

March 13, 1951

P. G. MÁBY
PUNCHING TOOL

2,545,237

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2 Sheets-Sheet 1

Fig. 1

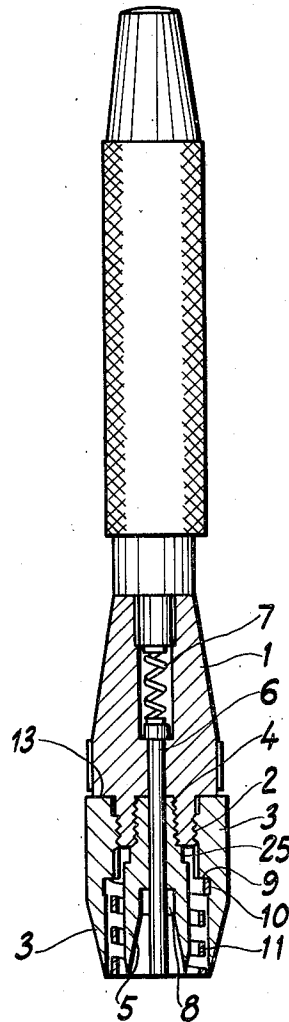


Fig. 2

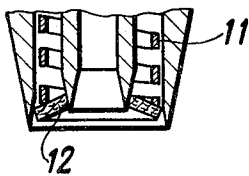
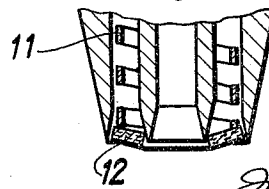


Fig. 3



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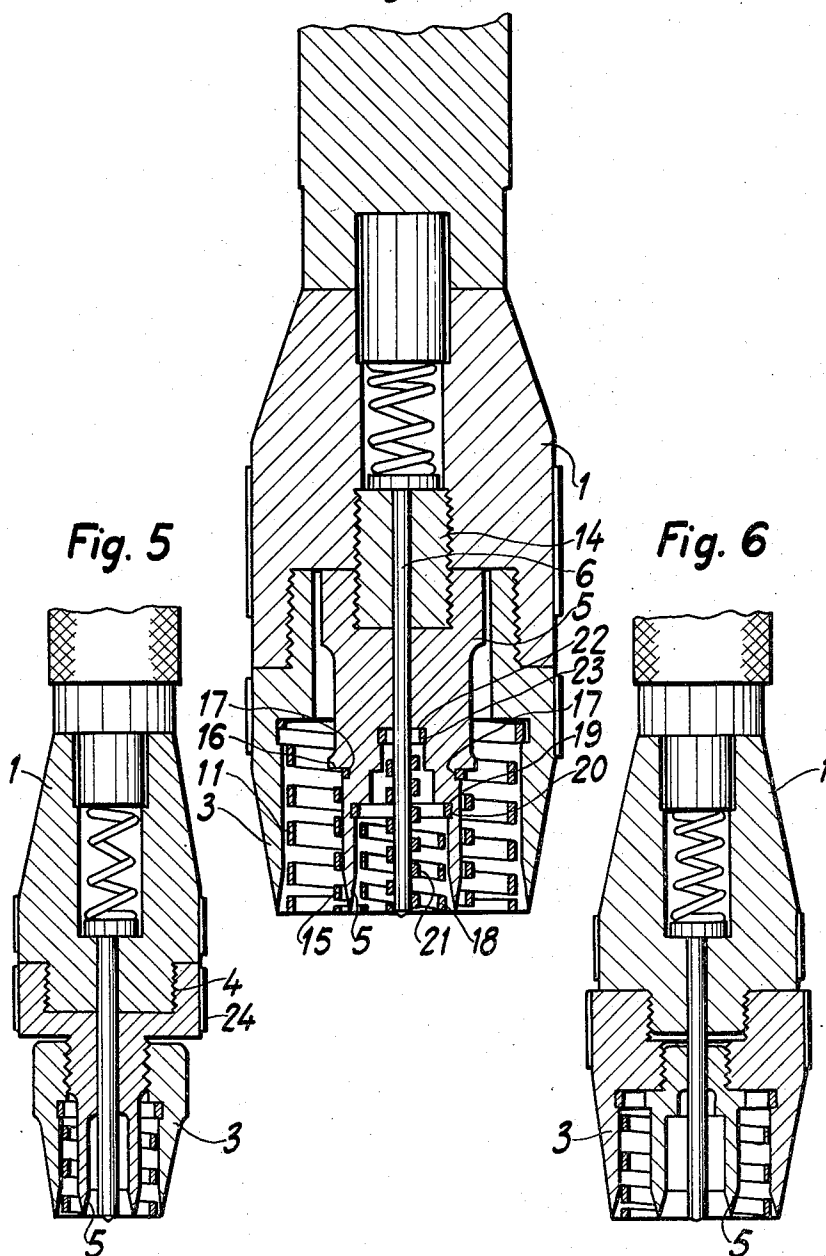
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Fig. 4



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UNITED STATES PATENT OFFICE

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PUNCHING TOOL

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7 Claims. (Cl. 164—32)

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The present invention relates to a punching tool for cutting out annular washers, particularly of packing material, while using an inner sleeve-shaped cutting edge and a sleeve-shaped outer cutting edge surrounding the former edge which edges are detachably fixed in a holder. In punching tools of this kind hitherto known it has often been found that the cut-out packing washer tends to stick between the outer and inner edges. The present invention has, amongst others, for its purpose to render possible a rapid removal of the packing washer from the interspace between the edges and consists substantially therein that the outer edge as well as the inner edge are, by means of individual threads, screwed into the holder directly or indirectly so that the one edge is rotatable in its threads independently of the other edge. Provided the screw pitch is defined as being the distance between like points in two consecutive turns of the thread and is counted as the positive lead in a certain direction of rotation, the pitch of the outer edge is, according to a preferred embodiment, more positive than that of the inner edge. This may mean, that the screw pitch of the inner edge is negative in relation to that of the outer edge, so that the threads of the one edge are right-handed and those of the other edge left-handed. The pitch of the inner edge may then have the same or a greater absolute size than that of the outer edge. Both screw pitches may, however, be positive provided that the screw pitch of the inner edge is less steep than that of the outer edge.

The invention will be further described with reference to the accompanying drawings, on which Fig. 1 illustrates the tool in lateral view and partly in longitudinal section. Figs. 2 and 3 show details of Fig. 1 with the parts in two different positions. Figs. 4, 5 and 6 show longitudinal sections of three different embodiments of the invention.

In the embodiment shown in Fig. 1 the holder is provided with a thread 2, on which the outer edge 3 may be screwed. The holder 1 is also provided with a thread 4 in which the inner edge 5 may be screwed. The thread 2 has, counted in the direction of rotation, a greater positive pitch than the thread 4. The latter may either have a faint pitch in the same direction as the thread 2 or a thread in the opposite direction, i. e. a negative pitch in comparison with the pitch of the thread 2. The edge 5 and the holder 1 are, in a way known, provided with a bore receiving an ejecting plunge 6, which is actuated by a helical compression spring 7. The inner edge 5 is

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provided with abutments 8 and 25 respectively, by way of example, in the shape of an interior and/or exterior hexagon, a slot or the like, engageable by a wrench, chisel or the like, whereby the inner edge may be screwed out or tightened independently of the outer edge, by way of example, in exchanging. The outer edge 3 is on its inside provided with a shoulder 9 and an annular slot 10. A helical spring 11 is inserted between the outer and the inner edges and its innermost turn is somewhat pressed out so as to engage the slot 10, whereby the spring is retained. The spring 11 is preferably given a rectangular and relatively narrow cross section, whereby a great force is obtained when cutting out narrow packings.

The device functions in the following manner. When the tool is struck, for instance, into a piece of leather the edges 3 and 5 pierce down into the material while the elastic elements 6 and 11 are forced inwards by the material. When the punching tool has penetrated the material, the tool is lifted upwards, a cut-out packing washer between the edges 3 and 5 and a round central portion within the inner edge then sticking to the tool. The central portion will, as a rule, be ejected by the plunge 6 without difficulties, whereas, on the other hand, the packing washer between the inner and the outer edges will often remain in position in spite of the action of the spring 11.

When the operator grips the socket of the edge 3 by his hand and rotates it in its screwing-off direction, the edge 5 will not participate in the rotation due to the fact that its threads 4 are either threaded in the opposite direction or threaded in the same direction as the threads 2 but have such a small pitch, that a considerably larger turning moment is required to unscrew the inner edge than the outer edge. The process is illustrated more closely with reference to Fig. 2. The cut-out washer 12 is pulled off partially from the inner edge, it being then elastically contracted in its central aperture and the pressure towards the inner edge is decreasing. The distance between the outer and inner edges of the washer will increase somewhat. A decrease of the pressure and a certain movement at the outer and inner edges of the washer will also arise therefrom that the washer will be somewhat convex inwards at its inner edge, the washer being sucked and held by the inner cutting edge when the outer cutting edge is being rotated in the direction of unscrewing and thus moves downwards according to Fig. 2.

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If the inner cutting edge 5 has a negative pitch in relation to the outer cutting edge 3 the inner edge 5 will be tightened when the outer edge is being unscrewed, due to the strong friction of the washer against the inner cutting edge from the beginning. The inner cutting edge need not therefore be tightened very firm with a wrench, which means saving time.

If the outer cutting edge is then rotated in the opposite direction so as to be tightened, the washer 12 will, according to Fig. 3, be forced outwards along the inner cutting edge and be made convex outwards at its inner edge. This gradually results in a decrease of pressure and movement towards the outer cutting edge, which facilitates the operation of the ejector spring 11 when pushing out the washer.

If the outer cutting edge 3 is made with comparatively sharply inclined and/or coarse threads, the washer will be pulled off from the inner edge already by a very small rotation of the outer edge which latter will not stick to the shoulder 13 of the holder 1 provided it is tightened only by hand.

By using outer edges having a pitch suitable for the ejection, the ejection springs 11 may be made of thinner goods and weaker spring tension and packing washers of narrower cross-sections may be produced.

It is preferable to make the inner edge 5 somewhat longer axially, by way of example 0.5 millimetre, than the outer edge, whereby the inner edge will force the washer more easily from the outer edge. Without being able to observe it in punching, the operator will then be sure of the fact that the inner cutting edge has penetrated the packing material at the moment when the outer edge has reached so far as to have cut-off the washer from the surrounding packing material.

In the embodiment shown in Fig. 4 the inner edge 5 is not directly screwed into the holder 1. Instead, a bushing 14 is screwed into the holder 1 and the inner edge 5 is screwed thereon. In addition to the spring 11 already described, also a spring 15 may be provided in the interspace between the outer edge 3 and the inner edge 5, the inner end of said spring 15 bearing against an abutment 16 of the inner edge 5 and being retained in a slot 17 of the same edge. The ejector action of the plunge 6 may be amplified by two springs, the outer one 18 of which bears against an abutment 19 in a slot 20 of the inner edge 5, whereas the inner spring 21 bears against an abutment 22 in a slot 23.

In the embodiment shown in Fig. 5 it has been endeavoured to facilitate further the ejection movement of the edges. For this purpose the outer edge 3 is screwed onto the inner edge 5, which in its turn is screwed onto the holder 1 by means of the threads 4, the inner edge 5 being then accessible from the outside between the screwed-on outer edge 3 and the holder 1 and having there preferably a knurled or grooved portion 24 to facilitate its engagement by the finger.

Finally, according to Fig. 6, also the inner edge 5 may be screwed into the outer edge 3, the latter

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being, in its turn, screwed onto the holder 1. Otherwise this embodiment corresponds with the ones previously shown.

I claim:

1. A punching tool for cutting out annular washers, said tool having an inner cutter and a sleeve shaped outer cutter surrounding the inner cutter, a holder for said cutters and separate threaded connections for securing said cutters to said holder whereby each is rotatable on its threads independently of the other, the screw pitch of the threads securing the outer cutter being more positive than that of the threads securing the inner cutter.

2. A punching tool for cutting out annular washers, said tool having an inner cutter and a sleeve shaped outer cutter surrounding the inner cutter, a holder for said cutters and separate threaded connections for securing said cutters to said holder whereby each is rotatable on its threads independently of the other, the screw pitch of the threaded connections securing one of said cutters being right handed and those securing the other cutter being left handed.

3. A tool as claimed in claim 2 in which the screw pitch of the threads of the connection securing the inner cutter has the same or a greater absolute size than that of the outer cutter.

4. A tool as claimed in claim 1 in which the screw pitch of the threads of the connection securing the inner cutter is positive though less than that of the outer cutter.

5. A tool as claimed in claim 1 in which the inner cutter is threaded onto the holder and the outer cutter is threaded onto the inner cutter and in which the inner cutter is accessible from the outside between the outer cutter and the holder.

6. A tool as claimed in claim 1 in which a rigid ejecting plunger is reciprocally mounted in the holder, a spring is mounted in a cavity in the holder independently of the inner cutter and urges said plunger outwardly for ejecting purposes and the inner cutter is sleeve-shaped and surrounds the ejecting plunger.

7. A tool as claimed in claim 1 in which a helical compression spring is mounted between the inner and outer cutters, the turns of the spring having a rectangular cross-section and the outermost end turn being formed to serve as an ejecting abutment.

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