April 4, 1944. A. W. HALLBERG 2,345,871

TUBE-EXPANDING AND THREAD-ROLLING APPARATUS

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Fig. 1.

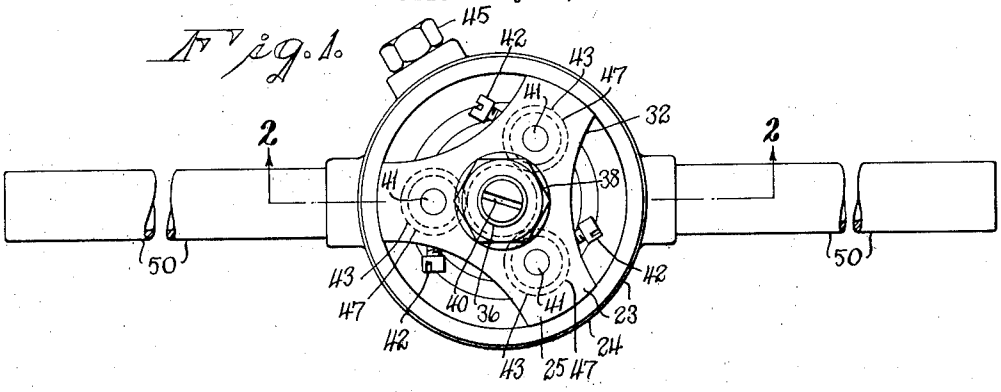
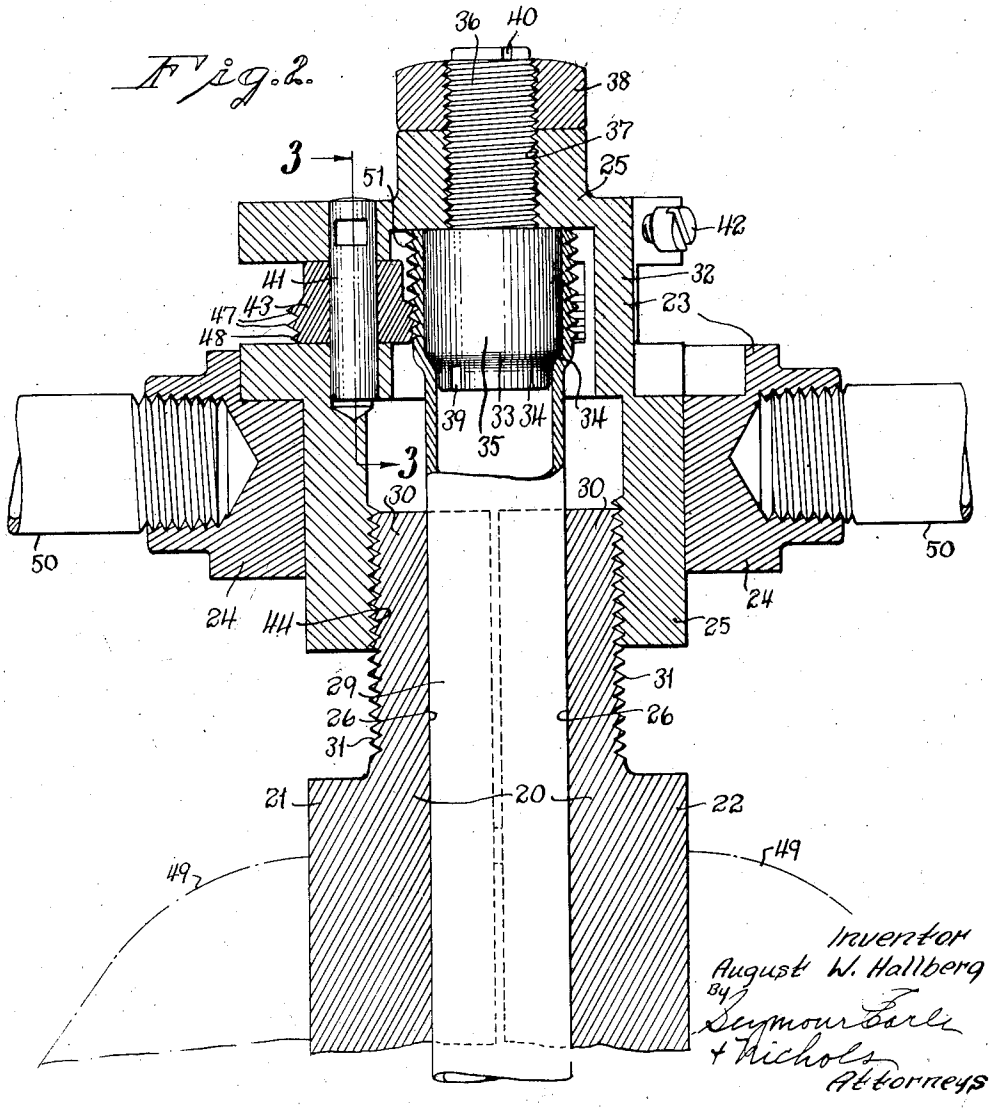



Fig. 2.




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Fig. 3.

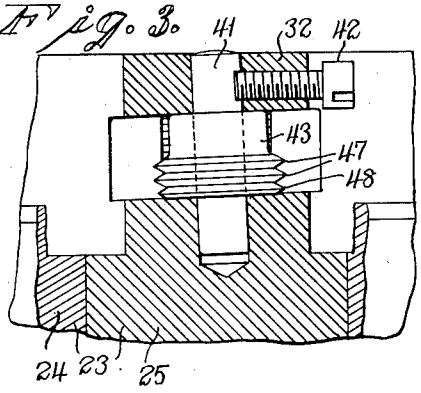



Fig. 5.

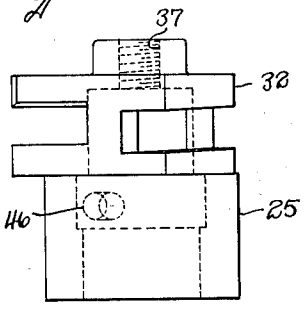



Fig. 4.

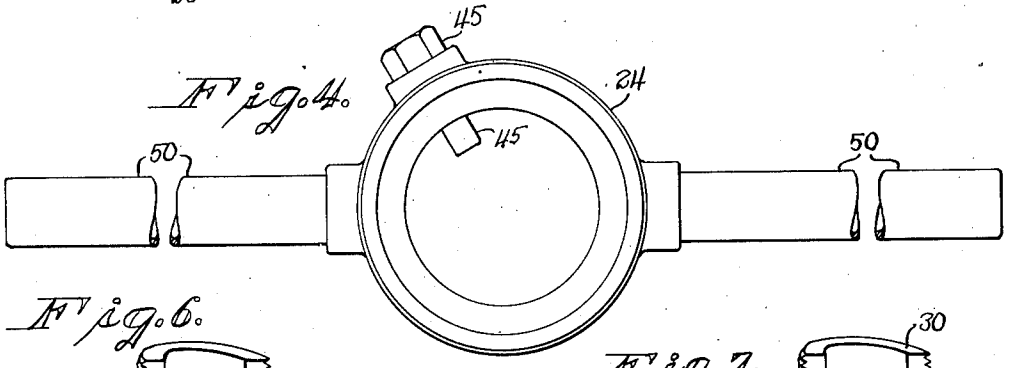



Fig. 6.

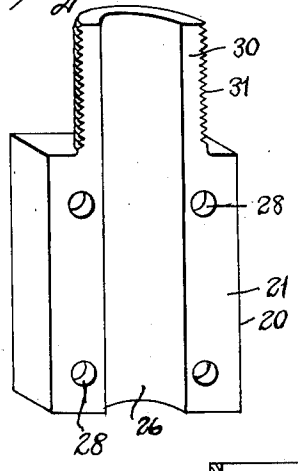



Fig. 8.

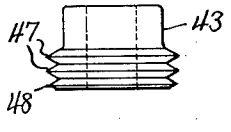



Fig. 7.

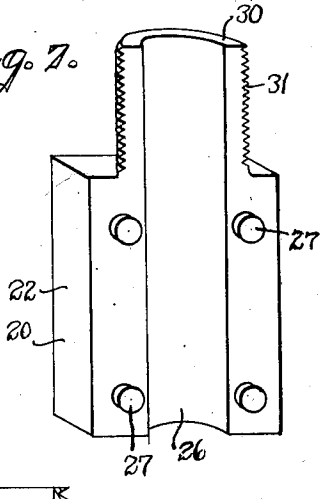



Fig. 9.

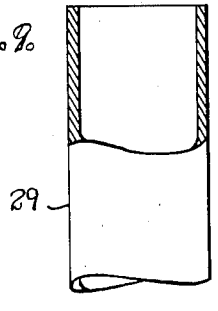
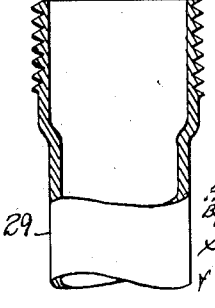



Fig. 10.




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2,345,871

## TUBE-EXPANDING AND THREAD-ROLLING APPARATUS

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Application July 29, 1942, Serial No. 452,720

2 Claims. (Cl. 29—33)

This invention relates to a combined tube-expanding and thread-rolling apparatus.

One object of this invention is to provide an improved apparatus for expanding the end of a tube and rolling a thread thereon in one operation.

Another object of this invention is to provide an improved combined tube-expanding and thread-rolling apparatus formed of simple elements readily manufactured and readily assembled to produce an efficient construction at minimum cost.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings forming part of the present disclosure, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a top plan view of a combined tube-expanding and thread-rolling apparatus made in accordance with the present invention;

Fig. 2 is an enlarged sectional view on line 2—2 of Fig. 1 with the device illustrated as held clamped in the jaws of a vise;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 1 of the holder which carries the tube-expanding and thread-rolling mechanism;

Fig. 5 is a front elevation of the body-member of the expanding-and-threading head;

Fig. 6 is a perspective view of half of the work-holder;

Fig. 7 is a perspective view of the other half of the work-holder;

Fig. 8 is a front elevation of one of the thread-rolling rolls;

Fig. 9 is a side elevation partly in section of a portion of a tube before expanding and threading; and

Fig. 10 is a view similar to Fig. 9 after an end-portion of the tube has been expanded and threaded.

In the description and claims, the various parts and steps are identified by specific terms for convenience, but they are intended to be as generic in their application as the prior art will permit.

The particular combined tube-expanding and thread-rolling apparatus chosen for illustrating the present invention includes a work-holder 20 formed of two half-parts 21 and 22, and a combined tube-expanding and thread-rolling unit 23 which includes a holder 24 and a tube-expanding and thread-rolling head 25.

The particular work-holder 20 illustrated is of longitudinally split form and has the two separate parts 21 and 22 each provided with an approximately-semicylindrical groove or channel 26, so that when the two parts or halves 21 and 22 are assembled together in clamping relation with the dowel-pins 27 and dowel-pin holes 28 in telescoped engagement, the two semicylindrical channels 26 together form an approximately-cylindrical hole for a pipe or tube 29 gripped therein by the parts or jaws 21 and 22, with an end-portion of the tube 29 extending beyond the end-portion 30 of the work-holder 20 which has the external lead-screw thread-portions 31 which together form the external lead-screw thread of the work-holder 20.

The expanding-and-threading unit 23 includes a body-member 32 which has a tube-expanding mandrel 33 which has a chamfered or tapered front-end 34 which merges into a smooth cylindrical portion 35, the mandrel 33 having a screw-threaded shank 36 by which it is threadedly engaged in a screw-threaded hole 37 in the body-member 32 and secured firmly in adjusted position therein by means of a lock-nut 38. Slots 39 and 40 in opposite ends of the mandrel 33 serve for adjusting the mandrel from either end. Three arbors or shafts 41 are fixedly secured in the body-member 32 by means of set-screws 42, the arbors 41 having freely rotatably mounted thereon the three thread-rolling rolls 43, preferably of hardened steel. In the particular form of the invention illustrated, the body-member 32 has the internal lead-screw thread 44 formed integral therein. A locking-screw 45 has its inner end extended into a hole 46 of the body-member 32 to lock the latter and the parts carried thereby within the holder 24.

Each thread-rolling roll 43 has its thread-rolling surface formed by two annular V-shaped thread-rolling ribs 47 of the same outside diameter and one smaller-diametered thread-rolling rib 48 which starts or initiates the thread-rolling operation upon the outer surface of the tube to be threaded, the formation of a thread upon the tube being accomplished by the V-shaped ribs 47 and 48 by virtue of the thread-rolling rolls having their axes arranged somewhat askew in the manner illustrated in Fig. 3, so as to have the inclination of the thread-rolling ribs correspond to the inclination of the thread to be rolled, and by virtue of the thread-rolling rolls being forced axially of the tube by virtue of the lead-screw threads 31 and 44.

In order to accomplish the combined tube-ex-

panding-and-threading operation upon a tube, the tube is placed in the hole formed by the semicylindrical grooves 26 of the work-holder parts or jaws 21 and 22 with a portion of the tube 29 to be expanded and threaded extending beyond the end-portions 30, as is best illustrated in Fig. 2, and the work-holder parts 21 and 22 are thereupon clamped in any suitable holding device such as the jaws 49 of a vise, and the internal lead-screw thread 44 of the head 25 is thereupon threaded upon the external lead-screw thread 31 formed upon the projection 30 of the work-holder 20, the unit 23 is rotated by means of the handles or hand-grips 50, which causes the chamfered portion 34 of the mandrel 33 to pass into and expand the end-portion of the tube 29, and as the tube becomes large enough to reach and pass along the cylindrical surface 35 of the mandrel, the thread-rolling rolls 43 are caused to travel in a helical path and roll the threads 51 upon the external surface of the expanded portion of the tube, as illustrated in Figs. 2 and 10.

It will be noted that in rolling the threads 51 upon the tube 29, the outside diameter across the threads becomes substantially greater than the outside diameter of the tube-portion from which the threads were rolled, owing to the fact that no metal is cut off, but the metal is forced to flow more or less radially outward in forming the screw-threads. Thus, it will be seen that this mode of forming screw-threads is especially applicable to thin-walled tubes such, for example, as copper or copper-base-alloy tubes, which can be comparatively thin.

By merely rotating the tube-expanding and thread-rolling unit 23 in the reverse or unthreading direction, the member 23 can be readily removed from the work-holder 20, which latter can be removed from the vise-jaws 49, and the parts 21 and 22 of the work-holder can then be readily spread apart and the expanded and threaded tube removed therefrom.

It will be seen that by means of the present invention, tubing of sides which are too small to receive threads to fit into standard pipe-fittings, may readily have the terminal or end-portions of such tubes expanded and roll-threaded to fit such standard pipe-fittings.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. Combined tube-expanding and thread-rolling apparatus, comprising: a tube-holder adapted to hold a tube in position to have an end-portion of the tube expanded and threaded; a tube-expanding-and-threading head having tube-expanding means and thread-rolling means and constructed and arranged to be movable helically endwise relatively to said tube-holder and said end-portion of the tube and cause said tube-expanding means to expand said end-portion of the tube and cause said thread-rolling means to roll threads thereon; and means for moving said head in said helically endwise direction.

2. Combined tube-expanding and thread-rolling apparatus, comprising: a tube-holder adapted to hold a tube in position to have an end-portion of the tube expanded and threaded; a tube-expanding-and-threading head having a tube-expanding mandrel and thread-rolling means and constructed and arranged to be movable helically endwise relatively to said tube-holder and said end-portion of the tube and cause said tube-expanding mandrel to expand said end-portion of the tube and cause said thread-rolling means to roll threads thereon; and means for moving said head in said helically endwise direction.

AUGUST W. HALLBERG.