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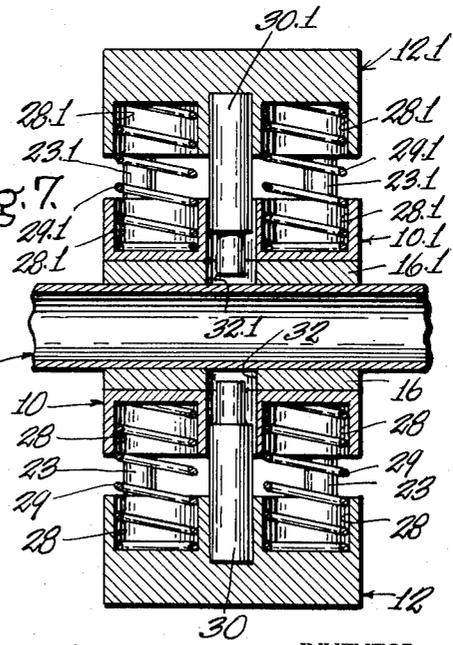
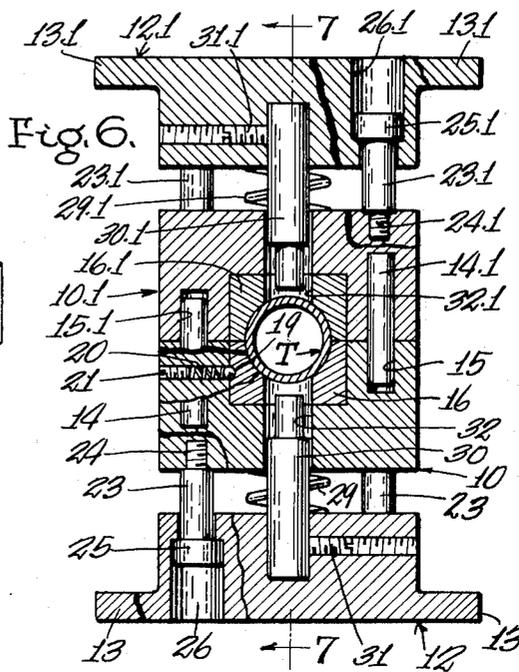
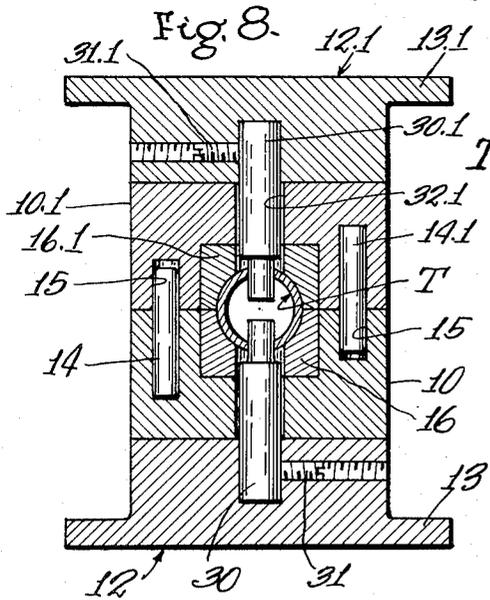
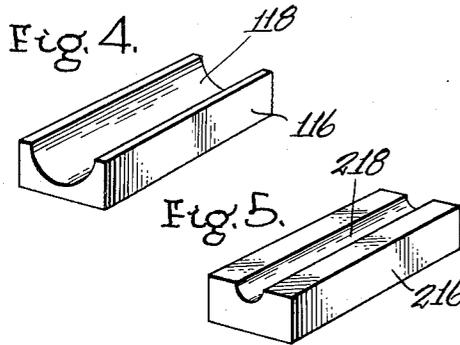
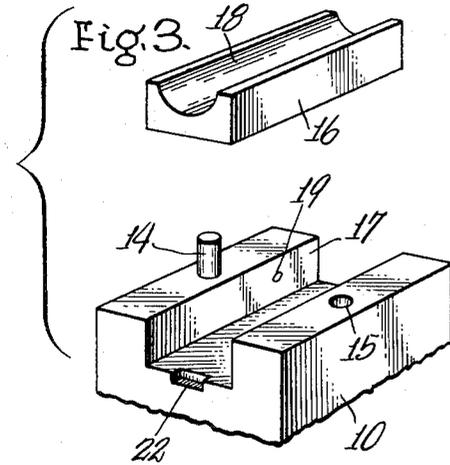
J. K. FAULL

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TUBE PIERCING APPARATUS

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2 Sheets-Sheet 2



INVENTOR.  
JAMES K. FAULL  
BY  
*Williams and Kreake*  
ATTORNEYS

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## TUBE PIERCING APPARATUS

James K. Faulk, 16 Walker Court, Poland, Ohio

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1 Claim. (Cl. 83-454)

The present invention relates to apparatus for piercing tubing and the like and the principal object of the invention is to provide new and improved apparatus of the character described.

With the modern, wide-spread use of tubing in a multitude of products, there is a great need for apparatus which will form transverse apertures in the tubing at the lowest possible cost. At first impression, it may appear that a drill press or the like would provide an easy solution to the problem; however, such expedient is too slow and too costly when high production is required.

On the other hand, any good die maker can make a die which would satisfactorily form transverse apertures in a tube on a high production basis; however, such a die is normally very expensive and is adapted to function on but one size of tube. Accordingly, unless very high production on a single tubing size is required, the usual custom-made die is generally too costly to warrant its use.

The present invention provides a tube piercing device whose cost is low enough to justify its purchase in very small manufacturing operations. Moreover, the device is readily adaptable to accommodate various tube sizes and to pierce various hole sizes by a simple and inexpensive substitution of few parts. These and other advantages will readily become apparent from a study of the following description and from the drawings appended hereto.

In the drawings accompanying this specification and forming a part of this application there is shown, for purpose of illustration, an embodiment which the invention may assume, and in these drawings:

FIGURE 1 is a perspective view of a tube piercing device embodying the present invention,

FIGURE 2 is a fragmentary view similar to FIGURE 1 but showing certain parts in separated relation,

FIGURE 3 is a fragmentary perspective view of the lower portion of the apparatus seen in FIGURE 2 but with a part thereof shown separated therefrom,

FIGURES 4 and 5 are perspective views of parts similar to that seen in FIGURE 3 but differing slightly therefrom to accommodate different tubing sizes,

FIGURE 6 is a slightly enlarged, sectional view generally corresponding to the line 6-6 of FIGURE 1, certain parts on the near side being broken away to show the underlying structure,

FIGURE 7 is a sectional view generally corresponding to the line 7-7 of FIGURE 6, and

FIGURE 8 is a view similar to FIGURE 6 but with certain parts shown in other positions.

With reference to FIGURE 1, the present invention comprises a lower die block 10 and an identical upper die block 10.1 normally disposed in the superposed, abutting relation shown. Such die blocks indirectly cooperate to provide an opening 11 in adjoining block faces and extending between opposed block faces for closely receiving a tube to be pierced. For reasons to appear, carriers 12, 12.1 are secured to respective blocks 10, 10.1 in opposed relation, such carriers being provided with opposed apertured feet 13, 13.1 respectively whereby the carrier 12 may be secured to the bed of a press or the like and whereby the carrier 12.1 may be secured to the ram of such press.

As illustrated in FIGURE 2, the blocks 10, 10.1 may readily be separated, as illustrated, to facilitate the dis-

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position of a tube in the opening 11 and for another purpose later to appear. To insure precise registry of the blocks with each other without interfering with their separability, the blocks carry vertically disposed dowel pins 14, 14.1 disposed on respective sides of the opening 11 aforesaid. Dowel pin 14.1 is anchored in block 10.1 and is closely received in a hole 15 in the block 10. Similarly, pin 14 is anchored in block 10 and is closely received in a hole 15.1 (FIGURE 6) in the block 10.1.

As previously mentioned, the opening 11 (FIGURE 1) is only indirectly provided by the blocks 10, 10.1, such opening being directly provided by inserts 16, 16.1 respectively carried by the blocks. Since the blocks and their associated inserts are preferably identical, a detailed description of one will suffice for both.

With reference to FIGURE 3 wherein block 10 is fragmentarily shown, the face of this block which adjoins the block 10.1 is provided with a channel 17 extending between opposed, side block faces for closely but removably receiving the insert 16. As illustrated, such insert is provided with a groove 18 extending from end-to-end thereof which cooperates with the corresponding groove in the block insert 16.1 to provide the tube opening 11. In order to releasably retain the insert 16 in the block channel 17, one side of the block carries a ball 19 which is urged by a spring 20 (see FIGURE 6) to seat within a slight recess in the insert. As illustrated in FIGURE 6, the block may be provided with a bore in which the ball 19 and the spring 20 are disposed, and a set-screw 21 may abut the spring to exert a compressive force thereon which resiliently urges the ball to seat within the insert recess. Although not shown, the block bore will preferably be reduced in size adjacent the channel 17 to limit projection of the ball 19 thereinto under the urging of the spring 20. To facilitate removal of the insert 16 so as to permit substitution therefor of other inserts 116, 216 such as those shown in FIGURES 4 and 4 whose grooves 118, 218 are of a different size so as to accommodate different tube sizes, a notch 22 may be formed in the block 10 in which a screwdriver blade or the like may be inserted to pry the insert from the block channel 17.

The previously mentioned carriers 12, 12.1 are secured to respective blocks 10, 10.1 by means of bolts 23, 23.1 at respective block corners. As best seen in FIGURE 6, bolts 23, 23.1 are preferably stripper bolts each having a shank portion freely passing through an aperture in respective carriers, respective reduced-size threaded portions 24, 24.1 threaded into respective blocks, and respective enlarged heads 25, 25.1 seated within respective somewhat over-block counterbores 26, 26.1. The arrangement is such, as will appear, that while each carrier 12, 12.1 is retained in assembled relation with its block, the carriers may slide toward their blocks from the positions seen in FIGURES 1 and 6 along the shanks of respective bolts 23, 23.1.

Means are provided for normally maintaining the carriers 12, 12.1 in spaced relation as seen in FIGURES 1, 6 and 7, with the bolt heads 25, 25.1 seated in the bottoms of respective counterbores and as best seen in FIGURE 7, facing counterbores 28 are formed in the block 10 and the carrier 12 in which are seated compression springs 29. Similarly, the block 10.1 and the carrier 12.1 are provided with facing counterbores 28.1 in which are seated compression springs 29.1.

As best seen in FIGURES 6 and 7, each carrier 12, 12.1 has respective punches 30, 30.1 removably anchored therein by respective setscrews 31, 31.1. As herein disclosed, the punches are in opposed relation for projection freely through respective, enlarged holes 32, 32.1 in respective blocks 10, 10.1 and their associated

inserts 16, 16.1. Punches 30, 30.1 are herein shown to have reduced-size, free end portions for a purpose to appear.

With the device as thus disclosed mounted in a press or the like with the carrier 12 secured to the press bed and the carrier 12.1 either secured to the press ram or otherwise positioned for engagement beneath the latter, operation will be as follows:

The tubing T to be pierced will be inserted in the opening 11 formed by the cooperating grooves 18, 18.1 in respective inserts 16, 16.1. Insertion of the tubing may be facilitated, if desired, by separating the blocks 10, 10.1 somewhat by elevation of the press ram (assuming of course, that the carrier 12.1 is attached to such ram). With the tubing T inserted as above described and with the blocks in the abutting relation seen in FIGURES 6 and 7, the press ram will be lowered to force the carriers 12, 12.1 toward each other against the force exerted by the springs 29, 29.1. Such movement of the carriers will cause the reduced diameter portions of the punches 30, 30.1 to pierce the closely contained tubing T as illustrated in FIGURE 8. The press ram will next be once again elevated whereupon the springs 29, 29.1 will return the parts to the positions seen in FIGURES 6 and 7 thus withdrawing the punches from the now pierced tubing. The latter may now be removed from the device and another piece of tubing positioned in the insert grooves 18, 18.1 for a repetition of the piercing operation.

It is an important feature of the present invention that tubing of various transverse sizes may readily be accommodated for piercing merely by a replacement of the inserts 16, 16.1 with those of the proper size. This is easily done by separating the blocks 10, 10.1 as shown in FIGURE 2, by prying respective inserts 16, 16.1 therefrom as previously disclosed, and by inserting in respective block channels 17, 17.1 respective inserts having the required size grooves therein.

Additionally, it is quite simple to change the size or shape of the holes being pierced in the tubing merely by replacing the punches 30, 30.1 with punches having the required size and shape at their free ends. This will readily be effectuated by separating the blocks 10, 10.1 as seen in FIGURE 2, releasing respective punches by loosening the set screws 31, 31.1 and substituting for such punches other suitable punches.

The ease with which the present device may accommodate various tubing sizes and with which it may be arranged to pierce various sizes and shapes of holes therein results in several advantages to a device purchaser. Apart from the obvious advantage of a user being readily able to convert his device for piercing different holes in different tubing sizes, the fact that the same basic device may be used for different tubing sizes and different pierced holes permits the basic device; that is, the disclosed device without inserts and punches, to be mass-produced at great cost savings without regard for its ultimate use. Thus, the only parts which need be tailored to an individual user are the relatively inexpensive inserts and punches. The above mentioned mass-production possibilities are even further enhanced because the upper block 10.1 and its carrier 12.1 are preferably identical with the lower block 10 and its carrier 12 respectively.

It will be understood that while the present device is adapted to punch a pair of holes in axially aligned relation in tubing, one of the punches could be omitted if but a single hole is required to be pierced in the tubing. Also, while the present device is shown designed to accommodate tubing which is round in cross-section,

tubing with a different cross-section (for example square tubing) can easily be accommodated merely by properly forming the desired groove in respective block inserts.

In view of the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention and it will also be apparent to those skilled in the art that the embodiment herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiment is illustrative only, and that my invention is not limited thereto.

I claim:

A tube piercing device comprising a separable pair of die blocks in face-to-face relation and each having a channel formed therein and such channels being in facing relation, inserts closely receivable in respective block channels and each having a groove therein and such grooves cooperating to closely contain the tube to be pierced, means resiliently retaining each insert in respective block channels and said inserts being removable from the latter for ready substitution therein of inserts having different grooves for close reception of different tubes, first guide means extending between said die blocks to insure precise registry therebetween and provided by a pair of guide pins in parallel relation and disposed on respective sides of said channels formed in said die blocks, one of said guide pins being anchored in one of said die blocks and being closely received in the other of said die blocks and the other guide pin being anchored in said other die block and being closely received in an aperture in said one die block, a punch carrier adjacent one of said die blocks and movable toward and away therefrom, second guide means provided by an elongated cylindrical member slidably carried by said punch carrier and having one end threaded into said one die block for anchoring purposes, said member mounting a shoulder spaced from its said one end and cooperable with said punch carrier to limit movement of the latter in a direction away from said one die block, and a punch secured to and movable with said punch carrier and having a free end spaced radially outwardly of said one die block groove when said punch carrier is spaced from said one die block and such punch end projecting into said one die block groove to pierce a tube disposed therein upon punch carrier movement toward said one die block.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

390,863	10/1888	Kelly	83—454
814,200	3/1906	Gibson	83—465 X
1,230,319	6/1917	Paulson et al.	83—465
1,241,255	9/1917	Hawthorne	83—390
1,895,589	1/1933	Spatta	83—54 X
2,173,730	9/1939	Schmied	83—620 X
2,632,511	3/1953	Hamilton	83—390 X
2,670,795	3/1954	Griep	83—54 X
2,699,830	1/1955	Hodge	83—637 X
3,027,793	4/1962	Sommer	83—698
3,120,143	2/1964	Krieder	83—54 X

##### FOREIGN PATENTS

565,056 10/1958 Canada.

WILLIAM W. DYER, Jr., *Primary Examiner.*

ANDREW R. JUHASZ, *Examiner.*