May 30, 1944. R. D. McINTOSH 2,350,054

TUBE FLARING TOOL

Filed Aug. 11, 1941

Fig. 1.

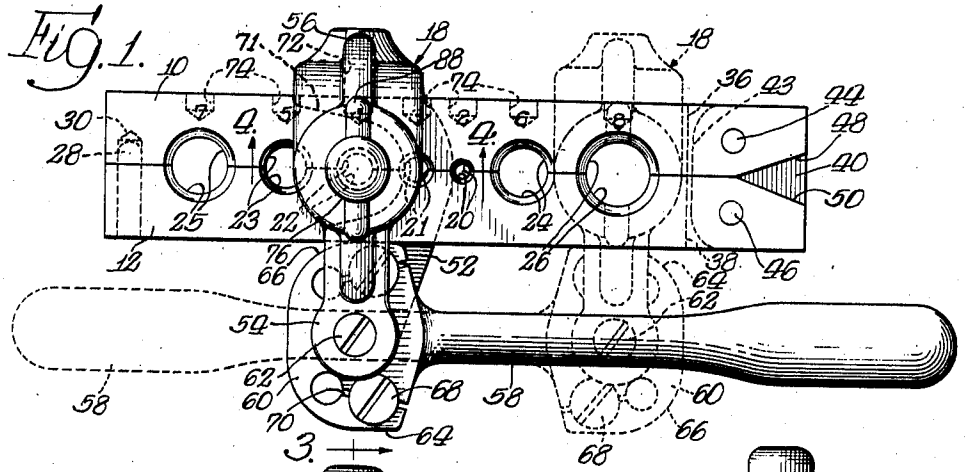


Fig. 2.

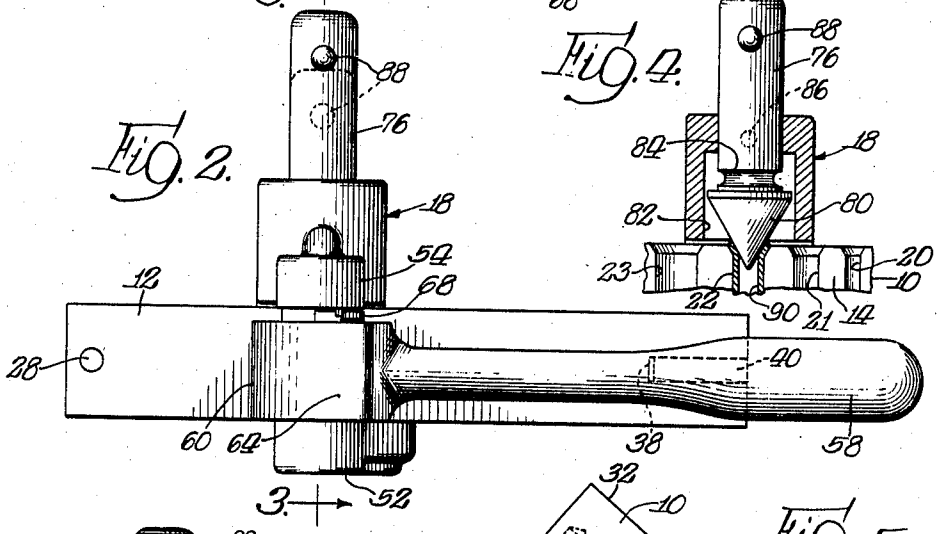


Fig. 4.

Fig. 3.

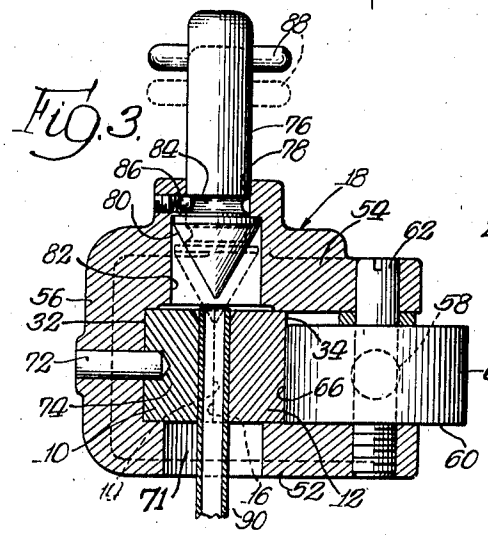
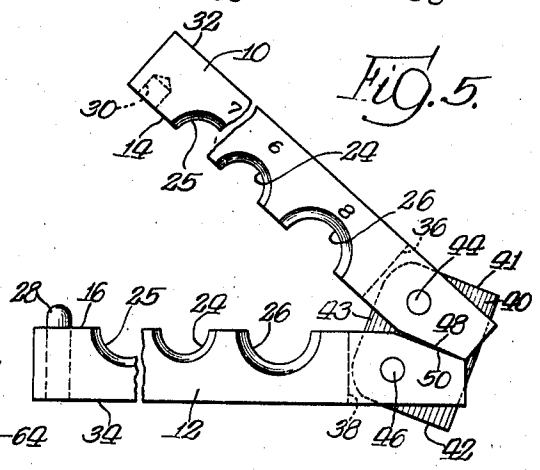


Fig. 5.



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TUBE FLARING TOOL

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Application August 11, 1941, Serial No. 406,429

3 Claims. (Cl. 153—81)

My invention relates to flaring tools and particularly small hand-operated tools which can be carried about in a tool kit and which are useful in making flares on tubing such as, copper, aluminum and other thin-walled tubing of a variety of kinds.

Among the objects of my invention is to provide a new and improved flaring tool which is quick and easy to operate in that the number of operations necessary to clamp a tube in the flaring tool and remove it therefrom have been substantially reduced.

Another object of my invention is to provide a new and improved flaring tool wherein the yoke is so constructed that it carries a part of the clamping mechanism which, during a clamping adjustment, is used together with the clamping bars in a lever-like arrangement in order to produce the necessary force to tightly clamp a tube in place.

It is further contemplated among the objects of my invention to provide a yoke with a lever means on it so constructed that it can be used for a pliers-like grip with either end of the clamping bars, one handle of the pliers being the lever and the other handle of the pliers being one end, or the other, of the clamping bars, depending on which end of the clamping bars is being used to hold the tubing.

Still another object of my invention is to provide a new and improved flaring tool which is small and compact in construction featuring clamping bars provided with means for guiding them into proper contact, said means being kept small in size and located inwardly from the outer faces of the clamping bars so that a yoke cooperable with the bars can be kept small and the aperture in it for receiving the bars kept correspondingly small in order to reduce the size of the tool.

Likewise among the objects of my invention is to provide a flaring tool in which the clamping bars are provided with contacting faces operable when the bars are open or separated from one another which serves to prevent spreading the bars too far apart so that they may be conveniently brought back together again when a new tube is to be inserted and flared.

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 top view of my flaring tool showing the parts in tube-clamping position;

Figure 2 is a side elevational view of the flaring tool with the parts in the position shown in Figure 1;

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 1 showing a tube in the tool after the flaring operation has been completed; and

Figure 5 is a top view of the clamping bars alone in maximum open position.

Although many kinds of flaring tools have been devised in the past for the purpose of flaring thin-walled tubing, they have for the most part been so constructed that a large number of operations, though simple in character, have been needed in order to insert a tube in the tool, flare it and then extract it. Although satisfactory flares can be made with tools now on the market, the time consumed in making each flare causes considerable time to be lost unnecessarily when they are used. Moreover, most of the flaring tools heretofore constructed have relied upon screw-threaded devices for tightening the bars in place and likewise for advancing the flaring punch into position. Since, in most cases, the threads need to have a rather small pitch to produce the necessary power, much time is needed in assembling and disassembling the tool after the flaring operation has been completed. Furthermore, tools in the past have been so constructed that the clamping bars and yoke used with them are complete and separate units and have not taken advantage of the fact that the bars themselves might be used cooperably with the yoke in order to provide a lever action quick in its operation for assembling the parts of the tool in operating relationship.

In the embodiment selected to show my invention, there is shown a pair of clamping bars comprising oppositely disposed bars 10 and 12 having contacting faces 14 and 16, respectively. A yoke 18 is designed to be slid over the bars and cooperate with them in making a flare.

In the opposite contacting faces of the clamping bars are provided a series of semi-cylindrical recesses 20, 21, 22, 23, 24, 25 and 26. These are of various sizes to accommodate tubing of different sizes.

A separable connecting device is provided at adjacent ends of the clamping bars at one end of the pair of bars comprising, as here shown, a pin 28 in the bar 12 adapted to be received into

a recess 30 on the inside face of the bar 10. It will be noted that an outside face 32 of the bar 10 and a corresponding outside face 34 of the bar 12 is flush and clear of any portion of the connecting device.

At the other end of the pair of clamping bars is provided a pivoted connection. To form the pivoted connection, the bar 10 is provided with a recess 36 and the bar 12 with a corresponding recess 38. A flat plate 40 is inserted in both recesses and has outer edges 41 and 42 which are substantially flush with the outside surfaces 32 and 34, respectively, of the clamping bars when the bars are in closed position, as shown in Figure 1. There is a slight clearance between an edge 43 of the plate and the adjacent bottoms of the slots 36 and 38. The plate is secured to the bar 10 by means of a pivot pin 44 and to the bar 12 by means of a pivot pin 46.

A cut-away portion 48 is shown on the bar 10 and a similar cut-away portion 50 may be made on the bar 12. It will be noted that the cut-away portions form a substantially V-shaped opening when the bars are in closed position with the base of the V, or in any event the narrowest part of the opening, adjacent the pivot pins 44 and 46. The wider portion of the opening is adjacent the ends of the bars.

On the yoke 18 there is provided a lower leg 52 adjacent the bottom of the clamping bars and an upper leg 54 adjacent the topside of the clamping bars. The legs are joined by an integral connecting portion 56. The inside faces of the legs 52 and 54, respectively, are spaced a distance apart not less than the thickness of the flaring bars so that the yoke may be slid easily over the bars.

Connected to the legs on the side opposite the connecting portion 56 is a lever 58. The lever is provided with a head 60 pivotally secured to the legs 52 and 54 by means of a pivot pin 62. It will be noted that the head of the lever has a pair of cam faces 64 and 66 on opposite sides thereof. Each cam face is provided with a means for adjusting its position comprising a tapered screw 68 mounted centerably within a slot 70 and adapted to spread or to allow the slot to contract in order to vary the relative positions of the clamping faces 64 and 66 so that they may be spread apart from one another or permitted to contract to positions closer together and closer to the pivot pin 62.

The lower leg 52 is provided with a cut-out portion 71 to permit the leg to surround tubing of the largest diameter for which the tool is designed. In the connecting portion 56 is a pin 72 located centerably, which is adapted to engage corresponding recesses 74 in the outer face 32 of the bar 10 in order to generally locate the yoke over a corresponding tube-holding recess.

A flaring punch 76 is carried by the yoke and in the embodiment shown is mounted in an aperture 78 in the upper leg 54. At the lower end of the flaring punch is a flaring cone 80 which is received in an enlarged portion 82 of the aperture. There is an annular recess 84 around the lower end of the punch and a spring-pressed ball 86 in the upper leg which is designed to engage in the recess. A cross bar 88 secured in the upper end of the punch prevents it from sliding clear through the aperture 78.

In operation, a length of tubing 90 of a selected size is cut off square at the end and placed in the tube-clamping recesses of a corresponding size, as shown in Figures 1 and 3. The end of the tube is approximately flush with the topside of the clamping bars. With the tube in place, clamping bars are brought together so that the pin 28 enters the recess 30 and aligns the topsides respectively of the bars 10 and 12 with each other. The opposite ends of the bars are held together by the plate 40 and pivot pins 44 and 46. It will be noted that when the bars are brought together upon a length of tubing, the outside faces are substantially flush and there are no protrusions of any kind outside the outer surfaces of the bars.

After the tube has been placed between the bars and held lightly in place by hand, the yoke is slid over the bars from either end as the case may be and located over the recess holding the tube 90. The yoke will be located substantially in proper position by means of engagement of the pin 72 with the corresponding recess 74. When the yoke is slid over the bars, the lever 58 will be moved so that it extends laterally, thereby leaving a maximum amount of space within the yoke to allow a free sliding movement.

Should the recess containing the tube 90 be on the lefthand side of the center line of the flaring tool, as shown in Figure 1, for example, the lever 58 is moved in a counterclockwise direction, or toward the right, as viewed in Figure 1.

Movement of the lever in this direction will bring the cam face 66 in contact with the outside face 34 of the clamping bar 12. As the lever approaches a position substantially parallel to the clamping bars, the hands of the mechanic can be spread around the lever 58 and the clamping bar 10, using the parts like two handles of a pair of pliers in order to squeeze the cam face 66 against the bar 12 with sufficient force to tightly clamp the tube 90 in place. After the tube has thus been clamped, the flaring punch 76 which was initially in the position shown by the solid lines in Figure 3, can be brought down against the end of the tubing 90 and driven against it by a hammer or some suitable instrument in order to flare the end of the tube outwardly to the position shown in Figure 4.

Having completed the flare, the punch can be withdrawn to the position shown in Figure 3 where it is held by means of the spring-pressed ball 86 seated in the annular recess 84, so that the cone will be clear of the clamping bars and not interfere with sliding the yoke off the bars. After the punch has been withdrawn, the lever 58 is opened away from the clamping bars to a lateral position in order to free the yoke from the bars. The yoke can then be readily slid over either end. When the yoke has been removed, the clamping bars are separated to the position shown in Figure 5 and the flared tube extracted.

It will be noted that in maximum open position, as shown in Figure 5, the cut-away portions 48 and 50 will be brought into substantial face-to-face contact and permit the bars 10 and 12 to be separated only a certain limited amount. The flat plate 40 in the slots 36 and 38, respectively, will maintain the bars in proper relationship to each other so that they don't flop out of alignment, and can be easily clamped again on the next tube which is to be flared.

If the next tube should chance to be a large sized tube adapted to fit into the recess 26, the yoke would then be located over the recess 26 and the lever 58 instead of being rotated counterclockwise would be rotated clockwise, as shown by the doted positions in Figure 1. In this case,

the opposite end of the clamping bar 10 would be used as the other handle of a tool resembling a pair of pliers in order to force the opposite cam face 64 against the outside face of the bar 12 for clamping the tube in place. When the flare has been completed as previously described, the parts of the tool may be separated in the regular way.

There has thus been described a flaring tool which is easy and rapid in operation and which utilizes the clamping bars for a variety of purposes in addition to the simple function of holding 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. In a flaring tool having a pair of elongated clamping bars provided with complementary recesses throughout their length for holding tubing of various sizes, the combination of a yoke forming a clamp having a leg adjacent the underside of the bars, a leg adjacent the topside of said bars and an integral connecting portion at adjacent ends of the legs overlying the outer side of one of said bars, a lever arm having a head end pivotally secured between opposite adjacent ends of said legs, said lever having an adjustable cam and cam face on each side of the head having a camming position against the adjacent bar forcing said bars into clamped relationship against a tube when the lever is adjacent and substantially parallel to one end of said pair of clamping bars, said lever and the clamping bar on the opposite side of the tube comprising cooperative handles for manually compressing the bars against any selected size of tube for either position of operation of said lever, an expanding element on each of said cams providing when operated a variation in the distance between said opposite cam faces, an aperture in the leg of said yoke adjacent the topside of the clamping bars, and a flaring die slidably supported on said leg in the aperture adapted to be forced into the tube for making a flare.

2. In a flaring tool having a pair of elongated clamping bars provided with complementary recesses throughout their length for holding tubing of various sizes and sets of engaging means at the respective ends for holding the bars in place on a tube, the combination of a yoke forming a clamp having a leg adjacent the underside of the bars, a leg adjacent the topside of said bars and an integral connecting portion at adjacent ends of the legs overlying the outer side of one of said bars, said legs at the ends thereof remote from the connecting portion being unconnected and providing a space there-between, a lever arm having a head end pivotally secured between adjacent ends of said legs at the ends opposite said connecting portion, the pivot being located at a point a substantial distance from the surface of the adjacent bar, said lever having cam means on the head having a camming position against the adjacent bar forcing said bars into clamped relationship against a tube, the breadth of the head between the pivot and one cam face at the widest part of the head being not less than the distance between the pivot and the face of the adjacent bar, said lever having a cam actuating position adjacent and substantially parallel to one of said pair of clamping bars intermediate said sets of engaging means, said lever and the clamping bar on the opposite side of the tube comprising cooperative handles and having relative pivotal movement toward and away from each other in the same plane for manually compressing the bars against any selected size of tube, an aperture in the leg of said yoke adjacent the top side of the clamping bars, and a flaring die extendable into the aperture and adapted to be forced into the tube for making a flare.

3. In a flaring tool having a pair of elongated clamping bars provided with complementary recesses throughout their length for holding tubing of various sizes and sets of engaging means at the ends of the bars for holding said bars in place on a tube the combination of a yoke forming a clamp having a leg adjacent the underside of the bars, a leg adjacent the topside of said bars and an integral connecting portion at adjacent ends of the legs overlying the outer side of one of said bars, a lever arm having a head end pivotally secured at its mid point between adjacent ends of said legs opposite said connecting portion, a pair of cam faces each having points along the face thereof spaced at varying increasing distances from the pivot point, the most remotely spaced point being at a distance from the pivot point not less than the distance from the pivot point to the face of the adjacent bar; there being one of said cam faces on each side of the head equidistant from the pivot, each said cam face having a camming position against the adjacent bar intermediate said sets of engaging means forcing said bars into clamped relationship against a tube when one side or the other of the lever is adjacent and substantially parallel to an end of said pair of clamping bars, said lever and the clamping bar on the opposite side of the tube comprising cooperative handles for manually compressing the bars against any selected size of tube for either position of operation of said lever, an aperture in the leg of said yoke adjacent the topside of the clamping bars, and a flaring die supported on said leg in the aperture adapted to be forced into the tube for making a flare.

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