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J. H. ABRAMSON ET AL

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METAL PUNCH

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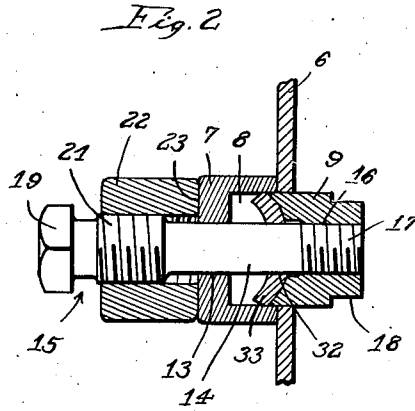
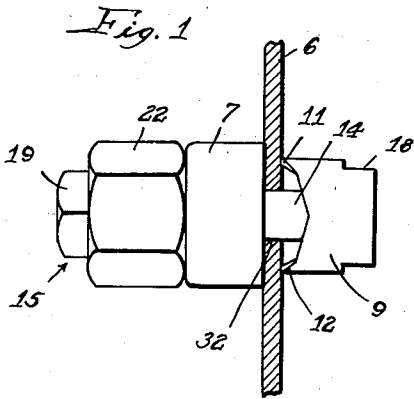


Fig. 3

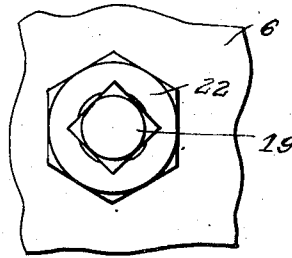
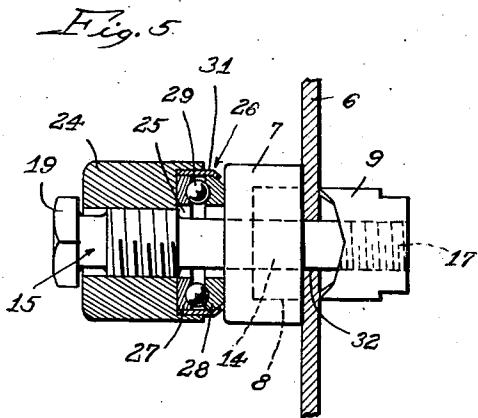
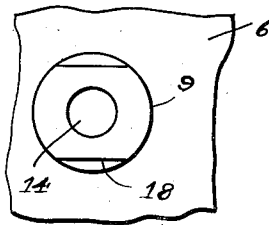


Fig. 4



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METAL PUNCH

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4 Claims. (Cl. 164—101)

This invention relates to metal punches and has special reference to a punch of the draw type.

Metal punches of the type herein contemplated, while used for a large variety of work, are commonly used for punching holes in electrical outlet boxes and the like, and this service places a heavy strain on the tools due to the thickness and toughness of the sheet metal. In this service the punches are used for cutting circular holes for the reception of electrical conduit, and in so doing the user first drills a hole through the metal with a small portable electrical drill. The screw is then passed through the hole, the die and punch elements are thereafter assembled on the screw with the elements on opposite sides of the metal, and the elements are then brought together, either by rotation of a nut or by rotation of the screw, to shear a hole in the box.

In practice the largest sized hole which can be conveniently drilled is $\frac{3}{8}$ " since most of the portable electric drill stocks will not accommodate a larger drill or bit. Therefore the largest commercially practicable screw which can be passed through the hole is $\frac{3}{8}$ ". However, considerable trouble has been experienced with devices with this sort in that the threads on the screw strip off after a short time in service because the power required to cut the heavy metal is too great for the threads on the screw.

We have found, however, that if the shearing force is applied so that there is no rotative movement between the screw and the element to which it is threaded, that is, so that there is no movement between the cooperating threads of the $\frac{3}{8}$ " screw, the threads have ample strength to withstand the required service.

An important object of the invention is to provide a punch of greater durability than those of the prior art and a punch in which the shearing operation is performed with greater facility.

We have also aimed to provide a punch wherein improved means are provided for imparting shearing movement to the punch elements.

A further object of the invention is the provision of a punch having a novel combination of a punch element, a die element, a screw for carrying the elements and means for imparting shearing movement to the elements.

We have also aimed to provide an improved screw for draw type punches.

Other objects and advantages will appear from the description and the drawing, in which—

Figure 1 is a side elevation of a punch embodying our invention;

Fig. 2 is a section taken longitudinally through the punch;

Fig. 3 is an end elevation of the punch showing the head of the screw;

Fig. 4 is an end elevation of the opposite end of the punch from that shown in Fig. 3, and

Fig. 5 is a side elevation, partly in section, showing a modified form of the punch.

Referring first to the form shown in Figs. 1 to 4, inclusive, the numeral 6 designates a sheet of metal, such as a side of a conventional outlet box, through which a hole is to be punched. The punching operation is performed by a die element 7 having a bore 8 adapted to receive a punch element 9 so as to shear the metal along the line at which the punch is received in the bore of the die as shown in Fig. 2. Commonly the punch is provided with shape characteristics such as the teeth 11 and 12 which serve to facilitate the shearing operations by entering the metal prior to the main body of the punch element 9. The die element 7 has a centrally disposed opening 13 for the reception of the body portion 14 of a screw designated generally by the numeral 15. The punch 9 likewise has a centrally disposed opening 16 for the reception of the body portion 14 of the screw, the openings 13 and 16 being arranged so that the punch and die elements approach each other in shearing relationship. The opening 16 is internally threaded for reception of the threaded section 17 of the body portion 14 as shown in Fig. 2, the punch element having flat sides adjacent its end as shown at 18 for the use of a wrench, if desired, for imparting relative movement between the punch element and the screw. It will be understood that while in this instance the punch element is threaded directly onto the screw, similar results might be obtained by making the bore of the element smooth and employing a nut on the threaded section 17 of the screw, the object being to retain the punch element against movement under the shearing force.

The screw 15 is provided with a head 19 at the end thereof opposite the threaded section 17 and adjacent to the head 19 is an enlarged externally threaded portion 21. In this particular instance the body portion 14 has the conventional size of a $\frac{3}{8}$ " screw, whereas the enlarged threaded portion 21 has the conventional size of a $\frac{1}{2}$ " screw. While the invention is of particular value in small sizes such as those recited, it is by no means limited to such sizes. Positioned on the enlarged threaded portion 21 is a nut 22 internally threaded for cooperation with the threaded

portion 21, the nut 22 being relatively long and having a bearing face 23 adapted to abut against the end of the die element 7 as shown in Fig. 2, the length of the nut being such as to impart upon its rotation sufficient travel to the die element 7 to accomplish the shearing of the sheet metal 6 by bringing the cutting edges of the punch element 9 completely into the bore 8.

In the form shown in Fig. 5 the construction is substantially similar to that of Figs. 1 and 2 with the exception that a nut 24, substantially similar in function to the nut 22, is provided, having a counterbore 25 within which is received an anti-friction bearing designated generally by the numeral 26 having spaced races 27 and 28 between which is positioned an annular row of balls 29, the bearing being held together by means of a cage 31 having a press fit in the bore 25. When the nut 24 is brought against the die element 7 as shown in Fig. 5, the race 28 bears against the die element so that the force is transmitted from the nut to the die element through the balls 29. In this way the friction between the nut and the die element is substantially reduced. By thus reducing the friction between these elements the strain on the screw 15 is reduced, primarily as to side strain occasioned by the eccentricity of wrenches applied to the nut for the purpose of turning the same. The arrangement shown in Fig. 5 is of special importance in large size punches wherein the element of friction between the two members assumes substantial proportions.

In use, the operator drills a hole in the sheet metal as shown at 32 by means of a portable electric drill or otherwise and inserts the body portion 14 of the screw 15 through this opening. As previously pointed out, the largest hole which the operator can ordinarily drill is a $\frac{3}{8}$ " hole because of the limitation in size of the chucks on portable drill stocks. The screw 15 is then threaded into the punch element 9 with the die element 7 and the nut 22 in position on the screw, the threaded section 17 being turned into the punch to the maximum extent in order to exert the greatest power transmitting capacity as between the screw and the punch. Thereupon the nut 22 is rotated bringing the die element 7 first into the position shown in Fig. 2 and upon continued rotation of the nut 22, by means of a wrench or otherwise, through the position shown in Fig. 2 into a position in which all of the metal has been sheared. The punch element 9 is then removed from the screw and the cut-out disk indicated by the numeral 33 is removed from the bore 8. Where it is necessary to punch a larger hole, a second punch, identical with that shown in the drawing with the exception of the relative sizes of the parts, is inserted in the hole thus cut and a second punching operation performed. For the latter type of punches the construction shown in Fig. 5 is desirable in that it materially reduces the power required to rotate the nut and advance the die and punch elements through their relative shearing movements.

While we have described a specific embodiment

of the invention, this has been by way of illustration, and we do not wish to be limited except as required by the prior art and the scope of the appended claims, in which we claim:

1. A metal punch comprising a punch element, a die element having a bore to receive the punch element to shear metal therebetween, each of said elements having a central opening, a screw of smaller diameter than said openings passing through said openings and having a threaded portion of larger diameter adjacent thereto, means acting between said threaded portion and one of said elements for imparting shearing movement of said element longitudinally of said screw to move the punch into the die, and means acting between said screw and the other of said elements to prevent longitudinal movement of the latter on the screw under the shearing force to shear metal in response to said longitudinal shearing movement.

2. The combination in a metal punch of a screw having an enlarged threaded portion spaced from one end thereof, a punch element and a die element axially positioned on said screw, at least one of said elements being slidable thereon and the other of said elements having an internal screw thread for reception of the screw, and means acting between said enlarged threaded portion and said slidable element for urging the same longitudinally of the screw toward the internally threaded element to shear metal therebetween.

3. A metal punch comprising a punch element, a die element having a bore for reception of the punch to shear metal therebetween, each of said elements having a central opening, a screw having a head, an enlarged threaded portion adjacent said head and a portion for reception in said openings, said screw having a sliding fit in at least one of said central openings, means acting between said screw and one of said elements for retaining the same against longitudinal movement under shearing force applied to said screw, and a nut on said enlarged threaded portion adapted to bear against the other of said elements to move the element through a shearing stroke.

4. A metal punch comprising a punch element, a die element having a bore for reception of the punch to shear metal therebetween, each of said elements having an axial opening, the axial opening of one of said elements being threaded, a screw having a body portion including a threaded end for reception in said threaded axial opening to retain one of said elements against movement under the shearing force, said body portion having a sliding fit in the other of said central openings, said screw also having a head on the end thereof opposite said threaded portion and an enlarged threaded portion adjacent said head, and a nut on said enlarged threaded portion adapted to bear against one of said elements to urge the same toward the other of said elements through a shearing movement.

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