

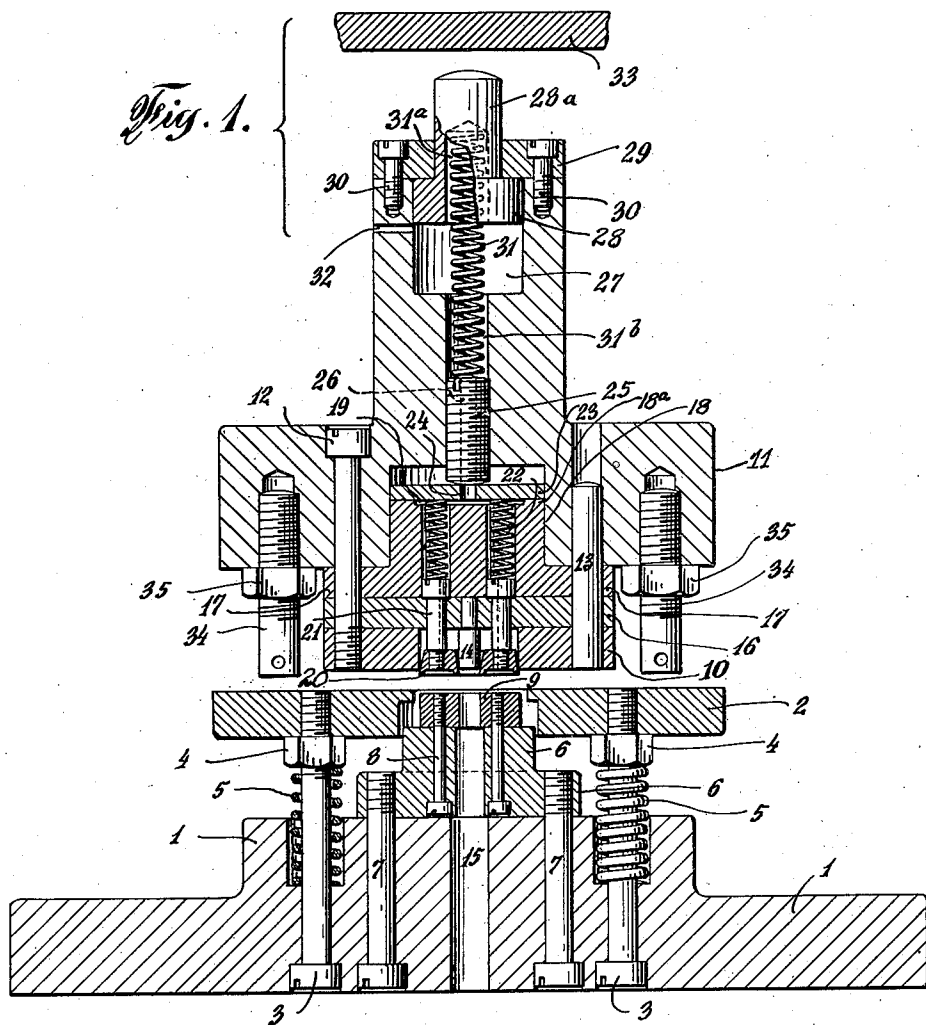
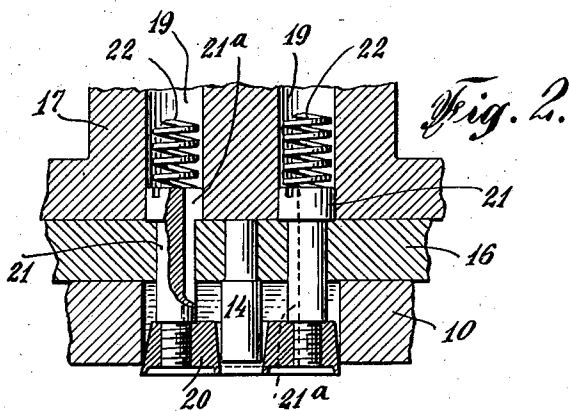
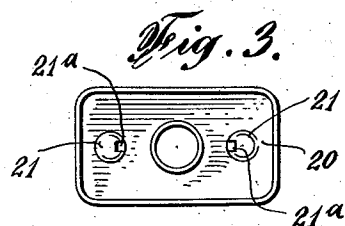
March 15, 1938.

B. SCHNEIDER ET AL

2,111,156

PUNCH AND DIE

Filed July 18, 1936



INVENTORS:

*Bernw. Schneider
Charles Hayward*

UNITED STATES PATENT OFFICE

2,111,156

PUNCH AND DIE

Bruno Schneider, Laureiton, and Oscar Mar-
guard, St. Albans, N. Y.

Application July 18, 1936, Serial No. 91,276

4 Claims. (Cl. 164—29)

This invention relates to improvements in punches and dies commonly employed for punching discs of various shapes from materials of sheet form, but more particularly for use in cutting blanks of any desired shape from sheet mica, for use as insulation in radio apparatus and the like.

As is well known in the art, it has heretofore been extremely difficult to punch mica sheets and at the same time prevent a slight separation of the strata along the sheared edges. We have found through exhaustive experimentation and observation that this is caused by a very slight bending of the mica at the point where the edge of the punch passes the edge of the die, and may be due either to too great clearance, to improper holding of the mica against the face of the punch, to an accumulation of mica dust that interferes with clean shearing, or to a combination of these causes. Separation of the strata may easily occur in sheets of mica having a thickness of only .0015 in. to .002 in., and when mica blanks are thus injured and later used as laminated insulation in radio equipment, and particularly in condensers, imperfect results are practically sure to follow. To overcome these conditions we have developed the punch and die apparatus illustrated in the accompanying drawing, in which:

Fig. 1 is a cross section through the central plane of the mechanism;

Fig. 2 is a somewhat enlarged view, in section, of the die and knock-out;

Fig. 3 is a bottom view of the knock-out.

In Fig. 1, 1 represents the base plate of the apparatus, which may be installed in any press of suitable design by bolting to the bed of the press. 2 is a stripper plate for stripping the sheet away from the punch in the usual manner, and is held in proper alignment with the base plate by means of screws, 3, which are free to slide in guide holes in the base plate 1. The screws 3 are held rigidly in stripper plate 2 by means of lock nuts 4, against which the springs 5 are compressed when the stripper plate is forced downward by the down stroke of the ram of the press, which is not shown. A punch base 6 is fastened to base plate 1 by means of screws 7, and held in proper alignment by dowels not shown. By means of screws 8 the punch 9 is fastened firmly to punch base 6. The foregoing parts comprise the stationary element of the apparatus, which in the illustration is the punch, or male portion of the set.

In the movable portion shown directly above

the punch assembly, the die plate 10 is securely fastened to die holder 11 by a suitable number of screws 12, and held in alignment by means of dowels 13. In the design shown an auxiliary piercing punch 14 is provided to cut a hole in the blank while the blank is being punched; the scrap being discharged downward through hole 15 extending through punch 9, punch base 6 and base plate 1. Piercing punch 14 is securely held in punch plate 16 by a drive fit in a hole drilled therein, and plate 16 is seated against the die base 17, which has a boss 18 fitted into a recess in die holder 11. Boss 18 is preferably cylindrical in form to simplify construction, and its upper surface is depressed somewhat inside an annular rim 18a to form a shallow open chamber 19. A knock-out, 20, having a contour similar to punch 9, and being only slightly smaller than punch 9, is equipped with two guide posts 21 whose lower ends are threaded, and screwed into correspondingly tapped holes in knock-out 20. These guide posts 21 are aligned in properly fitted holes provided therefor in punch plate 16, and are provided with flange heads which slide in corresponding holes in die base 17, the shoulders formed by these heads serving to limit the downward travel of knock-out 20 by abutting against punch plate 16. Guide posts 21 have longitudinal slots 21a extending throughout their length, and providing air passages connecting between the spaces surrounding springs 22 and the space between knock-out 20 and die plate 10; and also into the recessed portion of knock-out 20. Knock-out 20 is normally held down by pressure of compression springs 22, which bear against guide posts 21, and react against bearing plate 23, which has a hole 24 in its center. Bearing plate 23 is held in contact with the annular rim 18a of die base 17 by means of screw 25 threaded into die holder 11, this screw having a central hole 26 throughout its length and being concentric with bearing plate 23 and its central hole 24.

In the upper part of die holder 11 is a cylinder 27 in which is fitted a piston 28 having a tail rod 28a guided in cylinder head 29, which is fastened to die holder 11 in any convenient manner, as by screws 30, and serves to limit the upward travel of piston 28. A compression spring 31 is held at its upper end in a hole 31a in the piston 28, and at its lower end in a similar hole 31b in the die holder 11, where it bears against stud 25. Expansion of the spring 31 tends to hold the piston at the top of its stroke. One or more ports

32 serve to admit air to cylinder 27 when the piston 28 is in its highest position.

A precisely controlled and timed reciprocating action of stripper 2 is provided by the employment of adjustable studs 34 held in fixed relationship to die holder 11 by means of lock nuts 35, and in such a position that the ends of studs 34 are slightly below the working face of knock-out 20. The purpose of this will be hereinafter explained.

In Fig. 2 is shown a somewhat enlarged view of knock-out 20 with a portion of the surrounding mechanism. One difficulty in punching mica heretofore has been due to an accumulation of mica dust, in greater or less amounts, on the work itself, tending to prevent close contact between the knock-out and the face of the punch. To counteract this tendency we relieve the face of the knock-out 20 by milling out its entire face, or under side, as shown in the section, Fig. 2, and in the bottom view, Fig. 3, leaving only a narrow rim around the periphery of the knock-out to bear against the mica sheet. This provides a space in which mica dust can enter without being firmly squeezed between the knock-out and the work, and it also greatly reduces the contact surface of knock-out 20 and correspondingly increases its unit pressure against the work, thus insuring smooth cutting by the shearing action of the punch 9 acting in die 10. To prevent an accumulation of mica dust in the space between the knock-out 20 and die plate 10, we provide a strong current of air acting outwardly from the space intervening between these two parts. When the die assembly is forced downward by a down stroke of the press ram (not shown), the studs 34 first come into contact with stripper 2, forcing it downward and slightly below the flush surface of punch 9, and permitting the mica sheet to come in contact therewith. Next, knock-out 20 strikes the sheet and holds it firmly against the face of the punch 9. As the die assembly continues to descend, guide posts 21 remain stationary, and bearing plate 23, held in fixed relationship to the die assembly, compresses the springs 22, thus increasing the pressure of the knock-out, 20, against the work through the reaction of punch 9. As the die assembly approaches the lower limit of the down stroke, the blank is sheared, and after the press passes the dead center the reverse of these operations takes place. But, as the die assembly continues to rise, tail rod 28A of piston 28 strikes a cross bar 33 which is bolted to the press frame (not shown), and the air contained in cylinder 27 is suddenly compressed by the upward movement of cylinder 27 in relation to the piston 28, which is now stationary. The air thus compressed in cylinder 27 is forced downward, through holes 31b, 26, and 24, through recess 19, around and through springs 22 and the air passages 21a in guide posts 21 into the space between die plate 10 and knock-out 20. Its means of escape is partly through the narrow peripheral space at the lower edge of the die, through which it rushes under considerable velocity, carrying with it any dust which would otherwise tend to be caught in this space, and where experience has shown it will invariably collect in die sets of the ordinary type; and partly through the air passages 21c in knock-out 20, and into the recessed portion of knock-out 20, where its action not only forces the punched blank away from the knock-out and prevents it from adhering thereto, but also expels any

dust that might otherwise accumulate on knock-out 20. On the down stroke of the press, air is again admitted to cylinder 27 through a suitable number of ports 32, when piston 28 has been released by bar 33 and is forced upward by spring 31.

Conceivably, the same results might be accomplished by using a small bellows actuated by the reciprocating movements of the press ram, or by leading compressed air from an external source through a flexible connection into the space surrounding knock-out 20, and causing it to act intermittently by opening and closing a valve through the reciprocal movement of the die assembly. But experiments show that this latter practice produces poor results, owing to the accumulation of moisture in air thus compressed and stored. We therefore prefer to use the method set forth above, in which the air compressor is built integral with the die set.

As a further improvement in our invention, we provide means for preventing the sheared blank from being again pushed in reverse direction through the hole left in the sheet when the blank is cut out. We have shown above that the lower ends of studs 34 are slightly below the plane of the working face of knock-out 20. Thus, during the down stroke of the die assembly, stripper plate 2 is depressed below the cutting edges of punch 9 before knock-out 20 strikes the work. After knock-out 20 has seized and held the sheet against punch 9, die plate 10 continues downward until its cutting edges have passed the cutting edges of punch 9, thus shearing the material. Simultaneously springs 22 are compressed, and knock-out 20 retreats slightly into the recess in die 10, the work necessarily following it. Piercing punch 14 also enters the hole in punch 9, cutting a hole in the blank. After the ram of the press passes the dead center and starts to rise, knock-out 20 remains stationary, against the sheared blank, until the heads of guide posts 21 are again engaged by die base 16, lifting knock-out 20 away from punch 9 and releasing the blank, which is now free to slide out; the press being customarily inclined at an angle sufficient to allow discharge of the work by gravity. Following the release of the blank by knock-out 20, stripper 2 is released by studs 34 in their upward movement, and rises due to pressure of springs 5, disengaging the scrap from punch 9. This sequence of operations prevents the punched blank from being pressed again into or through the hole already cut in the sheet or scrap, thus insuring better results, as such repressing into the hole already cut would tend to injure the edges of the blank and separate the strata.

While we have described our invention with great particularity with regard to a specific embodiment thereof, it is not to be construed that we are limited in scope to the identical design as shown in the drawing and described herein, for modifications of detail and a different arrangement of the parts could be made by those skilled in the art without departing from the spirit of our invention as covered in the following claims.

What we claim is:

1. A punch and die set for punching blanks from sheet material, including in combination a source of supply of air under pressure, means for keeping the blanks separated from the scrap after punching, means reciprocating within the die for clamping the work against the face of

the punch, one or more air passages communicating from the source of supply of compressed air to the internal opening in the die, and one or more air passages communicating from the source of supply of compressed air to the working face of said clamping means.

5 2. A punch and die set for punching blanks from sheet material, including in combination an air compressor integral with the moving element of the set, means reciprocating within the die for clamping the work against the face of the punch, and one or more air passages communicating from the air compressor cylinder to the internal opening in the die and between the die and the said clamping means.

10 3. The combination, in a punch and die set for punching blanks from sheet stock of an air compressing cylinder, means for clamping the stock against the face of the punch prior to the punching of the stock, air passages communicating between the air compressing cylinder and an enclosed space surrounding the said clamping means, means to strip the scrap from the

punch following the punching of a blank, and means co-acting with the clamping means and the scrap stripping means to prevent the blank from re-entering the hole left in the scrap, and throughout the operation to maintain the sheet stock substantially in the form of a plane surface.

5 4. In a punch and die set incorporating a stationary punch and movable die, the combination of means for compressing air, means for clamping the stock against the face of the punch during a predetermined portion of the cycle of motion of the die, said clamping means having its working surface confined to a narrow raised rim contiguous to the cutting edges of the punch and die, and a plate arranged to strip the scrap from the punch, the said plate having adjustable means for controlling its action in relation to the release of a punched blank by the movement of the said clamping means away from the punch.

BRUNO SCHNEIDER.
OSCAR MARQUARD.