

April 12, 1960

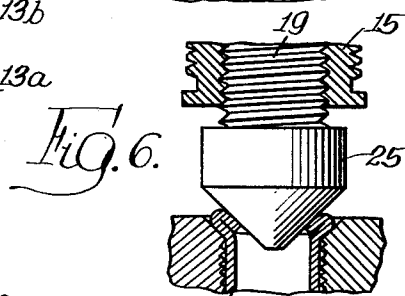
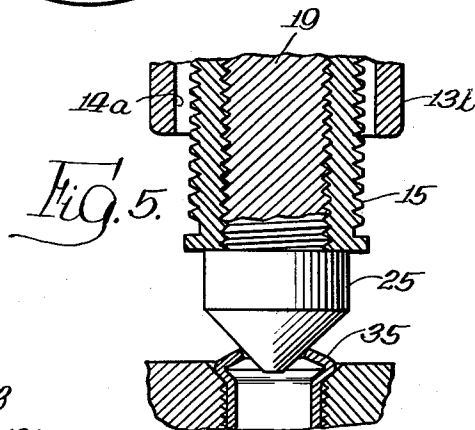
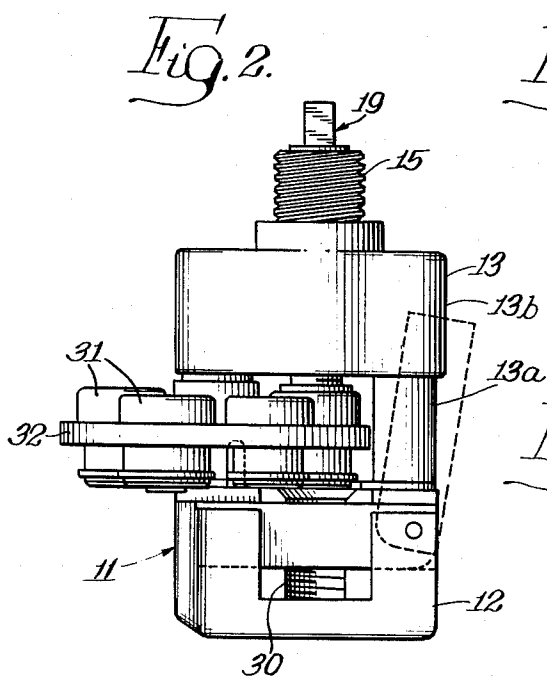
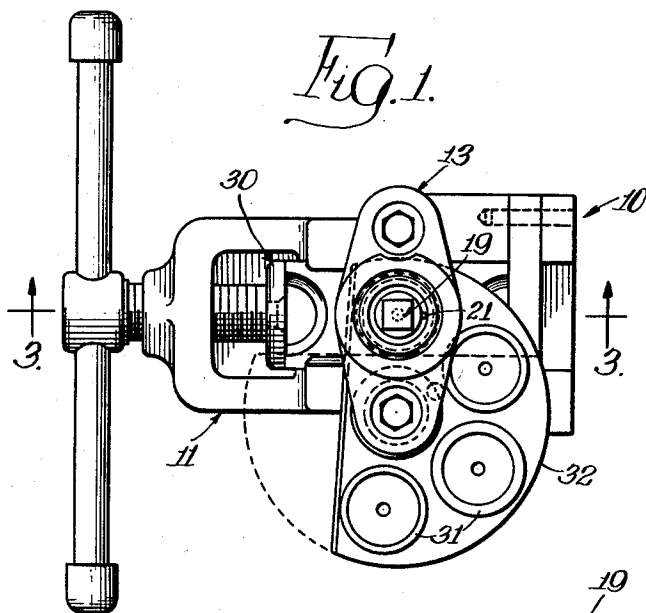
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2,932,338

DOUBLE FLARE TOOL ON A SHAFT THREADED IN A SLEEVE
THREADED IN A SUPPORT AND ARRANGED FOR
TWO SPEED ADVANCEMENT OF SAID TOOL

Filed April 10, 1956

2 Sheets-Sheet 1



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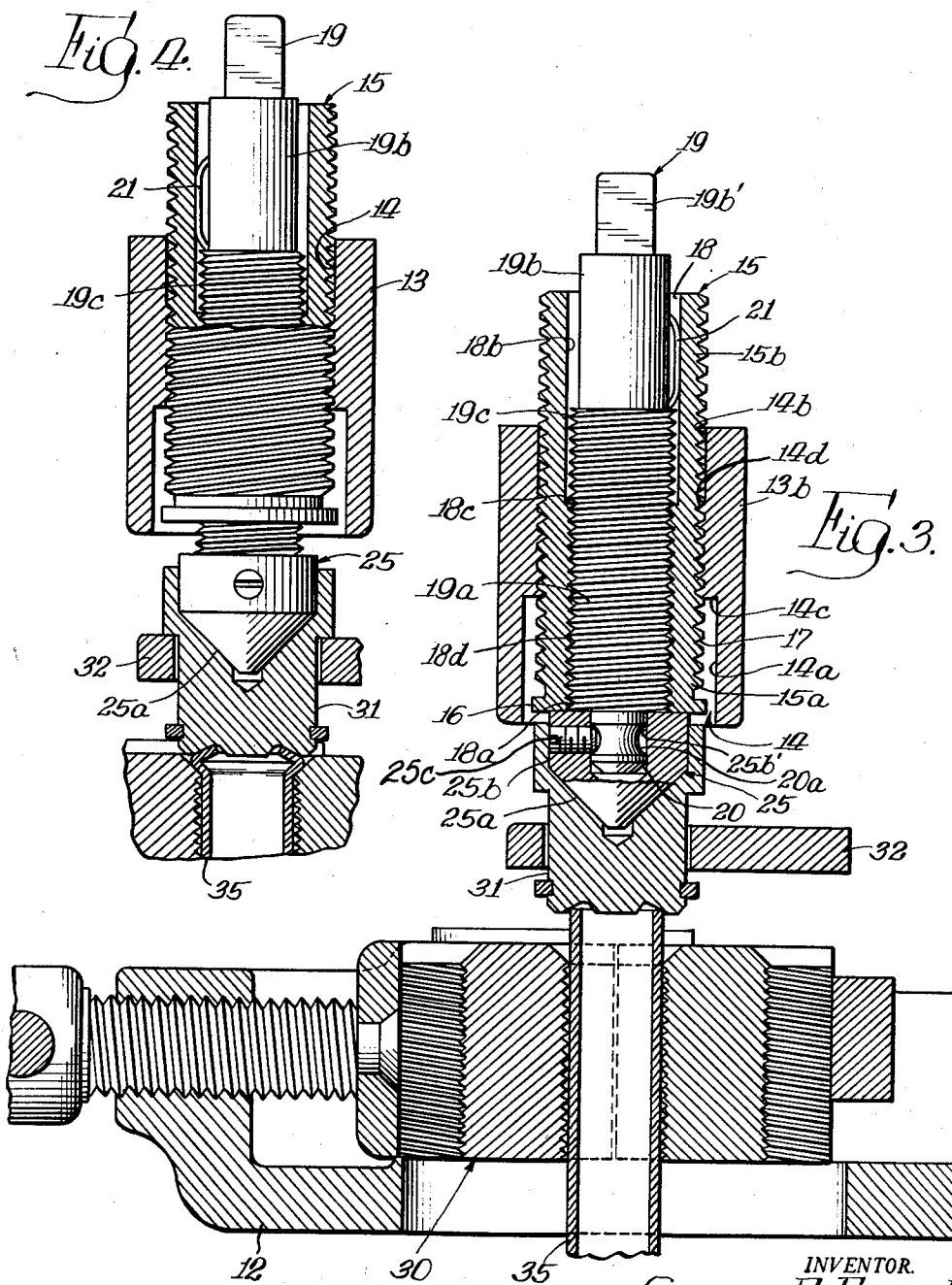
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DOUBLE FLARE TOOL ON A SHAFT THREADED IN A SLEEVE THREADED IN A SUPPORT AND ARRANGED FOR TWO SPEED ADVANCEMENT OF SAID TOOL

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Application April 10, 1956, Serial No. 577,248

3 Claims. (Cl. 153—79)

This invention relates to a screw type double flare tool and in particular to a flaring tool having a two speed feed and retraction means.

In portable flaring tools, it is important to provide simple and effective means for flaring the end of tubing. These means must be rugged as considerable pressure forces are involved, and, because such tools are often used in close quarters or other difficult working conditions, the simplest methods of manipulation are necessary.

The above requirements particularly obtain in tools for double flaring the tube end. In double flaring, two successive operations are required, and it is consequently of even greater importance that simple and fast acting means for performing the operation be provided.

The principal object of this invention is to provide a new and improved double flaring tool.

Another object is to provide a double flaring tool having new and improved means for advancing and retracting the flaring tool.

A further object of the invention is to provide a new and improved tool advancing and retracting means having two speed operation in both directions.

Still another object is to provide a double flaring tool arranged for two speed advancement of the flaring tool with an automatic change from high speed to low speed whenever the tool engages the work.

Yet another object is to provide a double flaring tool having two speed threaded means for advancing and retracting the flaring cone wherein the frictional and thread pitch relationship between elements of the tool automatically causes a change in the rate of advance or retraction.

A still further object is to provide a double flaring tool having automatic two speed advance and retraction of the flaring cone with integral stop means for causing a change in the speed.

Other features and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Figure 1 is a plan view of a double flaring tool embodying the invention;

Figure 2 is an elevational view thereof taken from the right in Figure 1;

Figure 3 is an enlarged fragmentary sectional view taken approximately along the line 3—3 of Figure 1, with the elements of the tool in the position of transition between the high speed and low speed advance;

Figure 4 is a fragmentary view partly broken away and partly in section of the tool upon completion of the first step in the flaring operation;

Figure 5 is a fragmentary view of the tool positioned for performing the final step in the flaring operation; and

Figure 6 is a fragmentary view of the tool upon completion of the double flaring operation.

In the exemplary embodiment of the invention as disclosed in the drawings, the double flaring tool, generally

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designated 10, is seen to comprise a frame 11 having a base 12 and a support 13. Means 30 for retaining the end of a tube 35 are carried by the base 12. A plurality of flaring adaptors 31 are carried on a platform 32 which is movably secured to support 13 selectively to position each of the adaptors in axial alignment with the tube end. The specific structure of the tube retaining means 30, the platform 32, and flaring adaptors 31 is described fully in my co-pending application Serial No. 352,929 for a Tube Working Device issued December 18, 1956, as Patent No. 2,774,408.

New and improved means are provided for advancing and retracting a flaring cone 25 relative to the end of the tube 35 secured in base 12. These means comprise a tubular sleeve 15 received in a bore 14 provided in support 13 and arranged for axial and rotative movement therein. A carrier member or shaft 19 is carried in tubular sleeve 15 for axial and rotative movement relative to the sleeve. Flaring cone 25 is mounted for rotational movement only relative to carrier member 19 at the end thereof adjacent base 12. While shaft 19 may have axial and rotative movement relative to sleeve 15, and sleeve 15 may have axial and rotational movement relative to support 13, the friction between shaft 19 and sleeve 15 is such as to cause transmission of torque to sleeve 15 from shaft 19 and cause sleeve 15 to turn in support 13 whenever axial movement of shaft 19 is unimpeded. When, however, axial movement of shaft 19 is impeded, as when cone 25 engages an adapter 31 or the end of tube 35, the force transmitting relationships between shaft 19, sleeve 15, and support 13 are such as to allow shaft 19 to have rotational movement relative to sleeve 15 and sleeve 15 to remain fixed relative to support 13. The specific structure and functioning of these elements will be made clear hereinafter.

Support 13 comprises a pair of spacing elements 13a between the outer ends of which is secured support portion or block 13b. A bore 14 is provided in spaced support portion 13b and is arranged to be in axial alignment with the end of tube 35 when the tube is secured in clamp means 30. Bore 14 is provided with an inner end 14a and an outer end 14b having a smaller diameter than end 14a with a resultant shoulder 14c formed therebetween. Outer end 14b is provided with a thread 14d.

Tubular sleeve 15 is provided with an inner end 15a provided with means for limiting the outward longitudinal movement of the sleeve through the bore comprising a radially extending flange 16. A thread 17 is provided on the exterior periphery of sleeve 15, extending from flange 16 to outer end 15b of the sleeve, for engagement with support thread 14d.

Extending longitudinally completely through sleeve 15 is a bore 18 having an inner end 18a and an outer end 18b of larger diameter than end 18a forming a resultant shoulder 18c therebetween. Inner end 18a carries a thread 18d.

Carrier member or shaft 19 comprises a generally cylindrical elongated member having an inner end 19a and an outer end 19b of smaller diameter than sleeve bore end 18b. Shaft inner end 19a is provided with a thread 19c having engagement with thread 18d of sleeve 15. The outer end 19b is provided with an axially projecting, squared end portion 19b' adapted for engagement by a wrench or tool. Projecting from the inner end 19a is an axially extending cylindrical knob 20 having a peripheral semi-circular annular groove 20a.

Means providing an additional frictional connection between shaft 19 and sleeve 15 may be provided in the form of a spring member 21 which is yieldingly interposed therebetween in bore portion 18b. Spring member 21 may be of any suitable construction, for illustrative purposes I show a bowed leaf spring secured to

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shaft end 19b and extending radially into yielding engagement with sleeve outer end 15b. The cumulative frictional engagement of thread 18d with thread 19c and spring member 21 with sleeve 19 is made sufficient to assure positive transmission of the entire rotative torque to sleeve 15 when longitudinal movement of shaft 19 is unimpeded.

Flaring cone 25 is provided with a frusto-conical flaring surface 25a and a base 25b. A recess 25b' is provided in the base 25b opening axially opposite surface 25a. The diameter of recess 25b' is made comparable to the diameter of projection 20 and the depth of the recess is made at least equal to the length of the projection so that cone 25 may be carried on the projection. Extending radially into base 25b is a pin 25c having its inner end slidably received in groove 20a of the projection. The dimensions of base 25b and projection 20 are made such that when cone 25 is mounted on the projection 20 with the pin inserted to engage the projection groove 20a the base 25b slidably abuts the inner end of shaft 19. Longitudinal movement of cone 25 relative to shaft 19 is thus prevented while rotational movement is readily allowed. Removal of cone 25 is easily effected through withdrawal of pin 25c.

Rapid advancement of flaring cone 25 toward the end of tube 35 secured in retaining means 30 is obtained by causing the frictional connection between shaft 19 and sleeve 15 to transmit torque applied to shaft 19 with support thread 14d and sleeve thread 17 being provided with a greater pitch than the pitch of sleeve thread 18d and shaft thread 19c. In the particular embodiment of the drawings threads 14d and 17 are 11/16, No. 9, triple lead threads and threads 18d and 19c are 7/16, No. 20, single lead threads. Whenever shaft 19 is rotated as by the application of a tool on end portion 19b' and longitudinal movement of cone 25 is unimpeded, torque is transmitted to sleeve 15 which will be threadedly advanced in support thread 14d, such advancement being at the greater rate resulting from the larger pitch thread. In the first step of double flaring the end of tube 35, an adaptor is interposed between flaring cone 25 and the tube end. Advancement of cone 25, as described above, continues until surface 25a of the cone abuts the upper portion of the adaptor 31 as shown in Fig. 3. This abutment provides an impediment to the longitudinal movement of cone 25. As a large force is now necessary to effect longitudinal movement of the cone toward base 12, the greater force multiplication of the smaller pitch threads 18d and 19c causes sleeve 15 to remain substantially stationary in support 13 while shaft 19 advances through the sleeve.

When the tube end has been provided with the proper initial flare, as best seen in Figure 4, cone 25 is spaced a short distance from inner sleeve end 15a. Opposite rotation of shaft 19 now effects withdrawal of cone 25 from adaptor 31 to allow removal of the adaptor from the axial path of the cone. As no impediment is acting against longitudinal outward movement of the shaft 19, such rotation of the shaft is transmitted through threads 18d and 19c to cause sleeve 15 to rotate relative to support 13; as threads 14d and 17 have a relatively larger pitch, the withdrawal is made at a rapid rate. When sleeve 15 has moved longitudinally outwardly sufficiently, abutment will result between flange 16 and shoulder 14c of support 13 thereby preventing further outward movement of the sleeve. Continued rotation of shaft 19 now causes the shaft to move outwardly relative to the sleeve until base 25b of flaring cone 25 abuts the inner end 15a of sleeve 15 automatically positioning the elements for the next operational step.

Adaptor 31 is removed from the path of the cone 25, and the cone is advanced as described previously with its unimpeded movement allowing the rapid advancement of sleeve 15 through support 13. Such movement continues until cone surface 25a abuts the preliminarily flared

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end of the tube 35, as seen in Fig. 5. The resultant impediment to longitudinal movement of cone 25 now causes sleeve 15 to be locked relative to support 13 and advancement to occur between shaft 19 and sleeve 15. When cone 25 has been advanced to complete the double flare, as seen in Figure 6, it is again spaced from the inner end 15a of sleeve 15. Retraction of cone 25 is effected in the same manner as described previously, with rapid relative movement between sleeve 15 and support 13 occurring until flange 16 abuts shoulder 14c. Continued retraction occurs between shaft 19 and sleeve 15 until cone base 25b abuts inner end 15a of sleeve 15. Tube 35, now having a completed double flared end, is removed from the tube retaining means 30 and the tool is now ready for a new forming operation.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A tool for double flaring the end of a tube, comprising: a frame having a base and a support extending outwardly from the base, said support having a portion spaced from the base provided with a bore therethrough, said bore extending axially toward the base and having a thread; a tubular sleeve in said bore having an exterior thread in engagement with the bore thread for rotational and resultant axial movement of the sleeve relative to the base, and an interior thread having a smaller pitch than said exterior thread; a shaft carried in said sleeve provided with a thread in engagement with the sleeve interior thread for relative rotational and resultant axial movement in said sleeve, with the torque required to overcome the frictional resistance to rotation between the shaft thread and the sleeve interior thread being normally greater than the torque required to overcome the frictional resistance to rotation between the sleeve exterior thread and the bore thread when longitudinal movement of the shaft is unimpeded; means providing a yieldable frictional connection between the shaft and sleeve to apply a constant force at all times therebetween augmenting the frictional resistance between said shaft and sleeve and assuring non-rotative association between said shaft and sleeve when longitudinal movement of the shaft is unimpeded; a tube flaring element at the end of the shaft nearest said base; and means on said frame adapted to hold a tube end to be flared in axial alignment with said bore.

2. In a tool for flaring the end of a tube, a base, a support element spaced from said base and having a threaded bore extending axially toward said base, a tubular sleeve threadedly carried in said bore, and an elongated carrier member threadedly carried in said sleeve for rotational and axial movement therebetween, and frictional means extending between said carrier member and sleeve applying a constant force therebetween at all times to augment the retaining action of the threaded association of said carrier member and sleeve for preventing said movement therebetween and transmitting torque therebetween whenever longitudinal movement of said member is unimpeded.

3. In a tool for flaring the end of a tube, a base, a support element spaced from said base and having a threaded bore extending axially toward said base, a tubular sleeve threadedly carried in said bore, and an elongated carrier member threadedly carried in said sleeve for longitudinal and axial movement therebetween, and frictional means including a spring member extending between the sleeve and the carrier member, said frictional means being arranged to provide a constant force therebetween at all times augmenting the retaining action of the threaded association of said carrier member and sleeve for preventing said movement therebetween and transmitting torque

therebetween whenever longitudinal movement of said carrier member is unimpeded.

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