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3,236,104

TUBE EXPANDER

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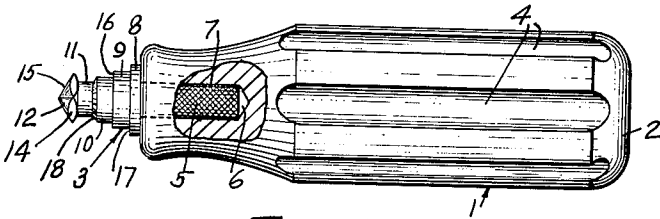


FIG. 1.

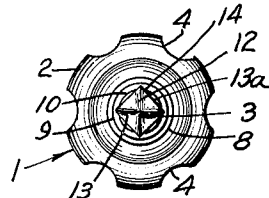


FIG. 2.

FIG. 3.

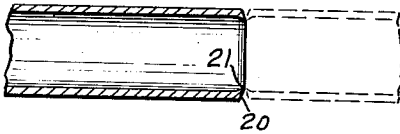


FIG. 4.

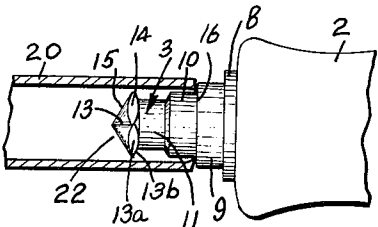
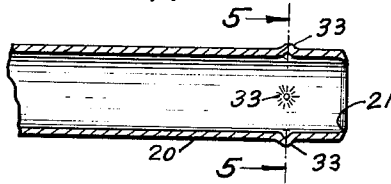


FIG. 6.

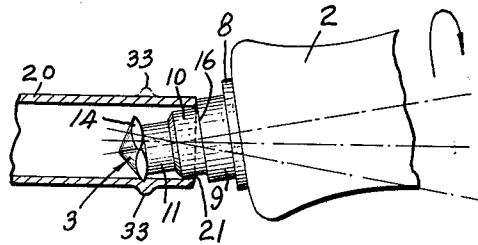


FIG. 7.

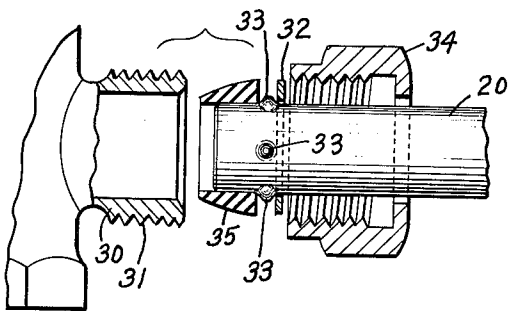


FIG. 8.

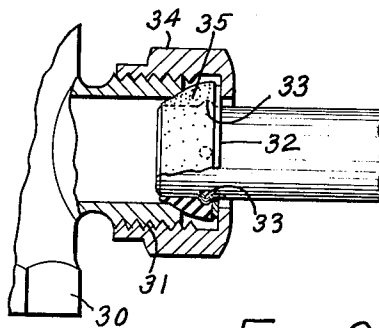


FIG. 9.

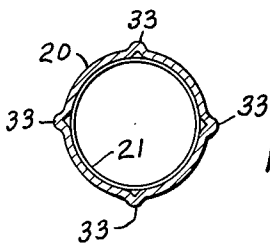


FIG. 5.

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TUBE EXPANDER

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The present invention relates to a tube expander.

At the present time it is customary for plumbers who install or repair tubing for conducting water from a supply pipe to a fixture, such as a wash basin, to cut tubing to length and then insert an end thereof in a fitting utilizing a gasket to effect a water seal. If the tubing should pull from the fitting, excessive water damage may result. Water damage often occurs when the water supply pipe is not equipped with a pressure regulator and there is excessive high water pressure, or at times when water hammer occurs.

For the purpose of obviating any danger of water damage in an installation wherein copper tubing or other type tubing is utilized, I have devised the tube expander of my invention.

An object of my invention is to provide a tube expander readily utilized by a plumber or other person which quickly and efficiently will swage or emboss a tube.

A further object is to provide a tube expander adapted to fit within different diameter tubes and to be manipulated so as to swage or emboss the tube to a desired degree by the operator.

A further object is the provision of a tube expander adapted to be received internally of a tube to quickly, efficiently and easily emboss the tube inwardly from an end thereof and without enlarging or expanding the diameter of the tube on either side of the embossed portion.

A further object is the provision of a tool which is easily carried in a tool kit, simple of construction, efficient in operation, inexpensive in cost of manufacture and generally superior to expanders now known to the inventor.

With the above mentioned and other objects in view, the invention consists in the novel and useful provision, formation, construction, association and relative arrangement of parts, members and features, all as shown in one embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claims.

In the drawing:

FIGURE 1 is a fragmentary, side elevation of the tube expander as an entirety;

FIGURE 2 is an end elevation, looking in the direction of the swaging or embossing element of the tube expander;

FIGURE 3 is a fragmentary sectional view illustrative of a tube of one diameter which has been severed at a given point;

FIGURE 4 is a fragmentary sectional view of the tube of FIGURE 3 shown in full lines after the same has been embossed at a given point;

FIGURE 5 is a sectional view on an enlarged scale, taken on the line 5-5 of FIGURE 4;

FIGURE 6 is a fragmentary, sectional view showing the swaging element of the tube expander within a tube;

FIGURE 7 is a fragmentary, partially sectional view similar to FIGURE 6, the expander being manipulated;

FIGURE 8 is a separated fragmentary, partially sectional view of a fitting adapted to receive a tube which has been embossed or swaged, together with means for sealing the tube to the fitting; and

FIGURE 9 is a fragmentary sectional view similar to that of FIGURE 6, showing the tube connected to the fitting.

Referring now to the drawing, the device as an entirety is designated by the numeral 1 and the same includes a handle 2 and a tube expander means 3 carried at one end of the handle 2.

The handle 2 is of a form suitable to be gripped by the hand and so constructed as to be easily manipulated such as by providing the sides of the handle with spaced longitudinal grooves or flutes 4. One end of the handle is provided with an axial blind hole 5 for reception of the shank 6 of the tube expander means. The shank may be of any geometrical section, however, it is shown as being cylindrical with a knurled periphery 7. Thus the shank may be attached to the tube handle 2 by press fit engagement within the hole 5 or by utilizing an adhesive, or both. The tube expander means 3, includes a collar 8 which may be integrally formed with the shank 7 and which collar bears against the end of the handle. The tube expander means is provided with stepped cylindrical members 9 and 10, and a short cylindrical shank 11 terminating in a swage or embossing device 12. All elements of the tube expander means lie on a common axis.

The swage 12, in the present instance, may be a regular pyramid, the lateral edges 13 being preferably at a 60° angle to the altitude of the pyramid, although I do not limit myself to any particular angle. The pyramidal construction results in a substantially square base as shown in FIGURE 2 at 13a, and it will be noted that the base 13a extends beyond the shank 11, as shown in FIGURES 1 and 2. The pyramid may be formed with flattened areas as shown at 14. It is preferable in the practice of my invention that the vertices or corners between the sides should be pointed and sharp, as shown at 15. This result is obtained by beveling the base at 13b providing the flattened areas 14 together with the lateral surfaces which merge to produce the points at 15.

The swage 12 may have other geometrical forms such as conical with a square base to provide points 15 or the swage may be a flat triangular or a square block integral with the shank 11. In certain adaptations the swage may comprise pointed wings or studs transversely extending from the shank 11. The principal feature of the swage being the provision of sharp points or projections extending transversely beyond the periphery of the shank 11.

The cylindrical portions 9 and 10 are of different diameter so as to fit within standard tubing such as 1/16" tubing for the portion 10 and 1/2" tubing for portion 9. The construction is such that the difference in diameter between cylindrical portions 9 and 10 provides an annular shoulder land or step 16 therebetween and the provision of the collar 8 provides an annular shoulder between cylindrical portion 9 and collar 8, as shown at 17. If desired, the end of the cylinder 10 may be beveled as shown at 18 at any angle such as 30° to a horizontal plane passed through the cylinder.

The operation, uses and advantages of my invention are as follows.

I assume that copper tubing of a standard size for water supply to a fixture, has been cut to length by a cutter, as shown in FIGURE 3 at 20. Such a cutting usually results in an internal burr 21, as shown. In ordinary practice, the burr is usually removed by the plumber, however, with my tool I preferably do not remove the burr. Thereafter, the head of the tube expander means is inserted within the tube 20 so that the burr portion and the tube end engages the annular shoulder 16. This positions the swage a certain distance inwardly from the end of the tube as shown in FIGURE 6 at 22. It is to be observed that in standard type tubing such as 1/16" tubing, as depicted, that the diameter of the cylindrical portion 10 is slightly less than the internal diameter of the tubing. After the tube expander means is positioned within the tubing as shown in FIGURE 6, the operator gyrates the handle 4 in the manner shown by the arrow in FIGURE 7. Gyration brings the swage into contact with the tubing and swages or embosses the tubing in a series of zones all of which lie in the same

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vertical plane, as shown in FIGURES 4 and 5. Depending upon the gyrating given handle 2, the vertices or points 15 will emboss and expand outwardly portions of the tube at multiple points. I have found that it is unnecessary to produce a multiple series of embossments as one or two embossments extending from the periphery of the tube are oftentimes sufficient. However, the number of embossments will largely depend upon the plumber. In FIGURE 5 four embossments were selected which resulted from gyrating the swage 12 a few times within the tube 20.

It is to be noted that my invention when gyrated does not flare the tube end as the tube end bears against a flat shoulder 16 or 17 and the cylindrical portions 9 and 10 are uniform in diameter.

After the tube has been embossed or swaged with the swage 12, the plumber may then attach the tube to a fitting, as shown in FIGURE 8 at 30. This is a T type fitting one element of which is screw threaded at 31. A washer 32 usually of metal is received on the tube 20 at one side of the swaged or embossed area 33 and the same side likewise has passed around the tubing a sleeve nut 34. The end of the tubing 20 receives a cone-type washer or gasket 35 with the base thereof abutting the embossments 33. This gasket is in part received within the fitting 30, and the sleeve type nut 34 engages threads 31 of the fitting to clamp the gasket in place, as shown in FIGURE 9. FIGURE 9, likewise, shows that the washer 32 has engagement with the swaged or embossed area 33 so that the tubing is held against longitudinal or axial movement relative to the assembly. As a rule, unless the tubing is held positively to the fitting, excessive water pressure, or water hammer may cause the tubing to pull from the assembly resulting in a bad water leak which may result in extensive damage to property. However, the use of my invention prevents escape of the tubing from the fitting assembly regardless of water pressure.

I have provided a simple device which is easily carried in a tool kit and which is universal in its adaptation to tubing of standard size and of the type which may be deformed. After a swaging operation on tubing, the tube expander is released from the tubing and the burr 21 may be removed if desired.

My invention requires one hand operation whereas the average device for swaging tubing requires both hands

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and sometimes an additional helper. It is obvious that the number of cylindrical step portions 9 and 10 may be increased or decreased dependent upon the number of tube diameters the tool is adapted to operate upon, and I do not restrict my invention to a device having two cylindrical portions, in fact, the collar 8 may be deemed a cylindrical portion which would fit the internal diameter of a third tube. In each instance, it will be observed that the swage 12 will extend further into each tube dependent upon the diameter of the particular tube.

I claim:

1. A tube expander including: a swage of pyramidal form to provide sharp corners where the lateral edges meet the base, and a cylindrical portion the axis of which lies on the altitude of the swage and joins therewith, said swage and said cylindrical portion adapted for reception within tube to be deformed, and means whereby the swage may be gyrated on its axis.

2. A tube expander, including: a swage of pyramidal form, axially aligned compound cylindrical members of different diameters joined to said swage and spaced therefrom, an elongated shank in axial alignment with the cylindrical portions and the altitude of the swage, and means whereby the swage and cylindrical portions may be gyrated.

3. A tube expander, including: a swage of conic section, the base of said conic section being square to provide sharp lateral points, a shank in axial alignment with the altitude of the swage securing the swage and a member provided with a shoulder secured to said shank, the tube to be expanded having an end abutting the shoulder when the swage is positioned within the tube, and a handle secured to the member provided with a shoulder whereby the swage may be gyrated.

References Cited by the Examiner

UNITED STATES PATENTS

157,875	12/1879	Sharpneck	72—393
220,651	10/1879	Pagan	72—393
224,023	2/1880	Mallery	145—29
784,934	3/1905	Freebury	72—479
1,841,879	1/1932	Croxford	72—75

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