubing. At its upper end the roller is provided with a handle 48 by means of which the shaft can be rotated within the sleeve 36. The sleeve has at its lower edge similar cam surfaces 50 and 51 providing shoulders 52, one being shown in Figures 1 and 2 and the other being hidden from view at the rear side.

A pin 54 is positioned crosswise of the shaft 42 and extends outwardly on opposite sides so as to slide along the cam surfaces 50 and 51.

At the upper side of the sleeve there is an extension 56 and around this extension is a collar 58 positioned so that it can rotate relative to the extension and slide axially relative thereto. A coiled spring 60 is provided pressing against the sleeve at the bottom side and against the collar at the top side so that the spring always tends to urge the shaft 42 upwardly causing the pin 54 to be always in contact with the cam surfaces. At the upper end of the extension there is provided a lug 70 serving as an interceptor and on the rotating handle is a similar lug 72 designed to engage the first lug at a certain stage of operation, thereby halting any further extension of the shaft in an axial direction.

In operation a tube 18 is clamped within the clamping blocks in the position shown in Figure 1 so that the upper end of the tube lies against the flaring anvil. The handle 48 is then rotated and during rotation the pin 54 slides along the cam surfaces 50 and 51 causing the anvil to be projected endwise, or downwardly in the position shown, against the end of the tubing. This downward motion of the anvil flares the end of the tubing as shown in Figure 2.

It will be noted that the lugs 70 and 72 are here shown spaced approximately 180 degrees apart with the cam designed in accordance with the relative position of these lugs and that as the handle 48 is rotated the lug 72 is moved axially downward toward the extension 56 by reason of a shifting of the position of the shaft caused by the cam surfaces. The rotation necessary, however, to produce a full flare can be changed by making appropriate changes in the cam construction. In the position shown in Figure 2 the lugs are lowered to a point where they engage each other after a rotation of substantially 180 degrees, rotation of the pin 54 relative to the sleeve is thereby halted, preventing it from slipping over the end of the cam surface. At this point the flare is complete.

Then the handle 48 can be turned further and during this additional rotation the sleeve 36 will rotate together with the anvil so that the entire flaring mechanism continues to rotate in a fixed plane. The later described portion of the operation is designed to smooth and polish the inside surface of the flare by means of the rollers 46 but not to enlarge the flare at all. As much polishing as is necessary can be accomplished by continuing the rotation of the handle with relatively little effort.

After the polished flare has been thus completed the tool can be reset by reversing the rotation of the handle 48 through an angle of about 180 degrees and during this reverse rotation the spring 60 maintains the pin in contact with the cam surfaces until it is back at its initial position bearing against the shoulders 52 and 53. The tool can then be disassembled and the flared tubing removed preparatory to a second operation on additional tubing.

A modified form of the device is shown in Figures 5, 6 and 7 illustrating a rapid means of very accurately clamping a piece of tubing in alignment with the flaring member.

In this modified form there is shown a bracket 30′ on the yoke which is provided with the flaring member previously described consisting of the flaring anvil 44, the sleeve 36, the shaft 42, the handle 48 and the other parts, a detailed description of which has already been included.

The lower portion 80 of the yoke in the modified form has a somewhat rectangular outline and is provided with a rectangular aperture 82. On the long parallel sides of the aperture are recesses 84 and a recess 85 is formed in one of the short sides of the aperture. Clamping blocks are used in the modification in a manner similar to that outlined in the first described form of the invention.

One block 86 has a substantially semi-circular recess 87 for receiving one-half of a tube to be clamped and is positioned within the rectangular aperture of the lower portion of the yoke at the extreme left side, as viewed in the drawings. The block is stationarily secured in position by means of a screw 88. The block and the recesses in the aperture are carefully dimensioned so that the center of the semi-circular recess is in axial alignment with the center of the flaring member when the tool is assembled.

The other clamping block 89 is adapted to slide within the opposite recesses 84 on opposite parallel sides of the aperture 82 so that it can be moved into and out of engagement with a tube to be clamped. This clamping block likewise is provided with a substantially semi-circular recess 90 complementary to the recess 87 of the other block.

At the left side of the lower portion of the yoke, as shown in the drawings, there is provided a pair of extension members 91 and 92 bolted to the yoke by means of the bolts 93. The extension is provided with a recess 94 wide enough so that the clamping block 89 can be received into the end having a bottom 95 against which the block may abut when it slides outwardly.

In the clamping blocks are oppositely disposed hollows 96 and 97 respectively and in each pair of hollows is positioned a coiled spring 98.

The springs are balanced on each side of the tube holding recesses and tend normally to separate the blocks. Since the block **86** is stationary, the block **89** is moved outward or toward the right, as viewed in the figures, to a distance limited usually by the bottom **95** of the recess **94**.

A lever **99** is pivotally mounted on the extension by means of a pivot **100** so that it can swing freely to and fro. The lever has a curved cam face **101** at the end. Also at the end of the lever is a depression **102** forming a part of the cam face. On the clamping block **89** there is provided a hardened plug **103** which is threaded into the block at the face opposite the cam and a washer **104** is used with the plug in order that the top of it may be extended the proper distance beyond the surface of the block.

In order to change the projected distance of the top of the plug washers of different thickness can be used and the plug tightened down against them so that it will always be firmly secured in place. By being able to adjust the plug it will be always possible to compensate for wear on the cam in order that just the right leverage may be available to force the clamping blocks into tube clamping relation.

In using the modified form of my device an end of tubing is inserted as shown in Figure 5 with the free end projecting into contact with the flaring anvil **44**. When the tube is being inserted the cam **101** is released as shown in Figure 7 so that the clamping block **89** is forced away from the block **86**. When the tube is in place the lever **99** is lifted to the position shown in Figure 5 and this movement forces the cam surface **101** against the plug **103** which in turn forces the clamping block **89** snugly against the opposite plug **86**. By squeezing the blocks together the tube is securely held in place and when the lever **99** is moved with the left hand of the operator he can quickly and easily manipulate the lever **48** with his right hand in order to rapidly flare a tube and polish the flare in substantially a minimum amount of time.

As soon as the flare is completed a quick reversal of the parts is made. As previously described, a reversal of the handle **48** some 180 degrees will return the flaring member to its initial position. As indicated on Figures 5, 6 and 7, a movement of the lever **99** some 90 degrees in a clockwise direction will release the cam surface from engagement with the plug an amount sufficient to permit the springs **98** to push the clamping block **89** outward a distance sufficiently to release the tube. The distance which the block moves outward accordingly leaves an aperture between the blocks so great that the flared end of the tubing may pass freely between them. When the lever **99** is released the plug **103** can be received into the depression **102** of the cam surface. At this point the tool is ready for another quick and accurate flaring operation.

Should it be desired to flare tubes of different diameters the clamping block **86** can be removed and replaced with another block having a tube receiving recess of the desired size and likewise a correspondingly recessed movable block **89** can be provided.

There has thus been provided a compact portable flaring tool capable of quick, easy and accurate operation upon a succession of tubes of various sizes.

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. A forming tool for tubing comprising a tube holder having a recess therein for tubing, a yoke engaging said holder in a position overlying the tube recess and having an aperture therein in axial alignment with the tube, and a device in said aperture operable to flare the tube, said device comprising a first element having a rotatable mounting on said yoke and secured against endwise movement relative thereto, a second element having an axis of rotation in alignment with the tube recess and rotatably secured to and shiftable endwise relative to the first element, said second element having a tube forming die at the end adjacent the tube recess and a handle at the other end, a cam face on one end of the first element, a corresponding cam member on said second element adapted to slide on said cam face when said second element is rotated, an engaging member on one of said elements and a second engaging member on the other element positioned normally at an angular distance of less than 360 degrees from the first engaging member, said second element and the die having a combined rotational and axial movement during passage of said cam member over said cam face and a rotational movement only when engagement of said engaging members takes place for polishing the formed portion of said tube.

2. A flaring tool for tubing comprising a pair of complementarily recessed blocks for holding the tubing, a yoke having a bracket portion engaging said blocks so that the bracket portion thereof overlies the recess, said portion having an aperture in axial alignment with the tube, and a device operable to flare the tube, said device comprising a sleeve anchored rotatably in the aperture of the bracket portion, a shaft extending through the sleeve including an attachment on one end for the application of power and a tube forming die at the end adjacent the tube holding recess, a cam face on one end of the sleeve and a projection extending from the shaft adapted to slide on said cam face when the stem is rotated, a sliding collar and means on said shaft engaging one end of said collar, a spring between the collar and the sleeve for urging said shaft endwise to maintain contact of the projection with the cam face, an engaging member on the sleeve and a second engaging member on the shaft positioned normally at a predetermined angular distance from the first engaging member, said shaft being adapted to rotate and project the die endwise for flaring the tube until engagement of said engaging members takes place and thereafter to rotate the die in a fixed plane for polishing said flare.

3. A flaring tool for tubing comprising a pair of complementarily recessed blocks for holding the tubing, a yoke having a bracket portion engaging said blocks so that the bracket portion thereof overlies the recess, said portion having an aperture in axial alignment with the tube and a device operable to flare the tube, said device comprising a sleeve in the aperture of the bracket portion, coacting anchoring elements in said aperture and on said sleeve respectively to rotatably retain said sleeve in said aperture, a shaft extending through the sleeve having a tube forming die at the end adjacent the recess and a handle at the other end, a pair of cam members

on one end of the sleeve at opposite sides thereof and a pin extending from opposite sides of the shaft adapted to slide on said cam faces when the stem is rotated, a collar on the shaft loosely surrounding the sleeve and engaging the shaft, a spring for urging said collar together with said shaft endwise away from the tube, an engaging member on the sleeve and a second engaging member on the handle positioned normally at an angular distance of substantially less than 360 degrees from the first engaging member, said handle being adapted to be rotated and project the die endwise for flaring the tube until engagement of said engaging members takes place and thereafter to rotate the die in a fixed plane together with the sleeve for polishing said flare.

4. A flaring tool for tubing comprising a tube holder, a yoke member surmounting said holder and a device including a compound member attached to the yoke member in axial alignment with a tube held in the tube holder, said member having rotatably and axially movable portions including a tube forming die at one end and an operating member at the other end and a portion rotatably positioned in the yoke member including a thrust mechanism engaging the yoke member anchoring said last portion against endwise movement, coacting cam elements respectively on said portions of the compound member adapted to shift the die endwise relative to the yoke member into flaring engagement with said tube and coacting limiting elements on said portions of the member making contact between said portions and having an engagement after a partial revolution of said member at a position limiting the amount of said endwise shifting thereby to limit the size of the flare.

5. A flaring tool for tubing comprising a tube holder, a yoke surmounting said holder and a device attached to the yoke in axial alignment with a tube in said holder including operating elements operable to flare the tube, one of said operating elements being mounted for rotational movement in said yoke and including means for retarding said rotational movement, a second of said operating elements having an axis of rotation in alignment with the center of the tube and having a rotational engagement with said first operating element and being shiftable axially relative thereto, said second element having a tube forming die at the end adjacent the tube holder, coacting cam members respectively on said operating elements operable upon rotation of one element with respect to the other to move the die axially through a flaring operation, coacting engaging members making contact between said respective elements engageable at a predetermined position of rotation, said second element and the die thereon having a rotatable and axial movement until engagement of said engaging members takes place and thereafter having a rotatable movement only for successively flaring a tube and finishing said flare.

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