Nov. 25, 1947. J. F. KOPCZYNSKI ET AL 2,431,567

TOOL

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Fig. 1.

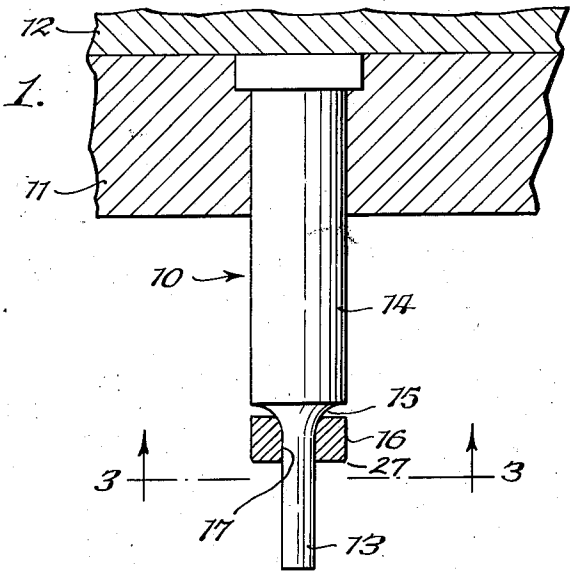


Fig. 2.

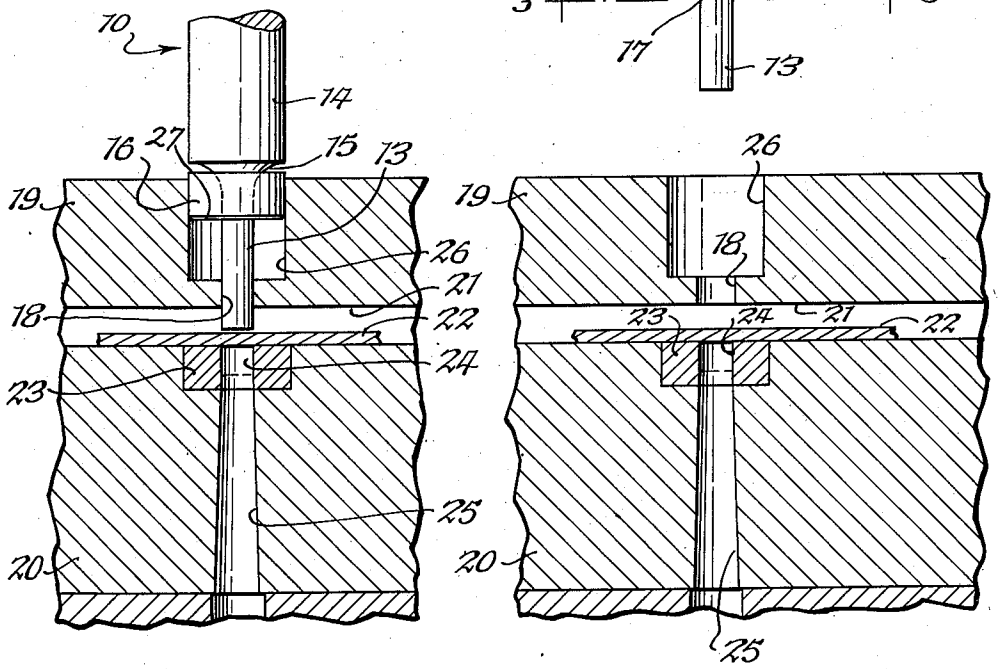
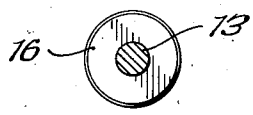


Fig. 3.



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TOOL

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6 Claims. (Cl. 164—124)

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This invention relates to tools, and particularly to punches for punching holes or apertures in sheets.

In die sets, a punch reciprocates relatively to a die and usually has a reduced end portion which does the punching, and an intermediate or junction zone connecting the main body portion with the reduced end portion or punching end. This intermediate zone increases progressively in cross sectional area through a plurality of stages from the reduced end portion of the body portion. Considerable difficulty has been experienced with punches of this type, owing to the fact that the reduced end portion frequently breaks off at approximately its junction with the intermediate zone which may be conveniently referred to as the fracture point. The cause of such breakage is due to a whipping of the reduced end portion of the punch, caused by the stresses created in the actual punching operation. When such a breakage occurs, the punch must be replaced by a new punch which in itself is a substantial expense, and also causes delay while the punches are being replaced and aligned.

An object of this invention is to provide an improved punch device or tool; with which punching operations may be performed in the usual manner; with which breakage of the punches is substantially reduced or eliminated; which will not interfere with the usual operations of the tool; with which the initial cost of the tool will be relatively small; and which will be practical and relatively simple.

Various other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawing:

Fig. 1 is an elevation, partly in section, of a punch device constructed in accordance with this invention;

Fig. 2 is a view similar to Fig. 1 but illustrating the position of the parts just before the blank or work is engaged by the punch; and

Fig. 3 is a bottom, sectional plan of the punch, the section being taken approximately along the line 3—3 of Fig. 1.

In the illustrated embodiment of the invention a metal standard type, one-piece punch 10 is suitably mounted in a punch holder 11 which, in turn, is connected to a die set member 12. The punch 10 has, at its lower or punching end, a punch shank 13, which is connected to the

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larger body part 14 of the punch by an intermediate or junction zone 15, that enlarges in cross sectional area in a plurality of stages in a direction away from the lower or punching end. Fitted on the punch is a cylindrical collar 16, also preferably of metal, which has an aperture 17 therein which snugly fits the shank of the punch end 13, and which also extends along the intermediate zone 15 a short distance. This collar 16 is fixed on the punch such as by shrinking it to the punch at the proper position, or by sweating, soldering or welding it thereto, or in any other suitable manner.

The reduced end or shank 13 of the punch passes through and slidingly fits an aperture 18 in a stripper 19, which is suitably secured upon the lower die plate 20. Beneath the stripper is a space 21 to receive the work 22, in the nature of a strip or sheet of material to be punched, which rests upon the upper face of a die 23 countersunk flush in the upper face of the die base or plate 20. The die 23 has an aperture 24 from face to face which is aligned with an opening or passage 25 in the die base or plate 20.

The punch 10 is positioned with its punching end 13 aligned with the aperture 24 in the die 23, so that when the punch is moved endwise, it will pass through the blank or work 22 and punch a slug therefrom which drops downwardly through the passages 24 and 25. When the punch 10 is retracted, the stripper 19 prevents the blank from following the punch end or shank 13 of the punch, and then the blank may be moved into a new punching position.

In this example of the invention, the stripper member 19 is provided with a cylindrical recess 26 in its upper face which is concentric with the punch shank 13, and of a shape and size to receive and slidingly guide the collar 16 before the advancing end of the punch engages the blank 22, as shown in Fig. 3. The periphery of the collar 16 fits closely, but freely, in the recess 26, and the advance corner edge of the collar is bevelled off as at 27 to facilitate entry of the collar into the recess. The collar 16 enters the recess 26 before the advancing end of the punch engages the blank 22.

Any whipping of the shank 13 of the punch is avoided by the engagement of the collar 16 with the side wall of the recess 26, and the recess is deep enough to enable the punch to make its full stroke before the collar 16 reaches the bottom of the recess. This guiding support for the punch at its punching end portion or shank, effectively reduces or largely eliminates the break-

age of the punch heretofore experienced. The periphery of the collar 16 is machined to the proper size after it is fitted on the punch, and preferably the periphery of the collar 16 is machined to the same diameter as that of the main body of the punch. It is believed that the operation of the device will be clear from the foregoing description.

The punch illustrated in the drawings is formed to produce round apertures in the blank or work sheet 22, and the collar 16 has a circular periphery. It will be understood, however, that either or both of the punching end or shank 13 of the punch and the collar 16 may have non-circular peripheries of any particular design, depending upon the character of the aperture to be punched in the blank or work 22. The periphery of collar 16 may be circular even when the reduced or punching end of the punch is non-circular. When the periphery of either the shank 13 or collar 16 is changed so as to be non-circular, then the passage 18 through which the shank 13 slidingly fits, or the side wall of the recess 26, will be correspondingly changed so that for any shape of the punching end of the punch, the guiding parts may be suitably provided with sliding fits.

With the punch strengthened in accordance with this invention, it is possible to punch apertures in blanks that have a thickness substantially greater than the diameter of the advance or piercing end of the punch. In fact, blanks having the thickness twice the diameter of the punch or aperture have been successfully pierced in this manner. It will be noted that the collar which closely fits the smaller end of the tapered part 15 of the piercing element 10 as well as the adjacent part of the end 13, is immovably fixed on element 10 and moves therewith. This does not interfere with the continuity of the metal of the element from end to end.

It will be understood that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention, as expressed in the appended claims.

We claim:

1. In a piercing punch device of the type having a lower die plate and a punch holder movable toward and from said plate, that improvement therein which comprises an integral piercing punch element having a body portion detachably anchored in said holder and projecting therefrom towards said die plate, said projecting portion being reduced in cross sectional area from its free end for a part only of its length and joining the unreduced part through a tapered portion, a separate collar fitted over and attached tightly, securely and immovably on said reduced part and extending in both directions along the length of the element from the junction between the reduced part and said tapered portion, but terminating before reaching said holder and the free end of the reduced part, and a stripper member having an aperture through which the free end of said reduced part moves in a piercing operation and in which said free end of the reduced part has a sliding fit and by which it is guided, said member also having walls snugly and slidingly guiding said collar in a piercing operation from engagement of the free end of said element with a blank to be pierced for at least a substantial part of the piercing operation.

2. In a piercing punch of the type having a lower die plate with a female die, a punch holder movable towards and from said plate and having a recess in which one end of the body of a one-piece piercing punch element is firmly but detachably anchored and from which said punch element projects towards said plate, passes through a tapered portion into an elongated piercing end of substantial length and reduced cross sectional area, and a stripper member having an aperture through which the free end of said piercing end reciprocates with a sliding fit, that improvement which comprises said element of one piece, and a separate collar attached tightly, securely and immovably on said element to extend in both directions along the element from the junction between the smaller end of the tapered portion and the reduced piercing end but terminating in spaced relation to said free end and said holder, whereby when said collar is slidingly guided by said member, breakage of said piercing end is prevented.

3. In a piercing punch of the type having a lower die plate with a female die, a punch holder movable towards and from said plate and having a recess in which one end of the body of a one-piece piercing punch element is firmly but detachably anchored and from which said punch element projects towards said plate, passes through a tapered portion into an elongated piercing end of substantial length and reduced cross sectional area, and a stripper member having an aperture through which the free end of said piercing end reciprocates with a sliding fit, that improvement which comprises said element of one piece, and a separate collar attached tightly, securely and immovably on said element from the junction between the smaller end of the tapered portion and the reduced piercing end but terminating in spaced relation to said free end and said holder, said member having close sliding interengagement with said collar for guiding it in the piercing movements of said punch element, from engagement of the free end of the piercing end of said element with a blank to be pierced through at least a substantial part of the piercing operation.

4. A piercing punch device comprising a die plate having a female die, a punch holder movable towards and from said plate, a one-piece piercing punch element detachably anchored at one end in said holder and projecting therefrom towards said plate in alinement with said die, said projecting portion of said element having, intermediate of its ends, a tapered portion converging towards its free end and gradually merging at the smaller end of the tapered portion into a piercing end of approximately uniform cross sectional area along the remainder of its length to its free end, a stripper member having an aperture through which the free end of said piercing end passes in a piercing operation and which slidingly guides the piercing end in its piercing operation, a separate collar attached tightly and immovably over said element at the junction between said piercing end and said tapered portion and extending along both said piercing end and said tapered portion, but terminating before reaching said holder and the free end of said piercing end, said collar and member having close sliding interengagement during the piercing movements of said element from approximately the engagement of the free end of the piercing end of said element with a blank to be pierced through at least a substantial part of the piercing operation.

5. A piercing punch device comprising a die plate having a female die, a punch holder movable towards and from said plate, a one-piece

piercing punch element having one end portion of generaly uniform cross sectional area for a substantial lengthwise direction received in and detachably anchored to said holder and also projecting therefrom towards said plate in alinement with said die, said projecting portion of said element having, intermediate of its ends, a tapered portion converging towards its free end and gradually merging at the smaller end of the tapered portion into a piercing end of approximately uniform cross sectional area along the remainder of its length to its free end, a stripper member having an aperture through which the free end of said piercing end passes in a piercing operation and which slidingly guides the piercing end in its piercing operation, a separate collar attached tightly and immovably over said element at the junction between said piercing end and said tapered portion and extending along both said piercing end and said tapered portion, but terminating before reaching said holder and the free end of said piercing end, said collar and member having close sliding interengagement during the piercing movement of said element from approximately the engagement of the free end of the piercing end of said element with a blank to be pierced through at least a substantial part of the piercing operation.

6. A piercing punch device comprising a die plate having a female die, a punch holder movable towards and from said plate, a one-piece piercing punch element detachably anchored at one end in said holder and projecting therefrom towards said plate in alinement with said die, said projecting portion of said element having, intermediate of its ends, a tapered portion converging toward its free end and gradually merging at the smaller end of the tapered portion into a piercing

end of approximately uniform cross sectional area along the remainder of its length, to its free end, a stripper member having an aperture through which the free end of said piercing end passes in a piercing operation and which slidingly guides the piercing end in its piercing operation, a separate collar attached tightly and immovably over said element at the junction between said piercing end and said tapered portion and extending along both said piercing end and said tapered portion, but terminating before reaching said holder and the free end of said piercing end, said collar and member having close sliding interengagement during the piercing movements of said element from approximately the engagement of the free end of the piercing end of said element with a blank to be pierced through at least a substantial part of the piercing operation, said stripper member having a recess in its upper face, alined with said collar, in which said collar slides and by which it is closely guided in its movements with the punch in a piercing operation beginning at least as early as the contact of the piercing end of said element with a blank to be pierced and continuing for at least the major part of the actual piercing of the blank.

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