

Nov. 3, 1964

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3,154,978

TUBE POINTER

Filed July 9, 1962

4 Sheets-Sheet 1

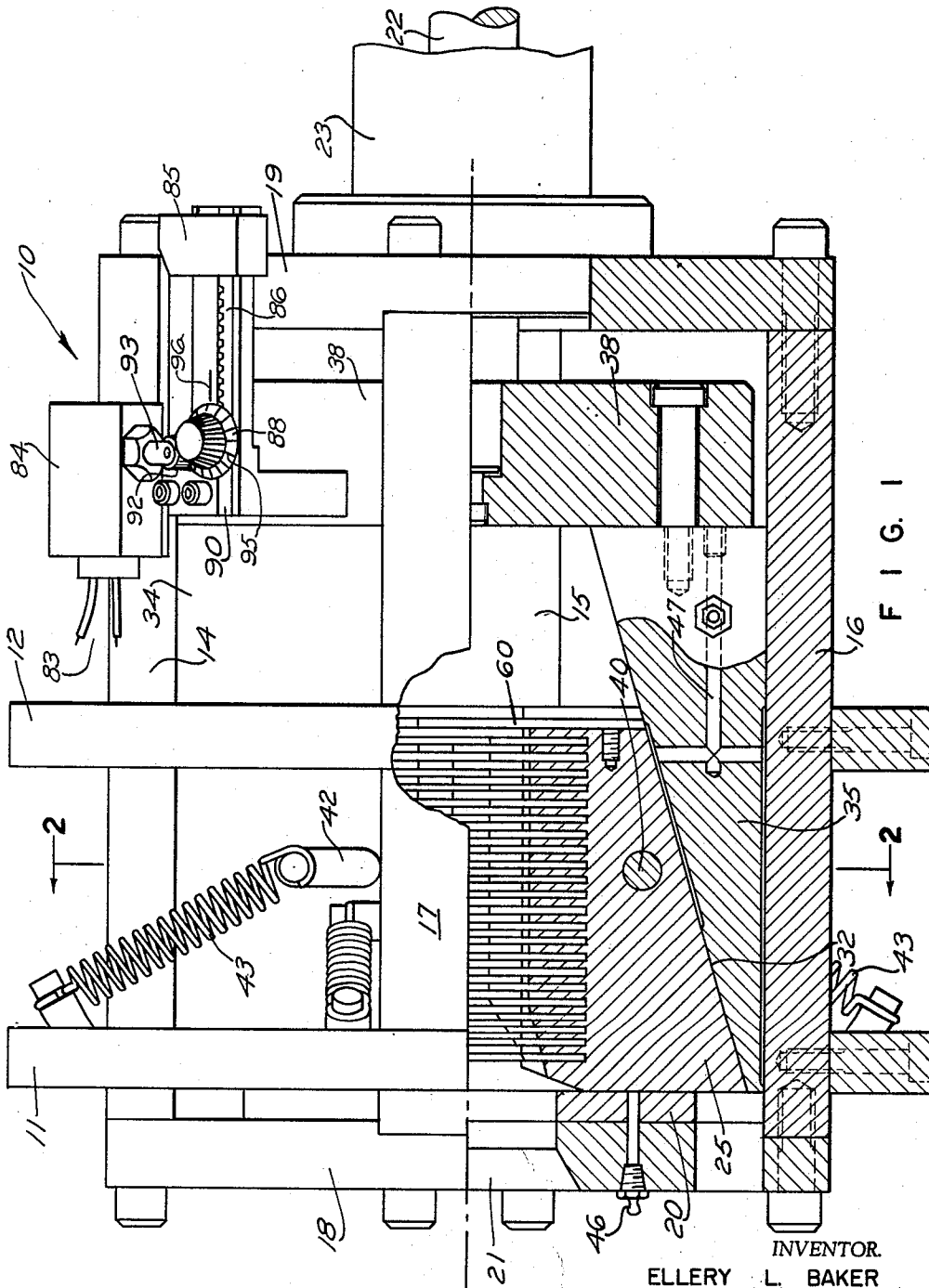


FIG. 1

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EDWARDS LIFESCIENCES EX. 1223

Edwards Lifesciences v. Boston Scientific Scimed  
U.S. Patent No. 6,915,560

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4 Sheets-Sheet 2

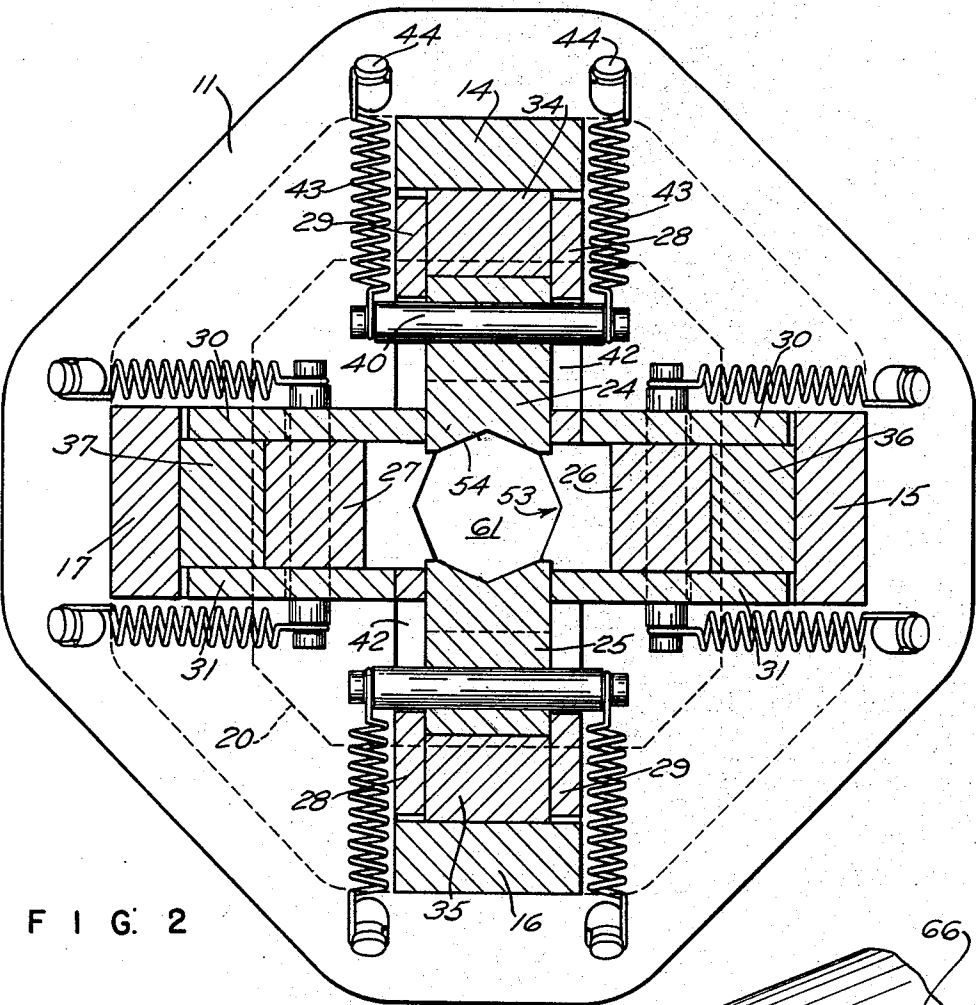


FIG. 2

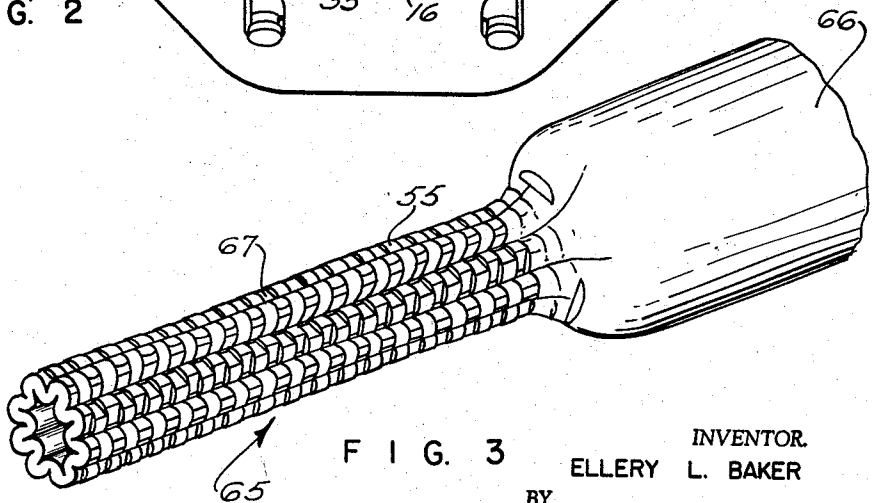


FIG. 3

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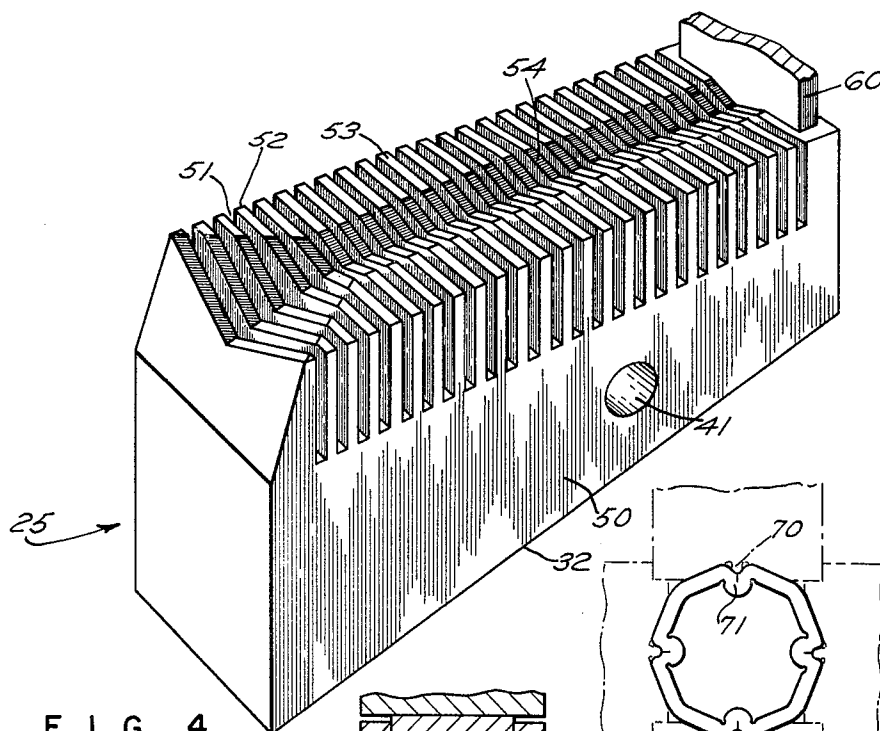


FIG. 4

FIG. 6

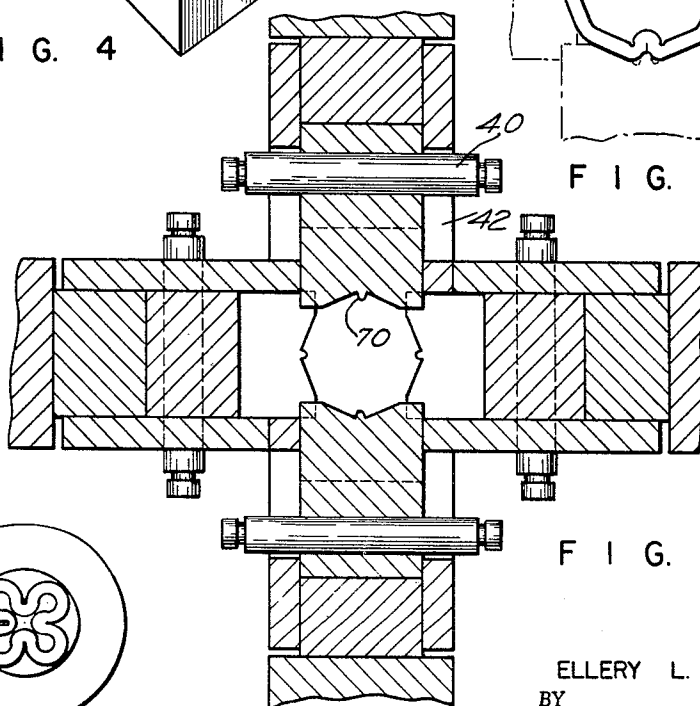


FIG. 5

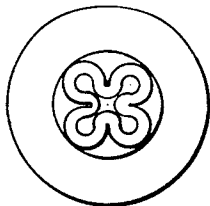


FIG. 7

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4 Sheets-Sheet 4

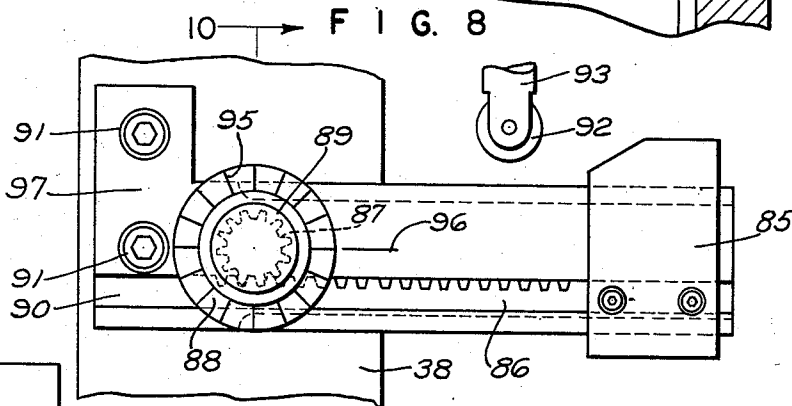
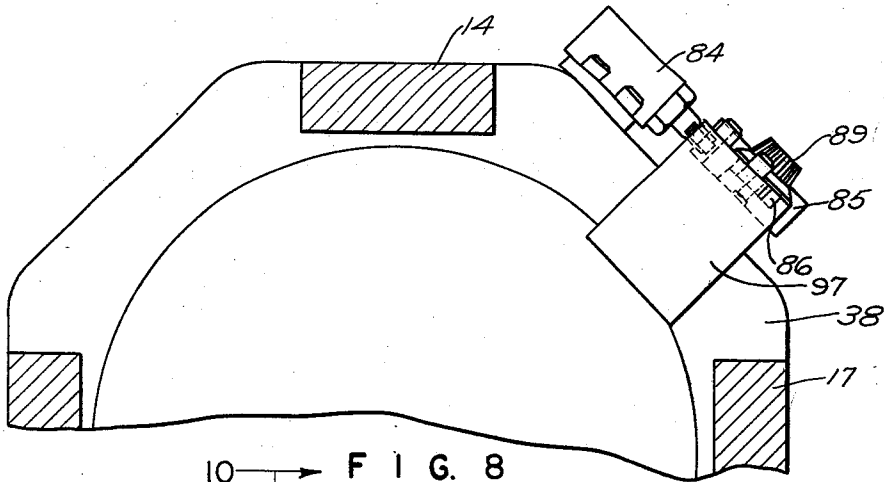


FIG. 9

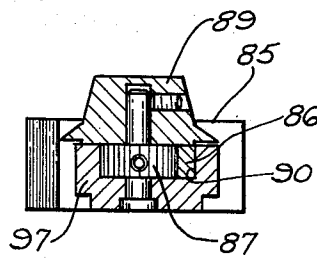


FIG. 10

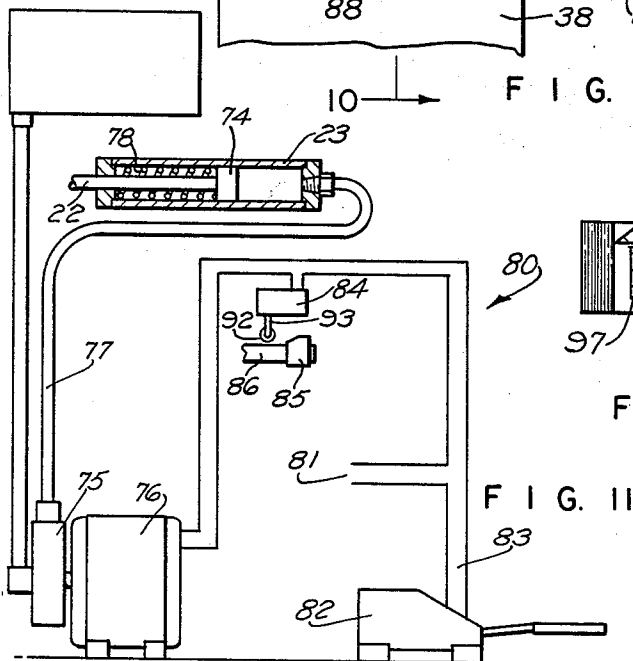


FIG. 11

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TUBE POINTER

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Filed July 9, 1962, Ser. No. 208,502  
8 Claims. (Cl. 78-15)

This application is a continuation-in-part of application, Serial No. 121,459, filed July 3, 1961, now abandoned.

This invention relates to a machine for compressing the end of a tube to form a so-called point thereon so that the tube may be easily inserted into a die for drawing the tube to reduce its diameter.

Rotary swaging has been used for some time to reduce the end of a tube to form a so-called point thereon, but this has more recently given away to the use of dies for folding in the stock of the tube and then compressing the remainder of the tube to form a point thereon. The usual folding of a tube is from diametrically opposite sides by means of projections on dies which move together, while other dies at 90° therefrom cooperate to move in the stock. The folded in portions usually contact and limit the reduction in size of the tube in the forming of a point. By these heretofore used methods a reduction of substantially 30 percent of the size of the tube was about the maximum. By reason of such a limit a large number of dies or pointing tools were needed for a full range of sizes. Approximately ten sets of dies were necessary for sizes of tubes varying from 1/4 inches to 1/16 of an inch.

A further difficulty was encountered in reducing the size of a tube by compression in that the tube would exude through the junction between the members which engage the tube for such compression.

One of the objects of this invention is to provide a pointing machine or device which will operate through a greater range of tube sizes than heretofore, such for instance as making one set of dies take the place of ten sets for the range of 1/4 to 1/16 which are heretofore used.

Another object of this invention is to provide a single set of dies which will perform a reduction on a tube of over 100 percent of its finished point diameter.

Another object of the invention is to adjustably select the amount of reduction of tube size to obtain the size of the point desired throughout a wide range.

Another object of the invention is to select the point size desired by a dial operation.

Another object of this invention is to provide a device which will prevent stock of the tube being reduced from exuding through the junction between the dies which engage and press the tube to smaller diameter.

Another object of the invention is to provide a surface on the reduced portion of the tube or its point which will afford a good gripping surface to be engaged by the tongs of a drawbench for pulling the tube through drawing dies.

Another object of the invention is to provide a point on the tube which will be stronger than points which have heretofore been formed on the end of the tube and thus prevent ripping or tearing of the stock of the work in the area of the point or where it has been reduced from the normal size of the tube.

Another object of the invention is to provide a device which will be much smaller than the old swaging machine which is utilized for tube pointing.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

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FIG. 1 is an elevation partly in section of the machine equipped with this invention;

FIG. 2 is a section on line 2-2 of FIG. 1;

FIG. 3 is a perspective view of a point formed on a tube in accordance with the machine here shown;

FIG. 4 is a perspective view of one of the jaws of the machine;

FIG. 5 is a sectional view of a modified form of machine and jaws;

FIG. 6 is an end view of the tube partially formed by the modified form of jaws of FIG. 5;

FIG. 7 is an end view of the tube point compressed until its opposite sides touch;

FIG. 8 is a fragmental section showing the location of the adjusting stop;

FIG. 9 is a plan of the stop adjusting device;

FIG. 10 is a section on line 10-10 of FIG. 9; and

FIG. 11 is a schematic view of the control mechanism.

In proceeding with this invention, I have provided a plurality of jaws or jaw members suitably guided in a housing or framework so as to move toward a common axis and a means for simultaneously moving these jaw members toward such a common axis to place pressure upon a tube which may be placed in their path of movement. Each of the jaws is provided with a plurality of fins or leaves, and the edges of adjacent jaws have these fins or leaves intermeshing or interlocking so that one supports the other and in this manner the jaw members encircle the axis toward which they move so that when they engage a work tube positioned in the opening between them and move into engagement with this tube, the tube cannot exude through the junction between the jaws as this interlocking prevents this. The shape of the engaging surface of the jaws may be varied, and generally the shaping will be such that as the tube to be operated on becomes smaller, the number of flat surfaces which are formed on the tube as compressed will be increased the smaller the tube becomes. In some instances I may provide a projection on these engaging surfaces so as to start the tube folding inwardly at certain locations. The general surface of the jaws may be such as to form a gradual taper on the tube so as not to strain or rip the stock of the tube by too an abrupt reduction. I also provide an adjustment which may be preset to limit the compression of the point to a certain amount that the desired size of point may be had.

With reference to the drawings, 10 designates generally the tube pointing machine which comprises a skeleton housing of two heavy plates 11 and 12, each of which has a cutout in the shape of a cross with bars 14, 15, 16 and 17 extending between them and located on the ends of the cross. These bars are provided with a head 18 at the forward end and a head 19 at the rear end. The head 18 has a smaller plate 20 between it and plate 11, and both have openings 21 at their centers through which the work may be positioned to be operated upon. An opening in the head 19 provides for the piston rod 22 to extend through from the hydraulic cylinder 23 for applying pressure to operate the jaw members.

In the present illustration of the device there are four jaw members arranged in diametrically opposite pairs, and as seen in FIGURE 2, one opposed pair comprises the jaws 24 and 25 while there is another opposed pair comprising jaws 26 and 27. Spaced members 28 and 29 engage the inner edges of the cutout cross and are welded to the plates 11 and 12 at these locations to provide guide ways for the jaw members 24 and 25 directing their path of sliding movement toward and from the axial center of the plates 11 and 12. Similarly, plates 30 and 31 are supported from the plates 11 and 12 to provide guide ways for the jaw members 26 and 27 directing them in a sliding

movement toward and from the same common axis of the plates 11 and 12.

Each of these jaw members is provided with an inclined surface 32 as seen in FIGURES 1 and 4 on its back or surface away from the above mentioned common axis, and these surfaces are engaged by wedge shaped members, 34 for jaw member 24, 35 for jaw member 25, 36 for jaw member 26 and 37 for jaw member 27. These wedge shaped members extend from a common head 38 carried on the end of piston rod 22, and each of these wedge shaped members slide along its corresponding bar 14, 15, 16 and 17 so that as the head 38 and the wedge shaped members 34 to 37 are advanced to the left as shown in FIG. 1, they will force the jaw members 24, 25, 26 and 27 inwardly toward a common axis. These jaws, of course, are supported at their forward end against the plate 20 so that they will not move to the left as the wedges move to the left, and consequently the jaws will be forced inwardly.

A pin 40 extends through a hole 41 in each of the jaw members and also through slots 42 in the guide plates, and springs 43 engage the opposite ends of this pin and also anchors 44 on the plate 11 which will spread the jaws or move them outwardly when the wedges and head 38 are moved to the right as shown in FIG. 1. The inclination of the springs hold the jaws against plate 20. Lubrication may be provided for the sliding engagement of the jaws and the wedges as shown at 46 and 47 in FIG. 1.

One of the jaws, 25 for example, is shown by itself in FIG. 4, and as there seen it consists of a body block 50 with a plurality of slots 51 cut into its work engaging surface to provide a plurality of fins or leaves 52. The slots 52 are substantially the same axial dimension as the same axial dimension of the fins. The edge surface 53 of these leaves is shown as made up of a plurality of flat surfaces, and each is formed with a V-shape formation 54 at the mid portion thereof, the arrangement being symmetrically arranged with uniform flat surfaces, there being here shown eight such uniform surfaces. Each four jaws has a gradually larger V-shape formation in the leaves at its entrance end so as to provide a tapering surface gradually increasing along the surfaces so as to provide surface 55 on the tube (see FIG. 3). At the inner end of one of the blocks, for example that block shown at 25, a stop plate 60 is provided which is held to the jaw 25 and is of a length to extend across the opening 61 formed between the jaws of the device. It is this opening 61 into which the work is inserted to be engaged by the opposite pairs of surfaces of the jaws as they are moved inwardly.

The jaws 24 and 25 are substantially duplicates so far, as the slots 51 and leaves or fins 52 are provided, whereas the jaws 26 and 27 are so slotted that their leaves 52 will be at the locations of the slots 51 and of substantially the same axial dimension as the slots on the jaws 24 and 25. Thus as the jaws are arranged in their housing, there will be opposed tube engaging surfaces on opposite pairs of jaws and also an interlocking of the fins or interleaving arrangement between the edges of adjacent jaws, and the fins or leaves 52 of the jaws 26 and 27 will extend into the slots 51 of the jaws 24 and 25, whereas the leaves 52 of the jaws 24 and 25 will extend into the slots 51 of the jaws 26 and 27. This is indicated in FIGS. 2 and 5.

With this arrangement of the jaws the work will be inserted into the opening 61 until it engages the stop plate 60. Thereupon the piston in the cylinder 23 will be actuated to force the piston rod 22 carrying the head 38 and wedges 34 to 37 to the left as shown in FIG. 1, and thereby forcing the jaws in their interleaving arrangement inwardly so as to compress the work or tube into a smaller diameter or size as shown in FIG. 3 to provide a point 65 on tube 66. At the same time that this compression occurs, the fins or leaves by reason of their applying pressure in localized areas will cause the tube to be somewhat

indented as at 67, and this indentation will provide a rougher surface on the point 65 thus formed which will give a better grip for the tongs of the drawbench to pull the tube through the drawing dies.

This arrangement provides for a large adjustment of point sizes. In each case regardless of size there will be the same folding pattern provided on the tube for each tube size. The dies, however, may vary somewhat in shape to accomplish the same general result.

In some cases it is desirable to provide projections 70 as seen in FIG. 5 on each of the jaw members so that as the jaw members are brought inwardly, an indent will be provided as at 71 (see FIG. 6) to start the stock inwardly at this location. In this event a fold such as shown in FIG. 6 will be provided. Other than this the jaws of FIG. 5 are the same as the jaws of FIG. 4 and the mechanism the same as heretofore described.

In order to actuate the piston 74 in cylinder 23 to move the rod 22 and the wedge shaped members 34, 35, 36 and 37 to close the jaws 24, 25, 26 and 27 on the work, I have provided a pump 75 (FIG. 11) driven by an electric motor 76. This pump will pump liquid, such for example as oil, through the conduit 77 into the cylinder 23 to force the piston 74 in the desired direction, to the left as shown in FIG. 11, and the further the piston is forced to the left, the more the jaws will be moved inwardly towards the axial center. When the pressure of the oil is released, a spring 78 will force the piston in the other direction, permitting the springs 43 to open the jaws.

In order to provide for a certain size of point, I control the amount that the piston may move in the cylinder by providing a control in the electric circuit which supplies the motor 76 which, in turn, drives the pump 75. This electric circuit is designated generally 80 (FIG. 11) and obtains power from a source 81 with a foot switch 82 interposed in the supply line 83. Also interposed in this line is a switch 84 which is located on the machine and is normally closed, although it may be opened to interrupt the circuit and stop the motor 76. Interruption of this circuit is obtained by means of a stop pawl 85 carried on a rack bar 86 which may be adjusted by a pinion gear 87 by means of a dial 88 carried on the shaft 89 of the pinion gear. This rack slides through a slot 90 in a bar 97 which is fixed on the head 38 by means of mounting screws 91 so that by turning this dial 88, the stop 85 may be positioned at a desired point so that when it contacts the anti-friction roller 92 of the arm 93, it will open the switch at 84, interrupt the circuit and stop the motor, thus stopping pumping of the oil into the cylinder which actuates the jaw members. At the time this occurs, the operator will release pressure on the foot switch 82, permitting the circuit to be open until return of the piston to starting position under action of the spring. By graduating the dial 88 as at 95 with some fixed indicia as at 96, I may set the stop 85 so that the desired dimension of pointer may be had.

I claim:

1. A tube pointer comprising a housing having an open end, a plurality of pairs of opposite work engaging jaw members movably mounted in said housing, means to guide said jaw members for radial movement toward a common axis extending through said open end, means to simultaneously move said jaw members relative to said housing toward said common axis, said jaw members each having generally V-shaped surfaces partially embracing the work and positioned at intervals lengthwise of said axis which surfaces of the jaw members complement each other to encircle said axis and provide an axially extending opening for the reception of the work, said opening varying as to diameter depending on the position of said jaw members relative to said housing, said jaw members having a plurality of intermeshing leaves at their adjacent edges which slide one upon the other as movement of the jaw members occurs toward and from said axis whereby

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as the work is being compressed by said jaw members, exuding of the work between the jaw members is prevented.

2. A tube pointer comprising a housing having an open end, a plurality of pairs of opposite work engaging jaw members movably mounted in said housing, means to guide said jaw members for radial movement toward a common axis extending through said open end, means to simultaneously move said jaw members relative to said housing toward said common axis, said jaw members each having generally V-shaped surfaces partially embracing the work and positioned at intervals lengthwise of said axis which surfaces of the jaw members complement each other to encircle said axis and provide an axially extending opening for the reception of the work, said opening varying as to diameter depending on the position of said jaw members relative to said housing, each pair of jaw members presenting diametrically opposite surfaces in a plane at right angles to the axis to engage the work, said jaw members having a plurality of intermeshing leaves at their adjacent edges which slide one upon the other as movement of the jaw members occurs toward and from said axis whereby as the work is being compressed by said jaw members, exuding of the work between the jaw members is prevented.

3. A tube pointer comprising a housing having an open end, a plurality of work engaging jaw members movably mounted in said housing, means to guide said jaw members for movement toward a common axis extending through said open end, means to simultaneously radially move said jaw members relative to said housing toward said common axis, said jaw members having surfaces extending lengthwise of said axis which surfaces of the jaw members complement each other to encircle said axis and provide an axially extending opening for the reception of the work, said opening varying as to diameter depending

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on the position of said jaw members relative to said housing, means including a power means from a source to move the jaw members toward said common axis to compress the work, and adjustable means positively movable with the jaw operating means to control the operation of said power means to limit the compression by the jaw members.

4. A tube pointer as in claim 3 wherein said adjustable means includes a rotatable part to manually effect such adjustment.

5. A tube pointer as in claim 3 wherein the work engaging surfaces of said jaw members have a projection extending therefrom toward the said axis.

6. A tube pointer as in claim 3 wherein the work engaging surfaces of said jaw members are inclined axially relative to the said axis to provide a tapering reduction of the work.

7. A tube pointer as in claim 1 wherein the dies cooperate to provide an opening for the tube which is of symmetrical shape regardless of the position of the dies.

8. A tube pointer as in claim 1 wherein the dies cooperate to provide an octagonal opening for the tube which is of octagonal shape regardless of the position of the dies.

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