Oct. 17, 1950 D. J. DIEKMANN ET AL 2,526,336

ARTICLE FORMING APPARATUS

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FIG. 1

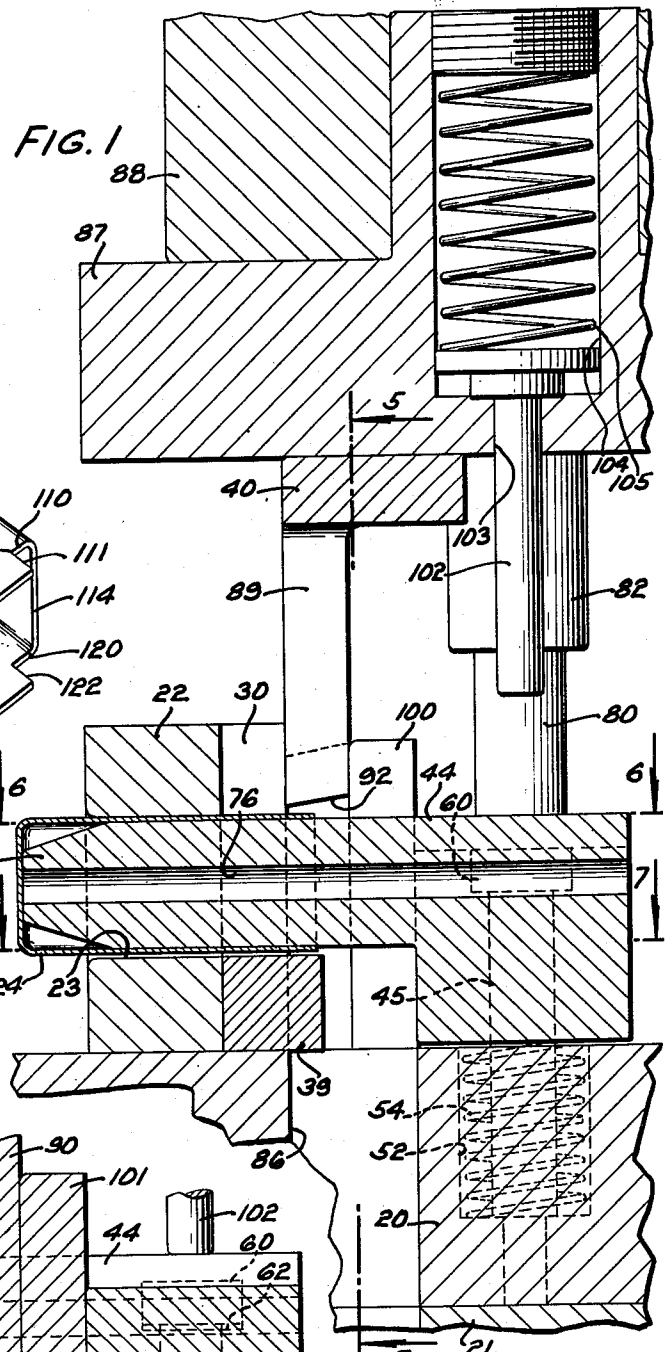


FIG. 2

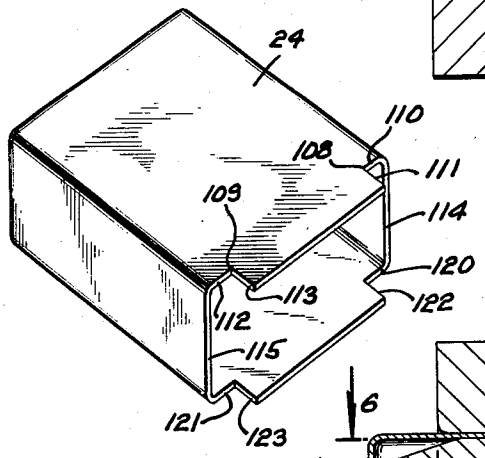
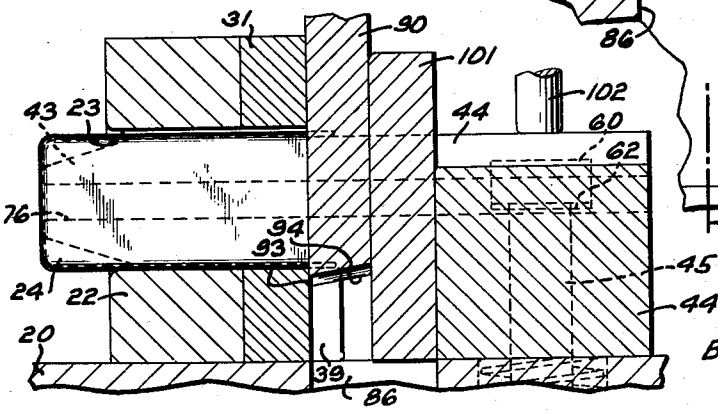


FIG. 3



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FIG. 5

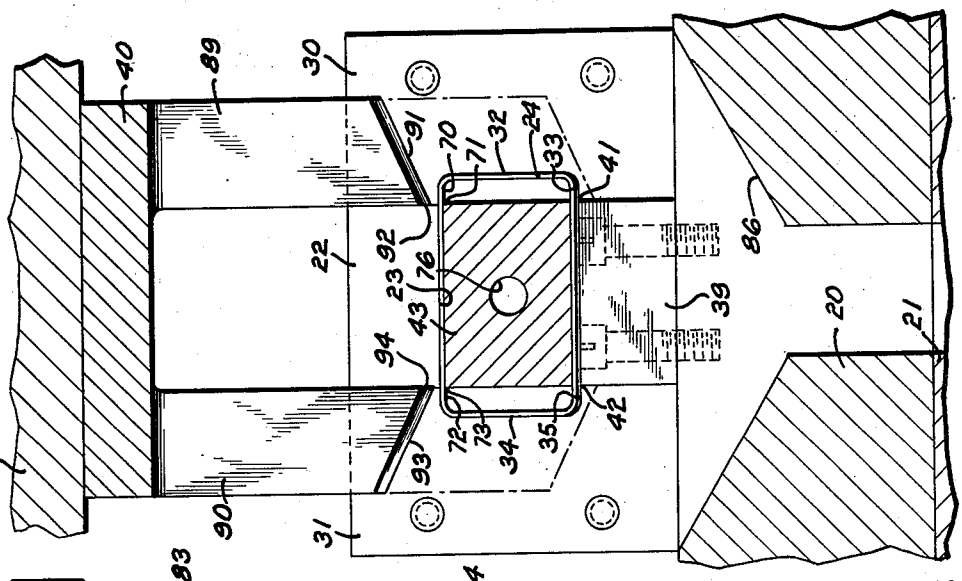
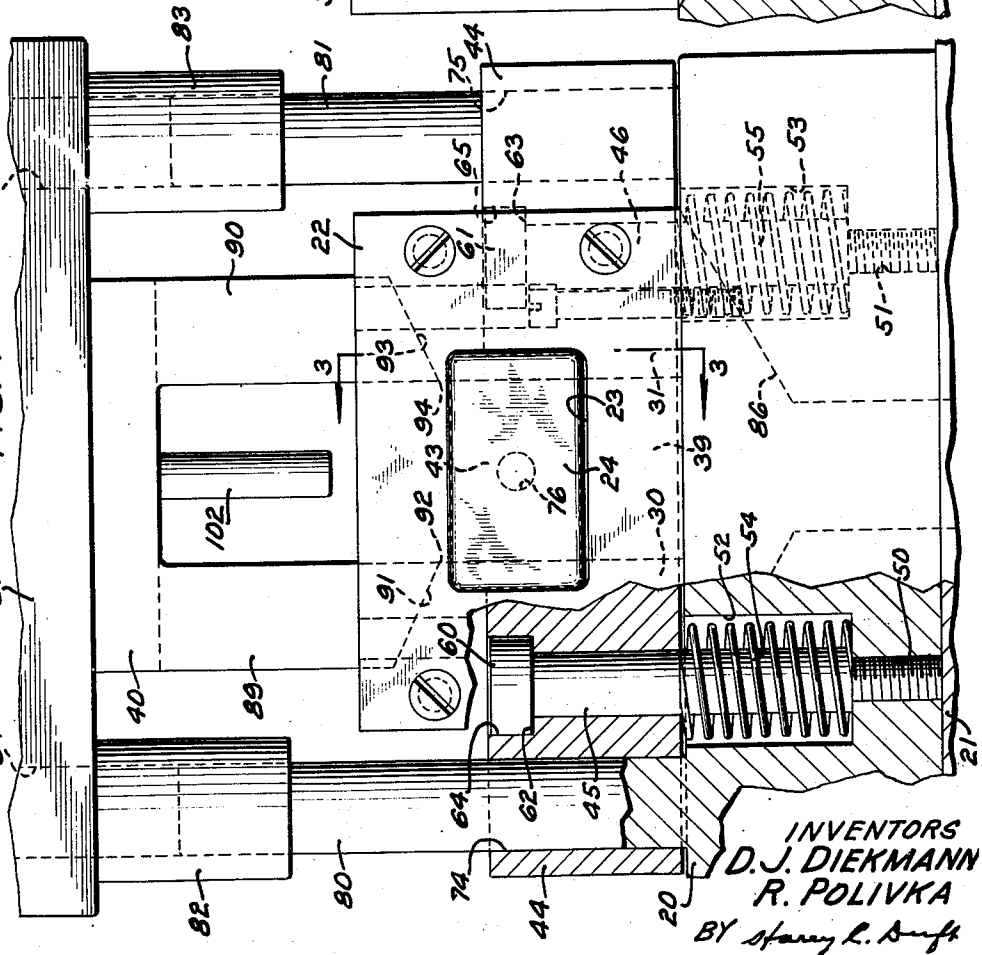


FIG. 4



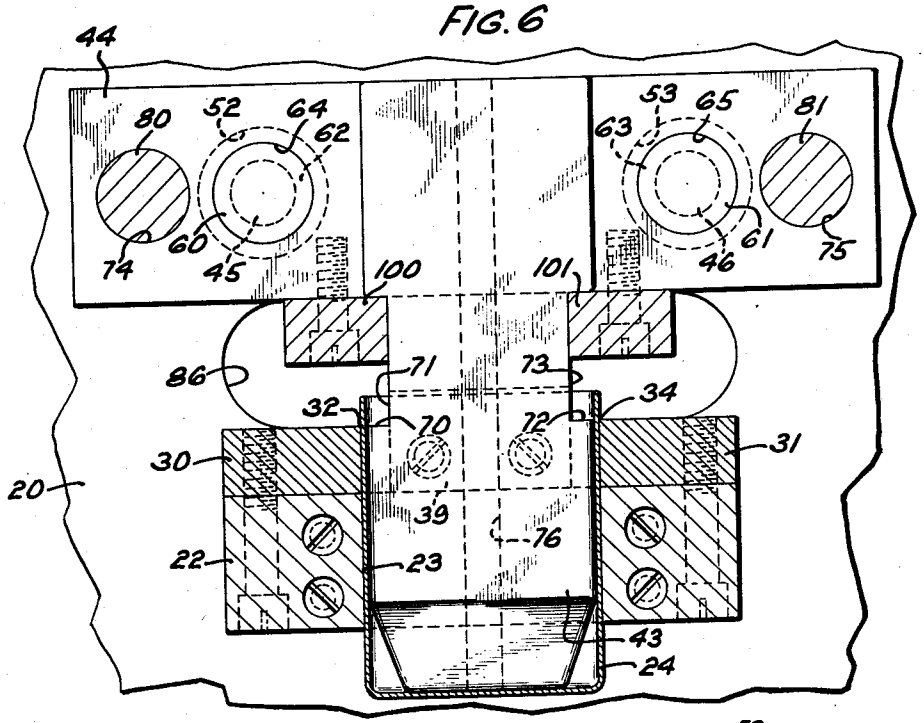
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FIG. 6



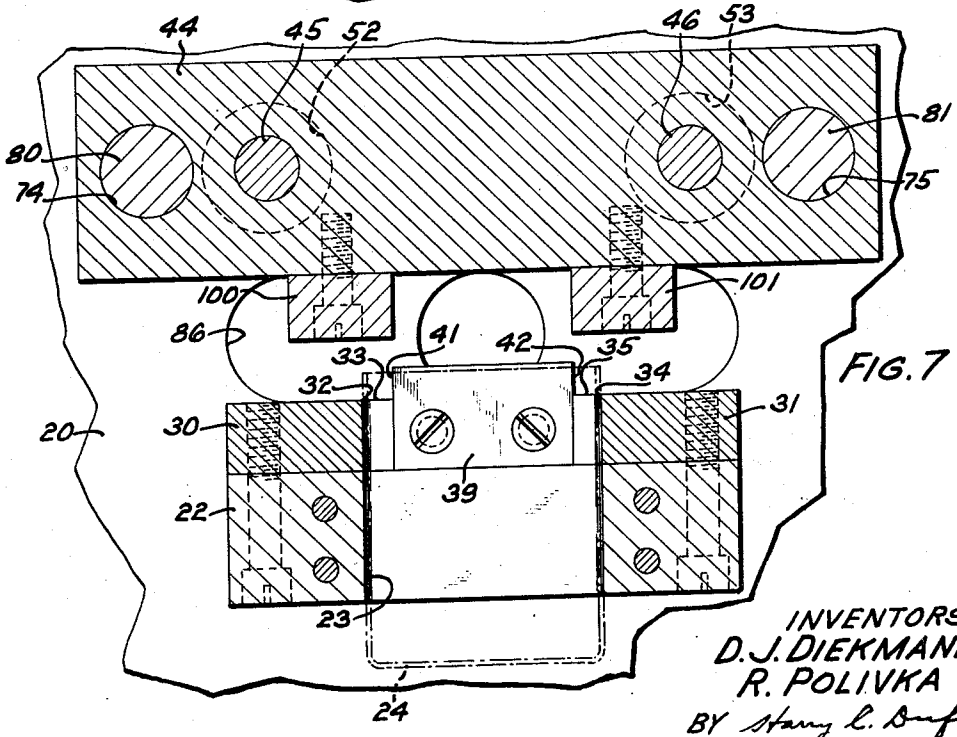


FIG. 7

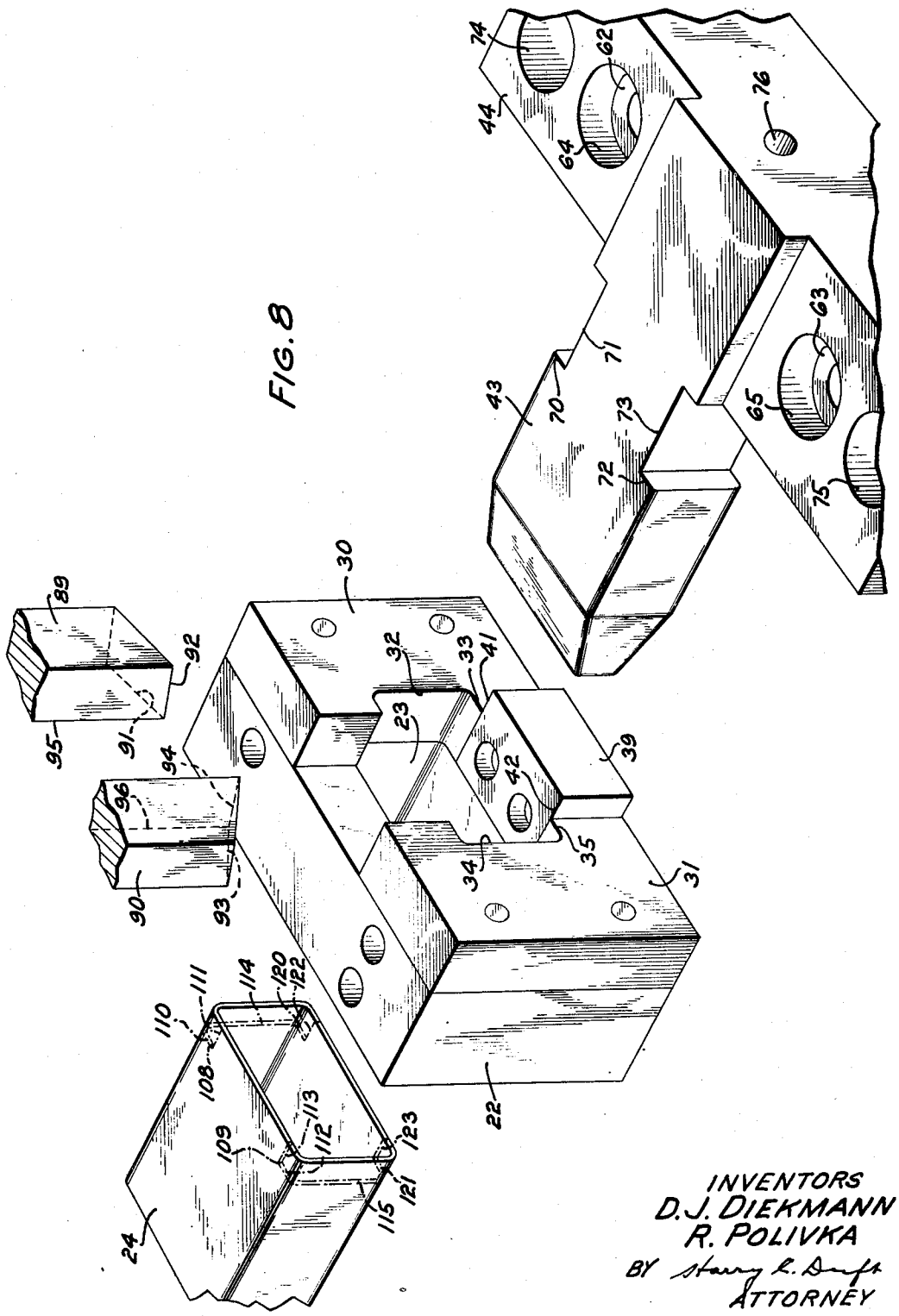
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FIG. 8



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Patented Oct. 17, 1950 2,526,336

UNITED STATES PATENT OFFICE

2,526,336

ARTICLE FORMING APPARATUS

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Application May 2, 1945, Serial No. 591,506

14 Claims. (Cl. 164—47)

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This invention relates to article forming apparatus and more particularly to a shearing punch and die for trimming can ends.

Heretofore, it has been customary in many cases to trim and notch the open ends of cans on milling machines which in many cases necessitated numerous operations including burr removal.

An object of the invention is to provide an effective and efficient apparatus for rapidly forming articles.

In accordance with one embodiment of this invention, the previously partially formed can which is to be trimmed in the apparatus is slipped onto a horn-like extension of a resiliently mounted die which provides internal support for the can. The horn-like supporting member extends into the aperture of a fixed die, the size and configuration of the aperture being such that when the can is positioned on the horn, the exterior surfaces of the can will slidably engage the sides of the aperture. A reciprocating punch cooperates with the dies to trim the can along predetermined lines. During the punching operation, the side of the can nearest the approaching punch is first clamped by the action of the resiliently mounted die, then as the punch nears the opposite side of the can, that side is clamped, preparatory to trimming, by a plunger moving parallel with the stroke of the punch, contacting the resiliently mounted die and moving it against the opposite side of the can.

A complete understanding of the invention may be had by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a vertical, central sectional view of the apparatus in the neutral or non-operating position;

Fig. 2 is a perspective view of a can after being trimmed by the apparatus;

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 4 showing the shearing punch at the lower end of the stroke;

Fig. 4 is a fragmentary front elevation of the apparatus shown partly in section;

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary plan view partly in section taken on the line 6—6 of Fig. 1;

Fig. 7 is a sectional view of the apparatus taken on the line 7—7 of Fig. 1, and

Fig. 8 is an exploded perspective view showing parts of the apparatus and the can.

In the embodiment of the invention disclosed

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herein, the apparatus comprises a base member 20, which is secured to the bolster plate 21 of a conventional punch press, and has mounted thereon a stationary die support 22 having formed therein an aperture 23 of a size and shape to permit the snug insertion of a can 24 to be worked upon. Two dies 30 and 31 are secured to the rear surface of the die support 22 at either side of the aperture 23 and have cutting edges 32, 33, 34 and 35 formed on them which cooperate with a shearing punch 40 in trimming the can. Additional cooperating cutting edges 41 and 42 are formed on a die 39 which is secured to the base member 20 between the dies 30 and 31.

Internal support for the can 24 is provided by a die 43 having a horn-like extension which projects into and through the aperture 23. In order that the die 43 may serve to clamp the can 24 against the upper surface of the aperture 23 during the trimming of that portion of the can edge and to later clamp the can 24 against the lower surface of the aperture 23, the die 43 is resiliently mounted to permit a slight amount of vertical movement. The die 43 is secured to a die supporting block 44 movably mounted on the base member 20 by means of a pair of headed bolts 45 and 46 threaded into the reduced terminations 50 and 51 of apertures 52 and 53 in which a pair of compression springs 54 and 55 are seated to urge the die supporting block 44 upward with respect to the base member 20 and the stationary die 22. The upward vertical movement of the die 43 is limited by the bolt heads 60 and 61 which abut the shoulders 62 and 63 formed by counterbores 64 and 65. There is enough spring-forced vertical movement of the die 43 to clamp the wall of the can 24 between the die 43 and the upper surface of the aperture 23. Sufficient clearance is provided between the die 43 and the lateral surfaces of the aperture 23 to permit the free insertion of the can 24. The space between the bottom of the die 43 and lower surface of the aperture is slightly greater than the thickness of the walls of the can. A number of cutting edges 70, 71, 72 and 73 are provided on the die 43 to cooperate with the shearing punch 40 in the trimming operation. An aperture 76 extending longitudinally through the die 43 and continuing through the die supporting block 44 prevents the entrapment of air between the can 24 and the die 43.

Apertures 74 and 75 are formed at either end of the die supporting block 44 to slidably engage a pair of liner pins 80 and 81 secured to the base member 20 to prevent undesired tilting movement

of the die supporting block in the apparatus. A pair of bushings 82 and 83 having apertures coaxial with apertures 84 and 85 formed in a punch holder 87 are provided on opposite sides of the punch holder to slidably engage the liner pins 80 and 81 thereby guiding the punch in its vertical reciprocable path. The base member 20 is also provided with a funnel-shaped aperture 86 to permit scrap trimmings to escape.

The shearing punch 40, which is attached to the lower side of the punch holder 87 which in turn is secured to the ram 88 of the punch press, is bifurcated having two downwardly extending cross-sectionally rectangular cutting members 89 and 90 to operate on both sides of the can simultaneously. Cutting edges 91, 92, 93 and 94, provided on the members 89 and 90, cooperate with the dies in trimming the can. The edges 91 and 92 form acute angles with an edge 95 on the cutting member 89 (Fig. 8) while the edges 93 and 94 form acute angles with an edge 96 on the cutting member 90. The cutting members 89 and 90 thus terminate in pointed ends. To insure sufficient cooperative pressure between the shearing punch 40 and the edges of the dies 30, 31 and 39, a pair of backing blocks 100 and 101 are secured to the die supporting block 44. These blocks continuously urge the shearing punch against the die edges without any binding effects and also aid in causing vertical movement without tilting of the die supporting block 44.

In order to move the die 43 downward to clamp the bottom portion of the can after the sides of the can have been substantially trimmed, a plunger 102 reciprocably positioned in apertures 103 and 104 formed in the punch holder 87 contacts the top of the die supporting block 44 just before the cutting members 89 and 90 reach the lower portion of the can, forcing the die supporting block downward to clamp the can against the lower edges of the aperture 23. A helical compression spring 105, positioned in the aperture 104 continuously urges downward the plunger 102 which yields after contacting and forcing the die supporting block against the base member 20. The spring 105 is made sufficiently strong to overcome the action of springs 54 and 55 when the plunger 102 engages the die supporting block 44.

In practising the invention, the operator slips the can 24 over the horn-like extension of the die 43 into the aperture 23 until the free end of the die 43 abuts the end wall of the can, the other end of the can then being in position to be trimmed by the cooperating punch and dies. The press is then operated, causing the punch holder to descend vertically carrying the shearing punch down, the points of the cutting members 89 and 90 first piercing the can at the points 108 and 109. Continuing downward, the cutting members, cooperating with the die edges 70, 71, 72 and 73, trim the top of the can on the lines 110, 111, 112 and 113. In their further downward course, the cutting members, cooperating with the die edges 32 and 34 shear through the side walls of the can on the lines 114 and 115. Just before the points of the cutting members reach the bottom wall of the can, the plunger 102 engages the top of the die supporting block 44, overcoming the pressure exerted by the springs 54 and 55, and forcing the die 43 downward. This action clamps the bottom walls of the article in engagement with the die edges 33, 35, 41 and 42 preparatory to trimming along the lines 120, 121, 122 and 123, which is effected as the cutting members, continuing their downward course, reach the lower limit of their stroke.

What is claimed is:

1. An apparatus for trimming cans comprising a movable die member adapted to fit into and support a can over which the can is placed to be worked upon, a second die member adapted to surround the can in working position, and a reciprocable die member movable parallel to the direction of movement of said movable die member having a shearing edge cooperating with said first mentioned die members to trim the can.

2. An article trimming apparatus comprising a plurality of cooperating dies providing an external and a resiliently yieldable internal support for an article to be worked upon, said internal support being yieldable in a direction at an angle to its longitudinal axis, and a reciprocable cutting member cooperating with said dies to trim the article along predetermined lines.

3. An article trimming apparatus comprising a yieldably mounted die having an extension to internally support an article, a set of dies to provide exterior support for the article, and a reciprocable cutting member movable parallel to the direction of movement of said yieldably mounted die and cooperating with said dies to trim the article along predetermined lines.

4. An article trimming apparatus comprising a yieldably mounted die to internally support an article, another die adapted to surround said article, and a reciprocable cutting member movable parallel to the direction of movement of said yieldably mounted die to cooperate with said dies in trimming the article.

5. A can trimming apparatus comprising a yieldably mounted die having an extending portion adapted to internally support a can, a second die adapted to surround said can, a relatively movable cutting member cooperating with said dies to trim said can, and a yieldable plunger for moving said yieldably mounted die to clamp the lower portion of said can just before said lower portion is trimmed.

6. A can trimming apparatus comprising a movable die adapted to internally support a can, a second die adapted to surround said can, a relatively movable cutting member movable parallel to the direction of movement of said movable die cooperating with said dies to trim said can, and means cooperating with said movable die to clamp the upper portion of said can while said upper portion is being trimmed.

7. A can trimming apparatus comprising means to externally support a can, movable means to internally support said can, a plurality of dies adapted to contact the exterior surface of said can, a relatively movable cutting member movable parallel to the direction of movement of said movable means to cooperate with said dies to trim said can, and means engageable with said movable means to clamp the lower portion of said can during the trimming of said lower portion.

8. A can trimming apparatus comprising a fixed die adapted to surround a can, a yieldably mounted die having an extension to internally support said can, a reciprocating punch cooperating with said dies to trim said can along predetermined lines, and means to force said yieldably mounted die downward to hold the lower wall of said can in contact with the lower portion of said first mentioned die prior to trimming said lower wall of said can after a substantial

portion of the side walls of said can have been trimmed.

9. A can trriming apparatus comprising a fixed die having cutting edges adapted to contact the exterior surfaces of a can to be worked upon, a movable die adapted to provide internal support for said can and having cutting edges to contact the inside surfaces of said can, a relatively movable cutting member cooperating with said dies to trim the can along predetermined lines, and means to clamp the lower part of said can against the lower cutting edge of said first mentioned die after the lateral walls of said can have been sheared prior to and during the shearing of the lower part of said can.

10. An apparatus for trimming cans comprising a die support adapted to surround a can to be worked upon, a die having cutting edges secured to said die support to contact the outer surfaces of said can, a movable die support having a die with an extension to fit into said can and provide internal support therefor, said second die having cutting edges to engage the inside surfaces of said can, a reciprocable cutting member cooperating with said dies to trim said can along predetermined lines, and means to move said movable die support to clamp the lower portion of said can in solid contact with the lower cutting edges of said first mentioned die after the side walls of said can have been substantially trimmed prior to and during the shearing of the lower portion of said can.

11. An apparatus for trimming cans comprising a fixed die adapted to surround a can having cutting edges to contact the exterior surfaces of said can, a resiliently mounted die having an extension to internally support said can, said second die having cutting edges to contact the interior surfaces of said can, a relatively movable punch cooperating with said dies to trim the can along predetermined lines, means to clamp one wall of the can while said wall is trimmed, and means to clamp the opposite wall of the can while that wall is being trimmed.

12. An apparatus for trimming cans comprising a movably mounted die adapted to provide internal support for a can, a fixed die surrounding the first mentioned die to provide external support for the can, a relatively movable cutting member to cooperate with the aforesaid dies to trim said can along predetermined lines, means to move said movably mounted die upward to clamp the upper portion of said can during the trimming of said upper portion, and means traveling parallel to said cutting member to move said resiliently mounted die downward to clamp the lower portion of the can while said lower portion is being trimmed.

13. An apparatus for trimming cans comprising a ram, a base member, a fixed die member secured to said base member and adapted

to surround and externally support a can to be trimmed, said die member having cutting edges contacting exterior surfaces of said can, a movably mounted die member extending into said can to provide internal support therefor, said second die member having cutting edges to contact the interior surfaces of said can, a cutting member secured to said ram, said cutting member being movable relative to said dies to cooperate with the cutting edges of said dies to trim said can along predetermined lines, resilient means to urge said movable die member upward to clamp the upper portion of said can while said upper portion is being trimmed, and means to urge the said movable die member downward to clamp the lower portion of said can while said lower portion is being trimmed.

14. An apparatus for trimming cans comprising a ram, a base member, a fixed die member secured to said base member and adapted to surround and externally support a can to be trimmed, said die member having cutting edges contacting exterior surfaces of said can, a movably mounted die member extending into said can to provide internal support therefor, said second die member having cutting edges to contact the interior surfaces of said can, a cutting member secured to said ram, said cutting member being movable relative to said dies to cooperate with the cutting edges of said dies to trim said can along predetermined lines, resilient means to urge said movable die member upward to clamp the upper portion of said can while said upper portion is being trimmed, and means to urge the said movable die member downward to clamp the lower portion of said can while said lower portion is being trimmed comprising a spring forced plunger attached to said ram parallel to said movable cutting member, said plunger contacting and downwardly urging said second mentioned die member after the lateral walls of said can have been substantially trimmed.

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