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MACHINE FOR FORMING THREADS ON METAL TUBING

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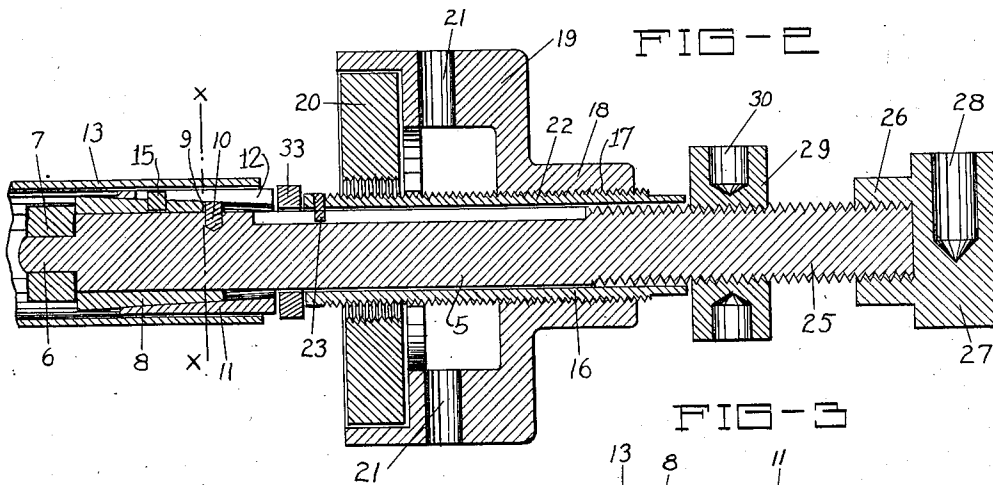
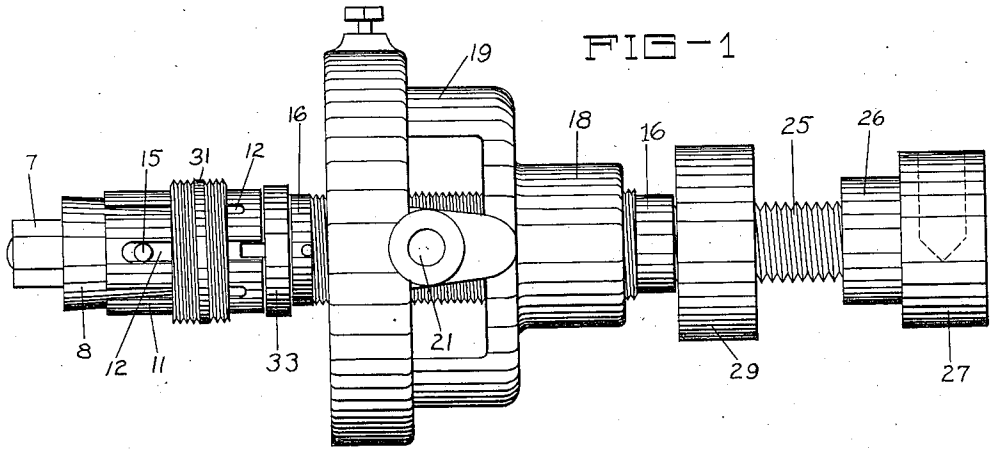
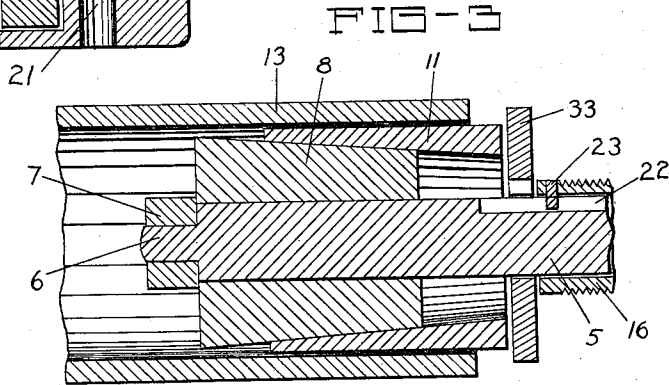
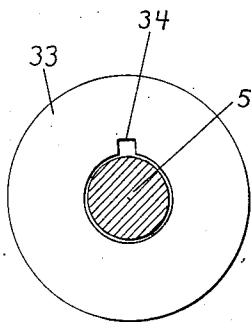


FIG-4



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# UNITED STATES PATENT OFFICE

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## MACHINE FOR FORMING THREADS ON METAL TUBING

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8 Claims. (Cl. 10—123)

My invention has reference to a machine for forming threads on metal tubing, and relates more specially to operations of that nature on what is known as fixture brass tubing, and other thin wall tubing of that character. Great difficulty is encountered in cutting a screw thread on a piece of tubing of the kind named on account of the tubing being provided with a high finish, such as nickel or chromium, which is liable to be damaged by holding the tubing in a vise or other gripping device. There is also danger of jamming or bending the tubing, on account of its comparative light weight. By means of said invention the necessity of gripping the tubing in any way is entirely done away with.

It is sometimes necessary or desirable to cut fresh threads on the end of a tube already established in a wall or other part of a building, and this can be easily done by the use of said invention, and on a piece of tubing which projects only a fractional part of an inch from the wall. It is a convenient plumber's tool, for work on the job under all conditions.

The device includes a hand-operated tool, which includes a thread-cutting apparatus, the supporting shaft for which is engageable with the end of a section of tubing from the inside thereof while the thread forming operation is proceeding. Nipples and other short pieces of tubing can also be positioned thereon and provided with a thread. The dies in the thread-cutting apparatus are interchangeable for use with sections of tubing of different diameters, and other parts of the machine are also interchangeable to conform therewith.

The above-named, and other features and advantages of the invention will more fully appear from the following specification taken in connection with the accompanying drawing, in which:—

Fig. 1 shows the invention in side view.

Fig. 2 is a longitudinal medial section thereof.

Fig. 3 shows a modified form of the expansion devices, detached.

Fig. 4 is a detail of a washer 33, in position on the shaft 5.

The reference number 5 indicates a spindle or shaft, reduced at one end into a threaded pin 6, on which is seated a nut 7. Held in place on said shaft by the nut is a taper member 8, provided at its inner end with a notch 9, engaged by a pin 10 fixed in said shaft. By this means the movement of the part 8 inwardly is limited, and said part is also rotatable with the shaft, or held from rotation therewith. On the outside of

the member 8 is an expansion mandrel 11, provided in its walls with alternately oppositely disposed slots 12, lending a degree of resiliency thereto. The inner wall of the mandrel is tapered to coincide with the taper of the part 8, and the outer wall of said mandrel is concentric with the shaft 5, and adapted to receive the end of a section of tubing, as indicated at 13 in Fig. 2. Upon the mandrel 11 being forced upon the member 8 the walls of the mandrel are spread, until the inner wall of the tubing is engaged thereby, and held rigidly connected therewith. The member 8 is also provided with a pin 15, entering one of the slots 12 in the mandrel, and holding the same from accidental release from the taper member.

Slidable on the shaft 5 is a sleeve 16, provided on its outer wall with a thread 17, engaged by a similar thread in the bore of a hub 18, projected from a die-mounting 19, in which is secured a die-ring 20. Openings 21 are provided in said mounting, by means of which it can be rotated on the sleeve 16, for a gradual feed thereof when in operation. The shaft 5 is also provided with a key-way 22, in which is movable a key 23, fixed in the sleeve 16, whereby said sleeve is caused to rotate with the shaft, or is held from turning therewith when the shaft is stationary.

At the opposite end of the shaft 5 from the expansion devices is a screw thread 25, on the end of which is fixed a collar 26, connected with a head 27, provided with a lateral bore 28, for use with a rod or other tool when it is desired to hold the shaft from turning. There is also mounted on said thread a travelling nut 29, provided with openings 30 for use with a tool, in turning said nut. When the nut is turned to move inwardly on the shaft 5 it comes in contact with the inner end of the sleeve 16, and a continued rotation thereof brings said sleeve into contact with the inner end of the mandrel 11, which is thereby moved outwardly, with the expansion effect hereinbefore described. The frictional engagement of the nut with the end of the sleeve 16 also serves to lock said parts from release.

The threads on the sleeve 16 are of finer pitch than those on the shaft 5, and are similar to those of the thread cutting dies. The length of the thread on said sleeve is such that threads can be cut on a piece of tubing as far as the end of the shaft 5 extends into the same.

When a thread is to be cut on the end of a piece of tubing, such tubing is supported on a bench or other support without any clamping or

gripping means, and the end of the shaft 5, with the expansion devices thereon in non-expanded position, inserted in the end of the tubing. The shaft is then held from turning by means of the head 27, and the nut 29 rotated to actuate the sleeve 16, and cause the expansion operation at the outer end thereof. When the mandrel is rigidly engaged with the inner wall of the tubing the die-mounting 19 is turned until the threads in the die 20 engage the end of the tubing, and a continued rotation of the die serves to produce a thread on the end of the tubing for the desired distance. The same rod or bar can be employed for turning the die-holder that is used for the nut 29. In the threading operation the piece of tubing, of whatever length, is held from turning by means of the shaft 5 anchored therein, and there is no need of holding the tubing in a vise or other clamping means. There is therefore no necessity for marring or otherwise injuring the finish on the outer wall of the tubing, or of distorting the same by gripping devices attached thereto, as is now the case.

At 31 is shown a ring section of tubing, such as are used for nipples, in position on the mandrel 11. When thus held in rigid position threads can be cut thereon as before described. Short sections of tubing can be similarly threaded. In case a piece of tubing projects a little ways beyond a wall, as indicated by the line  $x-x$  of Fig. 2, the end of the tool can be secured in place in the tube in the manner described, and the thread-cutting operation carried on, with the dies operating on the tubing to a point close to the wall. In this way a piece of tubing projecting a half-inch or less from a fixture can be provided with a thread on its outer surface, for use with a nut or other connections, and without disturbing the tubing or wall in any way.

When it is desired to release the tool from a piece of tubing, the nut 29 is moved along the shaft 5 away from the sleeve 16, and a sharp blow given to the outer face of the head 27, tending to separate the member 8 and mandrel 11, and loosen the same from the tubing. It is not necessary to have the end of the tubing supported on the mandrel for the full length of such mandrel, as the insertion thereof into the tubing for a short distance only will serve to support the tubing sufficiently, after the mandrel has been expanded and clamped in position.

There is shown interposed between the outer end of the casing 16 and mandrel 11 a washer 33, provided with a notch 34, by means whereof it can be slipped over the pin 10. In some cases the diameter of the bore of the mandrel 11 may be greater than that of the sleeve 16, so that they will fail to contact, but by use of a washer 33 of sufficient outer diameter this defect can be remedied. The diameters of thin wall tubing of the kind mentioned vary from one inch to two inch, with variations of one-eighth inch between said sizes, and taper members and mandrels of greater size can also be used, as shown in Fig. 3. When it is desired to change the expansion tools the nut 7 is removed, and the member 8 slipped off the end of the shaft 5, with the mandrel connected therewith. Another taper member and mandrel therefor are then substituted for the ones removed. Dies with cutting diameters conforming to the various sizes of tubing are also used interchangeably in the mounting 19. Washers 33 of greater diameters will also have to be used with the larger sizes of tubing.

The tool can also be used for cutting threads

on tubing of extra large sizes or on sizes less than those mentioned, by forming the tool of correspondingly larger or smaller dimensions.

The outer wall of the mandrel is parallel with the wall of the tubing, and it will be noted that when the expansion elements are firmly engaged in the end of a piece of tubing, they provide an anchorage therein for the tool, the other end of which can be supported by the operator. In turning the nut 29 in a direction to expand the mandrel it is the practice to hold the head 27 from rotation with one hand and turn the nut 27 with the other, or with a tool used for that purpose. In the thread cutting operation the head 27 can still be held by one hand and the threading tool turned by the other. In these operations the same bar or rod can be used for turning the nut 29 and mounting 19.

Other changes and variations in the construction and arrangement of the tool can be made 20 besides those noted herein, without departing from the scope of the invention.

What I claim, and desire to secure by Letters Patent, is:

1. A thread cutting tool, comprising a shaft, 25 expansion devices connected with said shaft so as to be non-rotatable therewith, a tubular member slidable on said shaft and non-rotatable therewith, a die-holder rotatably mounted on said tubular member, means for holding said tubular member in fixed position, and coating means on said tubular member and die-holder for suitably feeding the die-holder towards its work during the rotation thereof.

2. A thread cutting tool, comprising a shaft, 35 expansion devices on one end of said shaft engageable with the inner wall of a tubular section, a tubular member slidable on said shaft and engageable with said expansion devices to cause an expansion thereof, means on said shaft for actuating said tubular member, means for holding said shaft from rotation, a die-mounting rotatably supported on said tubular member, and threaded connections between said tubular member and die-mounting for giving a desired feed movement to the die-mounting during its rotation.

3. A thread cutting tool, comprising a shaft provided at one of its ends with a screw thread, expansion devices on the other end of said shaft, 50 non-rotatable therewith, and adapted for engagement with the inner wall of a piece of tubing, a tubular member slidable on said shaft and non-rotatable therewith, engageable with said expansion devices to actuate the same, a traveling nut on said screw thread, engageable with said tubular member for the operation thereof, a die-mounting on said tubular member, having a threaded feed connection with said member, and means for holding said shaft from rotation.

4. A thread cutting tool, comprising a shaft provided at one of its ends with a screw thread, expansion devices on the other end of said shaft, engageable with the inner wall of a piece of tubing, a tubular member slidable on said shaft and non-rotatable therewith, engageable with said expansion devices to cause the expansion thereof, a traveling nut on said screw thread, engageable with said tubular member to cause an expansion action thereof, and lock the same therein, a die-mounting supported rotatably on said tubular member, threaded connections between said die-holder and tubular member to cause the feed of said die-mounting toward its work, and means for holding said shaft from rotation dur-

ing the movement of said traveling nut and of said die-mounting.

5 5. In a device of the class described, a shaft, a taper member connected with said shaft and non-rotatable therewith, an expansible sleeve on said taper member, expansible by a longitudinal movement thereon, a member slidable on said shaft and non-rotatable therewith, engageable with said expansible sleeve to cause an expansion thereof, means on said shaft for actuating said slidable member and holding the same in engaging position, a threading tool rotatably mounted on said last-named member, and having a threaded connection therewith for feed action, and 15 means for holding said shaft from rotation.

20 6. In a device of the class described, a shaft, an expansion device connected with said shaft, and non-rotatable therewith, a tubular member slidable on said shaft, non-rotatable therewith, engageable with said expansion device to actuate the same, and provided on its outer wall with a feed-thread similar to the thread to be cut on a piece of tubing, a die-mounting threaded for engagement with said feed-thread, a threading die 25 detachably connected with said die-mounting, for interchanging with similar dies, means on said shaft for actuating said tubular member, and means for holding said shaft from rotation.

7. In a device of the class described, a shaft, a taper member connected detachably with said shaft, non-rotatable therewith, an expansion sleeve on said taper member, a tubular member engageable with said sleeve to expand the same, 5 non-rotatable with said shaft, and provided on its outer wall with a feed thread, a threading tool rotatably mounted on said tubular member, provided with a thread for engagement with said feed thread, a threading die held removably in said threading tool, means on said shaft for the 10 operation of said tubular member, and means for holding said shaft from rotation.

8. In a thread cutting tool, a shaft provided at one of its ends with a screw thread, an expansion device on the other end of said shaft, a sleeve 15 slidable on said shaft and non-rotatable therewith, a travelling nut on said screw thread engageable with said sleeve to move it toward said expansion device, a collar interposed between said sleeve and said expansion device of greater diameter than the end of said sleeve, a thread cutting tool mounted rotatably on said sleeve, thread 20 connections between said thread cutting tool and said sleeve, for suitable feed movement of said tool, and means for holding said shaft from rotation. 25

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