

June 30, 1953

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2,643,721

PUNCH WITH SLUG EXTRACTING MEANS

Filed March 6, 1947

2 Sheets-Sheet 1

Fig: 1.

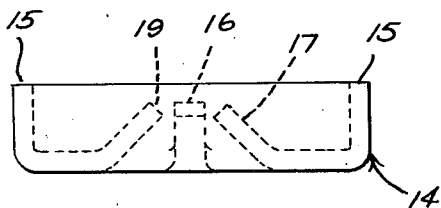


Fig. 2.

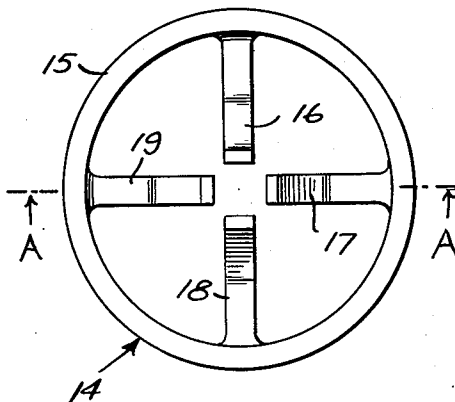


Fig. 3.

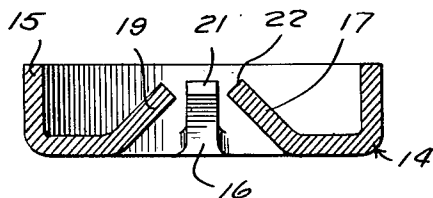


Fig. 4.

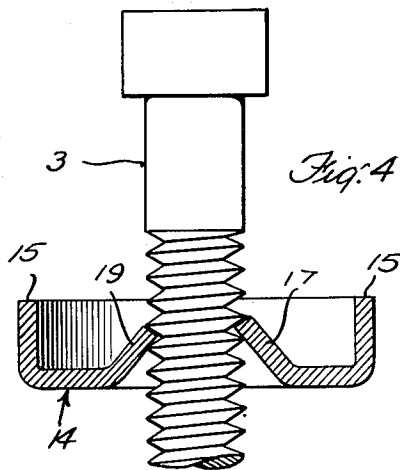
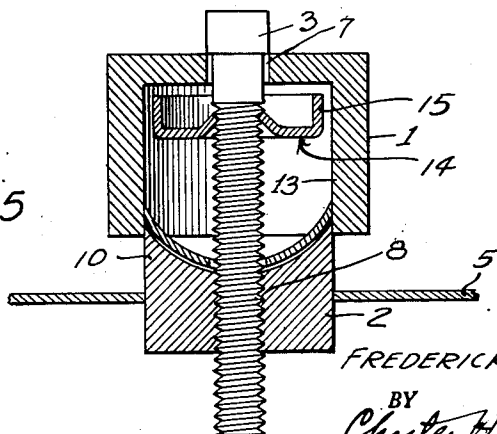


Fig: 5



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Fig. 6.

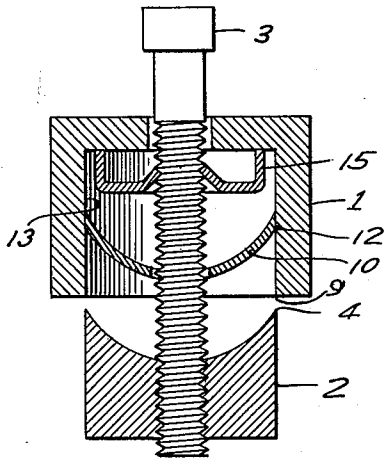


Fig. 7.

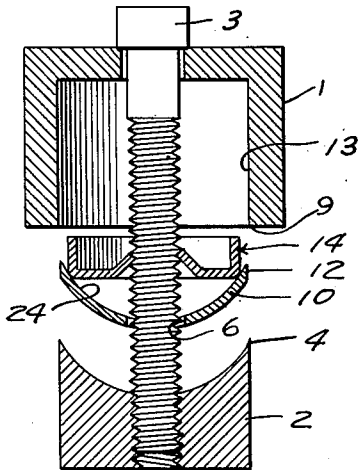
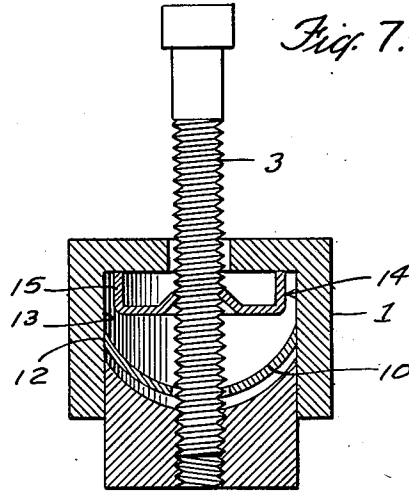


Fig. 8.

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2,643,721

PUNCH WITH SLUG EXTRACTING MEANS

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Application March 6, 1947, Serial No. 732,811

4 Claims. (Cl. 164—101)

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This invention relates to an improved metal punch having means for extracting punched slugs therefrom of the type using a threaded member in common with a male and female die to draw the male die through the material to be punched into the female die, depositing the punching therein. The objects of my improvement are, first, to provide a simpler and quicker means for removing the punched slug from the female die, and second, to eliminate possible injury to the cutting surfaces of the female die of the punch in the removal of the slug from the same. A punch of the type referred to and shown in the drawings is in common use today to which this invention may be readily applied.

I attain these objects by use of a device described in the following drawings which accompany and form a part of this specification, and in which:

Fig. 1 is a side elevation view of the slug-removing device used in my invention;

Fig. 2 is a top view of the device shown in Fig. 1;

Fig. 3 is a vertical section taken on line A—A of Fig. 2;

Fig. 4 shows the assembly of the slug-removing device of my invention on the threaded member when in position for use;

Fig. 5 shows the position of the slug-removing device of my invention within the female punch just following a punching operation.

Fig. 6 shows the position of my invention after the first step of slug extraction;

Fig. 7 shows the position of my invention during step two of slug extraction; and

Fig. 8 shows the third and final step of slug extraction by my invention.

The type of metal chassis punch shown in Figs. 5-8 is comprised of three parts, the female die shown as 1, the male die 2 and bolt 3. Both dies are circular in cross section with the irregular or inclined edge 4 forming a cutting edge for the die 2 and the edge 9 forming the cutting edge for die 1. The female die 1 has a clearance hole 7 in its end wall through which the bolt 3 passes. Male die 2 is provided with a tapped hole 8 for the threads on bolt 3. In using this punch a hole 6 is first cut through the metal for the screw 3.

In using the punch described, a slug 10, is cut and forced with considerable pressure into the female cavity 11, and is firmly embedded therein, and when of heavy gauge metal, may well offer marked resistance to removal. Often a hole is provided in the top of the female die through which a pin may be placed in contact with the inner slug and the latter knocked out with a

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hammer applied to the pin. This method, however, is not always satisfactory in that the straight sides 12 of the punched slug 10 tend to bind on the inner walls 13 of female cavity 11 if unevenly distributed pressure is exerted on the concave surface of the slug 10. Binding of the slug within the female cavity gives cause for prying, twisting or chiseling, which may damage the cutting surface of the female die.

A punch having my slug-removing means offers a quick and effective method of safely extracting the slug without recourse to other tools or processes. The ejecting element (shown in Figs. 1 and 2) will be termed the "Extractor" and referred to as such in further discussion.

As shown in Figs. 1 and 2, the extractor 14 is circular and dish-like in shape with upturned rim 15, and having an opening in the center of the flat portion of the dish with a plurality of radial ears such as 16, 17, 18 and 19 bent upward in the direction of the rim 15. The ears 16, 17, 18 and 19 are so formed that their respective inner edges 21, 22 and 23 shown in Fig. 3 will conform to the thread pitch and diameter of the bolt 3 shown in Fig. 4. The extractor is made of a light gauge stiff spring material so that the bolt 3 may be quite easily separated from the extractor 14 by lifting the bolt up in the direction of the ear curvature. However, any thrust motion in the opposite or downward direction will be opposed by the lower edges of the ears engaged in the threads of bolt 3. It is further noticed that the upper edges of the ears do not extend above the rim surface of the extractor. This feature will be explained later.

In practice the extractor 14 is placed on the bolt 3 in the position shown in Fig. 5, after the bolt has been inserted in the clearance hole 7 of the female die. The female die, bolt and extractor assembly is then placed over the clearance hole 6 in the metal sheet 5 and the bolt extended beneath the metal surface through the hole 6, allowing the male die 2 to be screwed on. Continued tightening of the screw forces the male die 2 through the plate 5 to form the hole and into the cavity of the female die 1. The slug 10 is forced into the cavity of the female die and the extractor remains above the slug and is in the uppermost portion of the female cavity. The rim 14, of course, extending beyond the height of the ears as previously explained, eliminates the possibility of the ears getting snarled in the threads of the bolt and the upper surface of the female cavity during the tightening and punching process.

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To extract the slug now it is necessary to follow but three simple steps: First, in Fig. 6, unscrew bolt 3 from male die 2 a small way and depress the bolt slightly into the female die, holding same; further continue to unscrew the male die 2 from the bolt 3 to a point comparable to Fig. 6. Step two, shown in Fig. 7, is then to strike the lower surface of the male die 2 against a hard surface while holding female die 1 in hand and allowing the bolt 3 to pass through the extractor in the direction of the ears, as described in Fig. 4, and result in the arrangement shown in Fig. 7. Now the third and final step, shown in Fig. 8, consists in striking the top of the bolt 3 downwardly in the direction against radial ears of the extractor, thus engaging the extractor 14 on the threads of the bolt 3, causing it to then move downwardly with the bolt and contact the slug 10 at a surface 24 on the concave side of the slug, thereafter forcing the slug to leave the female cavity, at which time the slug clearance hole 6 allows the slug to be easily removed from the bolt after completely unscrewing the male die 2 from the bolt 3.

To repeat the operation it is necessary only to screw the extractor up on the bolt until it enters well into the female die cavity and repeat the punching process as previously described.

Where this extractor principle finds ready application in removing circular slugs from the type of sheet metal punch described, other applications to various needs of slug extraction in dies and punches of different shapes and configuration will suggest themselves without, however, departing from the spirit of my invention as described in the following claims.

What I claim is:

1. In a sheet metal punch, a partially closed female die; a bolt loosely extending axially through the female die; a male die threadedly attached to the bolt and adapted to be moved thereby into the female die; an extracting means carried by the bolt and located on the opposite side of the sheet metal to be punched from the male die and constructed to permit the bolt to be pulled through the extracting means in a direction from the male die; and means for engaging the threads on the bolt so that the bolt will engage and move the extracting means to cause the latter to eject a punched slug from the cavity in the female member when the bolt is forced in the ejecting direction through the female member.

2. In a sheet metal punch, a combination of a partially closed female member; a headed bolt projecting from the partial closure of the female member axially through the same and adapted to slide loosely through the partially closed end of the female member, but being limited in movement in one direction by the head of the bolt; a male member threadedly engaging the bolt and having a cutting edge cooperating with a cutting edge on the female member and having a strip of sheet metal to be punched placed between the male and female members and through which the bolt is to loosely extend; an extracting means surrounding the bolt and adapted to fit inside the female member above the metal to be punched, yielding projections on the extracting means immediately surrounding the bolt, allowing the bolt to move in one direction axially relative to the extracting means and adapted to engage the threads on the bolt when the bolt is attempted to be moved in the opposite direction relative to the extracting means, said extract-

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ing means adapted to engage and eject the punched slug from the cavity of the female member upon driving of the bolt in the ejecting direction through the female member.

3. In a sheet metal punch, a combination of a female member having a cavity therein and an end wall having a hole therethrough, the edge of the cavity forming a cutting edge, a headed bolt projecting loosely through the hole in the end wall of the female member, the hole in the end wall being smaller than the bolt head to limit its movement in one direction by the head of the bolt, a male member threadedly engaging the bolt and having a cutting edge slidable within the cavity and cooperating with a cutting edge on the female member, an extracting means of a size to be insertable inside the cavity of the female member above the metal to be punched, yielding projections on the extracting means engaging the threads of the bolt at an angle with respect thereto to flex outwardly when the bolt is moved in one direction axially relative to the extracting means and non-flexibly engaging the threads on the bolt when the bolt is moved in the opposite direction, said extracting means adapted to engage and eject a punched slug from the cavity of the female member upon driving of the bolt in the ejecting direction through the female member.

4. In a sheet metal punch, a combination of a female member having a cavity therein and an end wall having a hole therethrough, the edge of the cavity forming a cutting edge, a headed bolt projecting loosely through the hole in the end wall of the female member, the hole in the end wall being smaller than the bolt head to limit its movement in one direction by the head of the bolt; a male member threadedly engaging the bolt and having a cutting edge slidable within and cooperating with a cutting edge on the female member, an extracting means of a size to be insertable inside the cavity of the female member above the metal to be punched, yielding projections on the extracting means engaging the threads of the bolt at an angle with respect thereto to flex outwardly when the bolt is moved in one direction axially relative to the extracting means and non-flexibly engaging the threads on the bolt when the bolt is moved in the opposite direction, and the extracting member having an axial dimension so that it extends above the yielding projections, said extracting means adapted to engage and eject a punched slug from the cavity of the female member upon driving of the bolt in the ejecting direction through the female member.

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