April 7, 1953 C. ROZANEK 2,633,890

PUNCHING APPARATUS

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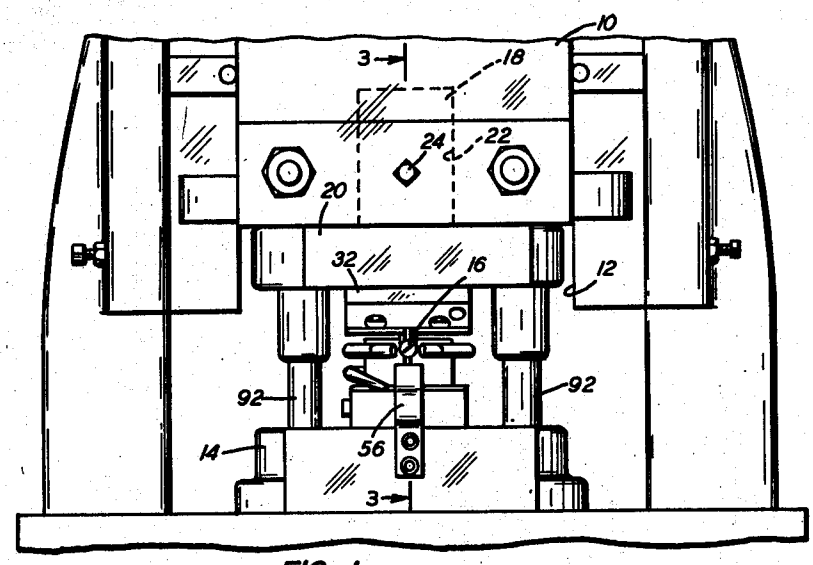


FIG. 1

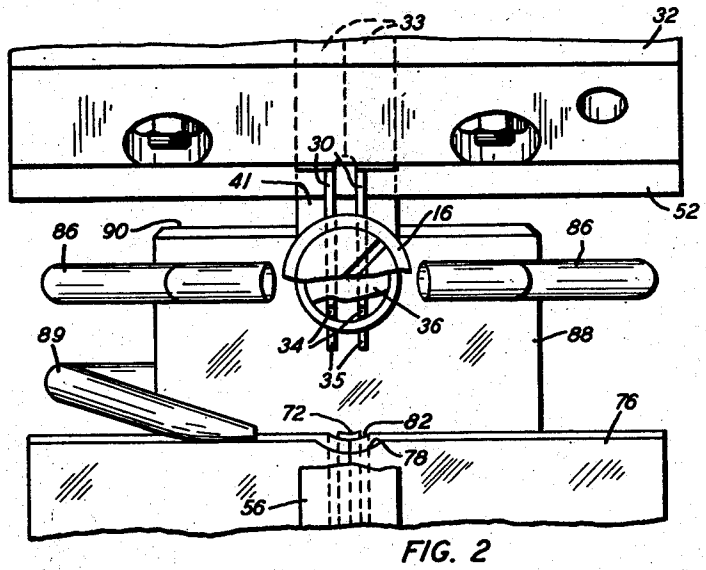


FIG. 2

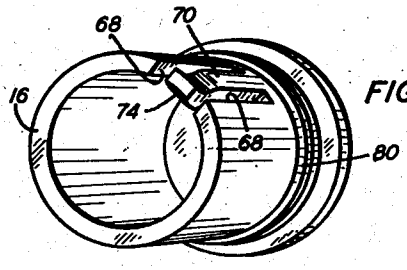


FIG. 8

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PUNCHING APPARATUS

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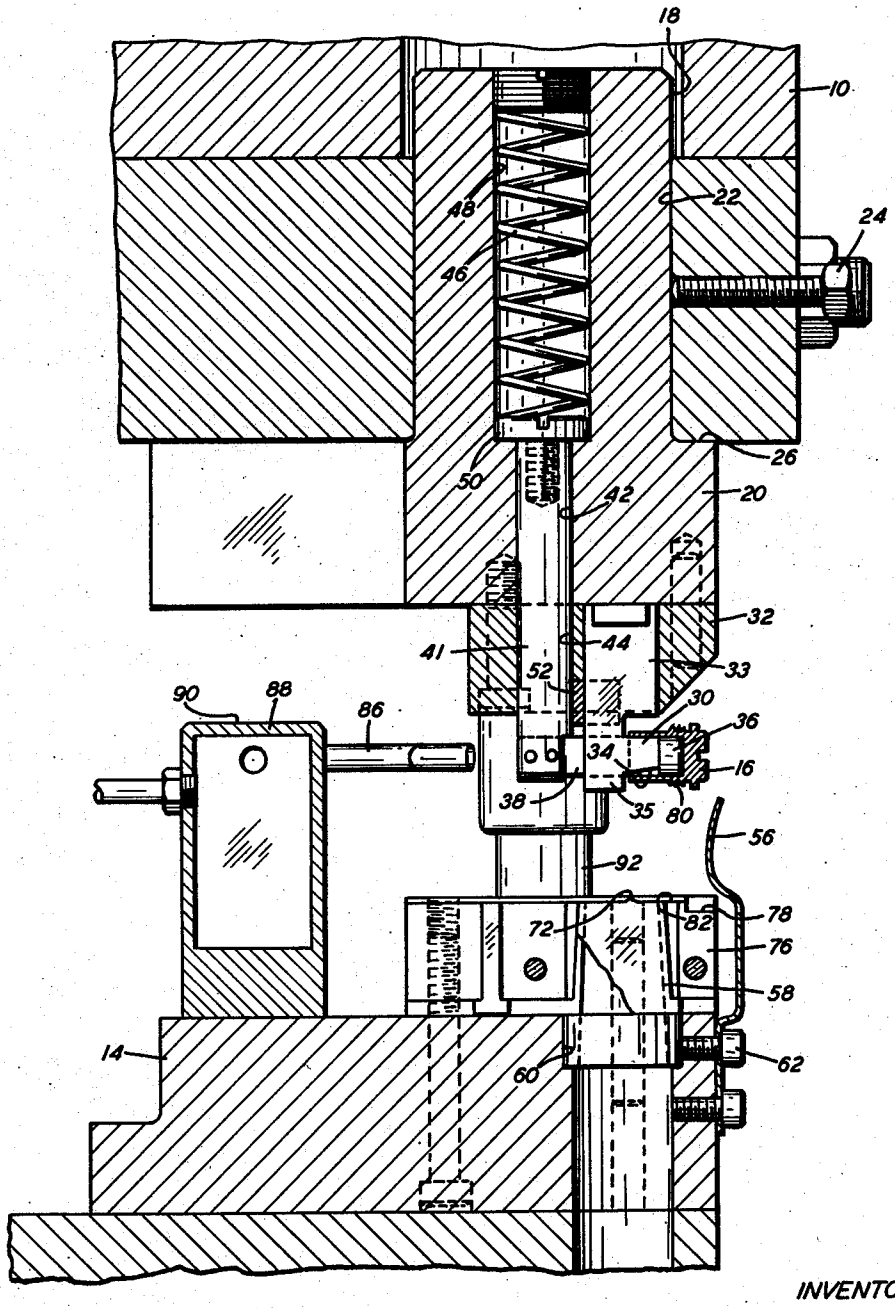


FIG. 3

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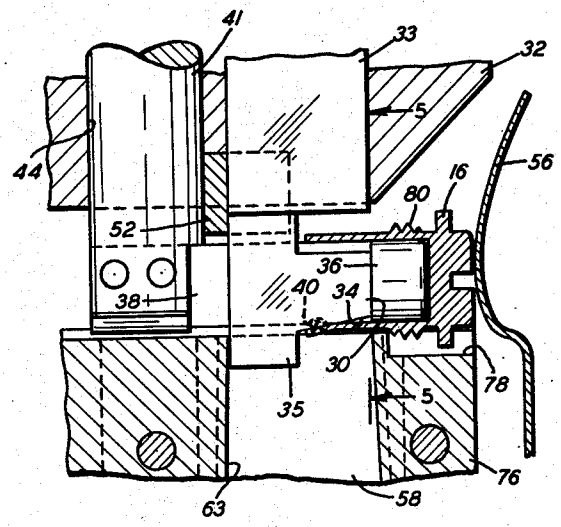


FIG. 4

FIG. 5

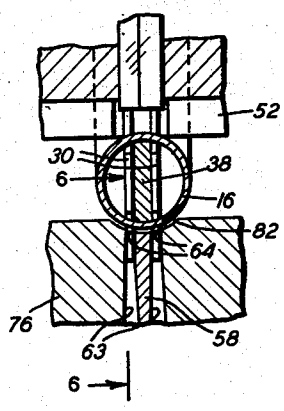


FIG. 6

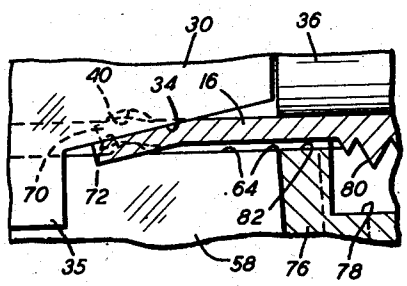
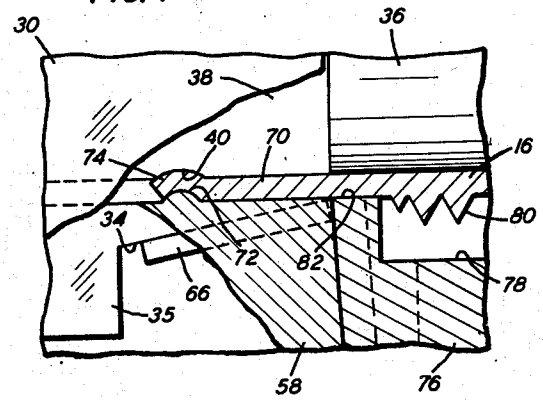


FIG. 7



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UNITED STATES PATENT OFFICE

2,633,890

PUNCHING APPARATUS

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Application November 3, 1949, Serial No. 125,210

2 Claims. (Cl. 153—2)

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This invention relates to punching apparatus, and more particularly to apparatus for slotting and crimping cup-shaped articles.

In the manufacture of small cup-like articles which are slotted and crimped to form electrical contacts on the interior thereof, the blank of such an article is sometimes slotted to form a tongue, and the tongue then is crimped in a separate operation. Furthermore, the slotting operations have been performed from the outside which leaves burrs on the inside. Such burrs were highly undesirable on an electrical contact and had to be removed, which was a difficult task because of the location of the burrs inside of the small article.

An object of the invention is to provide new and improved punching apparatus.

Another object of the invention is to provide new and improved apparatus for punching and forming articles.

A further object of the invention is to provide new and improved apparatus for slotting and crimping cup-shaped articles.

An additional object of the invention is to provide apparatus for slotting a cup-shaped blank from the inside to the outside to form slots without burrs on the inside of the article, and then crimping the resulting tongue.

An apparatus illustrating certain features of the invention may include a punching element, means for holding a cup-shaped blank in a position over the end of the punching element, a die having an opening therein for receiving the punching element, and means for causing relative movement between the die and the punching element.

A complete understanding of the invention may be obtained from the following detailed description of an apparatus forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a fragmentary, front elevation of an apparatus forming one embodiment of the invention;

Fig. 2 is an enlarged, fragmentary, front elevation of a portion of the apparatus shown in Fig. 1;

Fig. 3 is an enlarged, vertical section taken along line 3—3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary, vertical section of a portion of the apparatus shown in Fig. 1;

Fig. 5 is an enlarged, fragmentary, vertical section taken along line 5—5 of Fig. 4;

Fig. 6 is an enlarged, fragmentary, vertical section taken along line 6—6 of Fig. 5;

Fig. 7 is an enlarged, fragmentary, vertical section similar to Fig. 6, and

Fig. 8 is an enlarged, perspective view of an article produced by the apparatus embodying the invention.

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Referring now in detail to the drawings, there is shown in Fig. 1 a movable ram 10 reciprocable along a guideway 12 toward and away from a die-holder 14 for slotting and crimping a cap 16. The ram 10 is connected to a shank 18 of a tool-holder 20 secured by a set screw 24 in a bore 22 formed in the ram 10 at a position in which a shoulder 26 abuts the ram 10. Shearing blades 30—30 secured to a holding plate 32 by shank portions 33—33 are provided with sloping cutting ends 34—34 and advance guide portions 35—35. A horn 36 designed to fit into the cap 16 is provided with a shank portion 38 having a crimping indentation 40 therein. The shank portion 38 of the horn 36 is riveted to a rod 41 mounted slidably in a bore 42 formed in the tool-holder 20 and a bore 44 formed in the holding plate 32. A compression spring 46 mounted in a counterbore 48 formed in the tool-holder urges the rod 41 downwardly, as viewed in Fig. 3, toward a position in which a cap screw 50 secured to the rod 41 abuts the end of the counterbore 48. The horn 36 may be moved upwardly, as viewed in Fig. 3, with respect to the blades 30—30 until the horn strikes a stop 52 carried by the holding plate 32, which distance is sufficient to permit the cutting ends 34—34 of the blades to completely cut through the cap 16 at the edges of the cutting ends.

On downward movement of the ram 10 toward the die-holder 14, the cap 16 is moved into engagement with a camming spring 56 which presses the cap 16 against the end of the horn 36 to precisely locate the cap on the horn. A die 58 is held by a set screw 62 in a counterbore 60 formed in the die-holder 14. The die 58 is provided with slots 63—63 having shearing edges 64—64 designed to cooperate with the cutting ends 34—34 to shear the cap 16 to cut segments, of which a segment 66 (Fig. 7) is shown, to form slots 68—68 in the cap 16 leaving a tongue 70 between the slots. The slots 63—63 also guide the advance guide portions 35—35 of the blades 30—30 during the shearing operation so that the blades are firmly supported as they shear. A crimping bead 72 formed on the die 58 is designed to press the end portion of the tongue 70 into the crimping indentation 40 formed in the shank portion 38 of the horn 36 to form a crimp 74 in the tongue 70. A die-holding plate 76 is provided with a cutaway portion 78 to provide clearance for threads 80 formed on the cap 16. The die 58 and the die-holding plate 76 have a groove 82 formed therein complementary to the curvature of the cap 16.

Tubes 86—86 are connected to a chamber 88 supplied with compressed air after the ram 10 is moved to its starting position to blow the cap 16 off from the horn 36 into a suitable receptacle (not shown), and a tube 89 (Fig. 2) blows any shavings away from the groove 82. A

top surface 90 of the chamber 88 serves as a gauge for assembling the tool-holder 20 to the ram 10. Liner pins 92—92 secured to the die-holder 14 guide the tool-holder 20, and keep the tools secured to these elements aligned at all times.

Operation

With the ram 10 in its upper position, the cap 16 is placed upon the horn 36. Reciprocating means then is actuated to move the ram through one reciprocation. The ram 10 moves the elements carried thereby downwardly, as viewed in Fig. 3. As the cap 16 is moved into contact with the bead 72 of the die 58, the spring 56 presses the cap 16 against the horn 36. Upon further downward movement of the ram 10, the blades 30—30 move downwardly therewith to shear initially the portions of the cap at the bead 72. The spring-pressed horn then moves the cap fully into the groove 82, and the blades 30—30 (Fig. 7) complete the cutting of the slots 68—68 (Fig. 8). The rod 41 slides in the bores 42 and 44 (Fig. 3) to permit the horn 36 to remain stationary until the blades 30—30 have cut the portions of the cap on each side of the bead 72. The sloping cutting ends 34—34 of the blades shear the cap incrementally so that no undue strain is placed on the blades.

After the slots have been completely cut, the stop 52 engages the horn 36 and moves it and the cap 16 hard against the die 58 and the die-holding plate 76 so that the crimping bead 72 formed on the die 58 and the crimping indentation 40 formed in the shank portion 38 of the horn 36 form the crimp 74 on the tongue 70. The lost motion connection between the blades 30—30 and the horn 36 provides sequential shearing and crimping so that these operations do not interfere with one another, and very close tolerances may be provided in the dimensions of the slots 68—68 and the crimp 74.

The ram 10 then is raised, and jets of air from the tubes 86—86 (Fig. 2) blow the cap 16 from the horn 36 after the cap is raised above the camming spring 56 to the starting position thereof. At the start of the raising movement of the ram 10, the spring 46 (Fig. 3) presses the rod 41 downwardly to hold the cap 16 against the die 58 until the blades 30—30 have been moved back to positions completely inside the cap 16 and the cap screw 50 engages the end of the counterbore 48 in the tool-holder 20. The blades 30—30, the horn 36 and the cap 16 then are raised as a unit and the cap 16 is moved out of contact with the camming spring 56. The operation described hereinabove then may be repeated to slot and crimp another cap (not shown) identical with the cap 16.

The above-described apparatus serves to sequentially slot and crimp caps so that close dimensions may be maintained in the caps, and also serves to slot small caps with a shearing operation proceeding from the inside of the caps to the outside thereof so that any burrs formed by the shearing operation are formed on the outside of the caps. Consequently, access is provided for removal of the burrs without difficulty, if such removal is necessary, and no objectionable burrs appear on the inside of the caps.

What is claimed is:

1. An apparatus for slotting and crimping a cup-shaped article, which comprises a generally cylindrical horn having a pair of guideways formed therein transversely of the longitudinal axis thereof and also provided with a crimping recess extending from one guideway to the other guideway, a pair of blades having shank portions and cutting portions extending generally transversely from the shank portions at points intermediate the ends thereof, said blades being slidable in the guideways, a ram supporting the blades, means connecting the horn to the ram for urging the horn to a position in which the cutting portions of the blades are wholly within the guideways in the horn so that a cup-shaped article may be positioned over the end of the horn and the cutting portions of the blades, a stop for limiting movement of the horn against the action of the horn-urging means, and a die having a pair of slots for receiving the blades and provided with a crimping bead extending between the slots, said ram being movable toward the die to sequentially move a cap positioned over the horn and the cutting portions of the blades into engagement with the die, force the blades through the cap to form slots in the cap and move the horn by the stop to crimp the portion of the cap between the slots thereof.

2. An apparatus for slotting and crimping a cup-shaped article, which comprises a generally cylindrical horn having a pair of guideways formed therein transversely of the longitudinal axis thereof and also provided with a crimping recess extending from one guideway to the other guideway, a pair of blades having shank portions and cutting portions extending from the shank portions at points intermediate the ends thereof, said cutting portions of the blades having slanting cutting edges, said blades being slidable in the guideways, a ram supporting the blades rigidly, means connecting the horn to the ram for urging the horn to a position in which the cutting portions of the blades are wholly within the guideways in the horn so that a cup-shaped article may be positioned over the end of the horn and the cutting portions of the blades, a stop for limiting movement of the horn against the action of the horn-urging means, a die having a pair of slots for receiving the blades and provided with a crimping bead extending between the slots, said ram being movable toward the die to sequentially move a cap positioned over the horn and the cutting portions of the blades into engagement with the die, force the blades through the cap to form slots in the cap and move the horn by the stop to crimp the portion of the cap between the slots thereof, and a spring for pressing the cap on the horn as the cap is moved toward the die.

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