Jan. 5, 1932. C. H. ROLLASON 1,839,501

DIE MECHANISM FOR TUBULAR SHEET METAL ARTICLES

Filed June 14, 1930

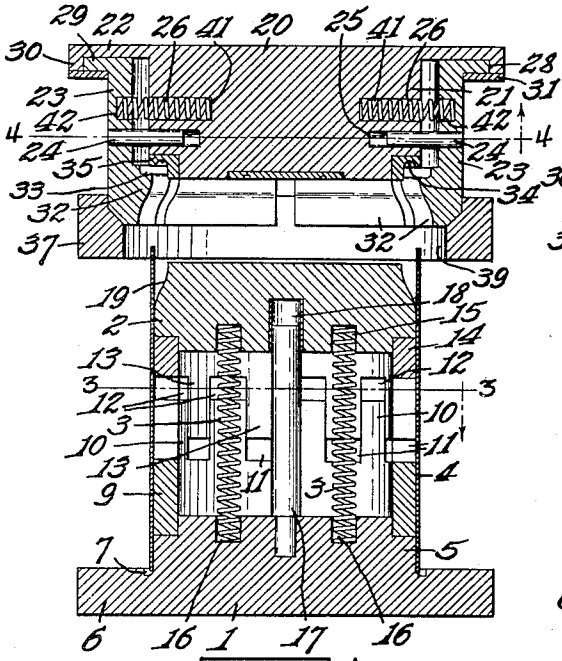

FIG 1

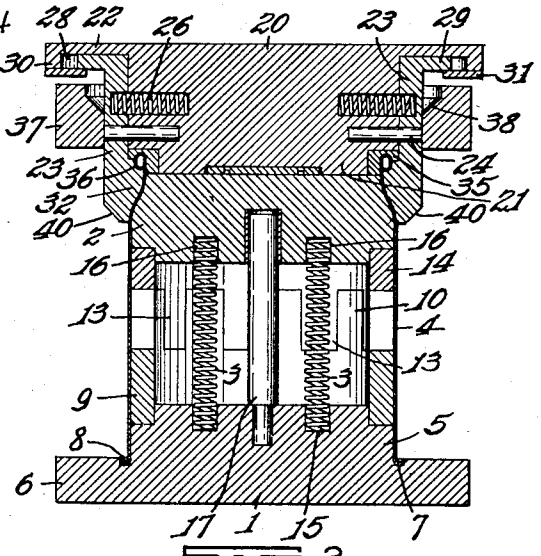

FIG 2

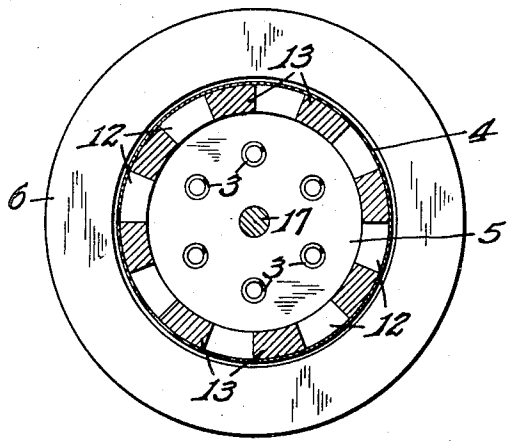

FIG 3

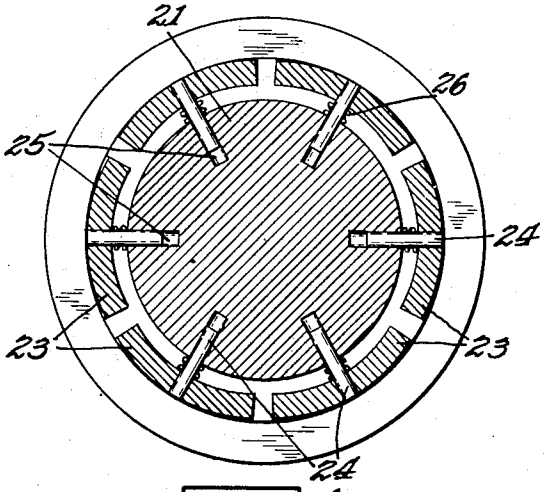

FIG 4

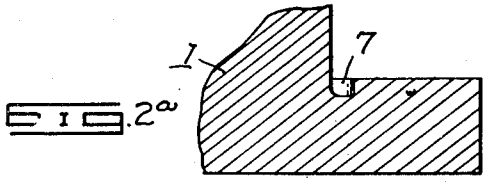

FIG. 2a

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UNITED STATES PATENT OFFICE

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DIE MECHANISM FOR TUBULAR SHEET METAL ARTICLES

Application filed June 14, 1930. Serial No. 461,088.

This invention relates to shaping dies for tubular sheet metal articles, and it has for its primary object to provide a die mechanism adapted for employment in association with a power press for forming reduced necks and rim-rolls on the ends of sheet-metal cans or pail bodies.

A further object is to provide mechanism of the character mentioned by means of which is formed on one end of a tubular can or pail blank in a single operation a reduced neck having a rim-roll and on the other end an annular flange designed for use in applying a bottom.

In describing the invention in detail, reference is herein had to the accompanying drawings, in which—

Figure 1 is a central vertical section of the invention with the die members occupying separated, or non-cooperating, relation;

Figure 2 is a similar view showing said die members occupying their closed functioning position;

Figure 2^a is an enlarged detail section of a portion of the base of the lower die, showing the channel therein; and

Figures 3 and 4 are sections taken, respectively, on lines 3—3 and 4—4, Fig. 1.

Referring to said drawings, 1 designates the base member of a lower die which comprises, additionally, an upper, or crown, member 2 that is vertically movable with respect to said base member, a plurality of compression springs 3 being interposed between said members 1 and 2 and normally maintaining the latter in the elevated position shown in Fig. 1.

Said lower die, generally considered, is of cylindrical form and is adapted to receive in closely embracing relation thereto the tubular sheet metal blank 4 which is to be acted upon in forming a can or pail body. As is shown, the base member 1 comprises a cylindrical body portion 5 and an integral circumferential end portion 6, the latter having a shallow channel 7 formed in its upper face at the angle which it forms with said body portion 5. Said channel has a width which substantially corresponds with that of the bottom flange 8 which is to be formed on the lower end of the tubular blank 4, as shown in Fig. 2.

The body portion 5 of the lower die 1 has its upper end reduced in diameter, and permanently seated in embracing relation to said reduced end is the lower edge portion of a metal ring 9 which has its upper edge portion recessed to form a plurality of alternate uniformly spaced tongues 10 and ways 11 which interengage, respectively, similarly spaced ways 12 and tongues 13 formed on the lower edge portion of a ring 14 whose upper edge portion is permanently seated in embracing relation to a reduced lower end portion formed on the crown member 2 of the lower die. The springs 3, which have their upper and lower ends seated in sockets 15 and 16 provided therefor in the base and crown members 1 and 2, respectively, normally maintain said crown member elevated, and are compressible to permit depression of said crown member to the extent required to effect the turning of the flange 8 upon the lower end of the body blank 4.

The exterior diameter of each of the rings 9 and 14 corresponds precisely with the diameter of the cylindrical portions of the base and crown members 1 and 2, as shown. A pilot pin 17 mounted centrally in the top of the body portion 5 of the lower die 1 coacts with a socket 18 provided therefor in the under side of the crown 2 to afford means for accurately guiding the crown member in its movements.

The upper end portion of the crown member 2 is reduced in diameter, forming a neck which, as shown at 19 in Fig. 1, has the curvature and dimensions required to be produced in drawing the metal of the upper end of the blank 4 inwardly in the formation of the neck for the can or pail.

Reciprocable with respect to the lower die hereinbefore described is an upper die 20 which is adapted to be carried by the ram of the press, said die comprising a cylindrical body 21 having about its top a circumferential flange 22. Disposed in encircling relation to said body 21 is a plurality of relatively spaced ring segments 23 which are radially movable relative to said body, each segment

having fixed thereto the outer end of a guide pin 24 which is slidably received in a radial socket 25 provided therefor in said body 21. A plurality of compression springs 26 serve normally to maintain said ring segments 23 thrust outward from the body 21 of the upper die, said springs having their opposite ends seated in sockets 41 and 42 provided therefor in said body 21 and said segments 23, respectively.

Means is provided whereby the assembled relation of said ring segments 23 with respect to the die body 21 is maintained and also whereby the extent of outward radial movement of said segments is limited. Said means, as herein shown, comprises an internal annular channel 28 provided in the outer edge portion of the flange 22 of the die body 21, and a horizontal outwardly extending flange 29 formed on the upper end of each of the ring segments, said flange being received by and radially shiftable in said channel 28. A downwardly extending lip 30 formed integral with the outer edge portion of said flange 22 has mounted on the under surface thereof a ring 31 of flat form which has its inner edge portion extending inwardly from said lip to form the lower defining wall of the channel 28, as shown in Figs. 1 and 2.

Each of the ring segments 23 has its lower end portion shaped to form an inwardly projecting jaw 32 having an inner surface contour corresponding with that of the neck portion 19 of the crown member 2 of the lower die. Said jaw also has in its upper portion an upwardly facing groove or channel 33 which is designed to complement a downwardly facing groove or channel 34 provided in a ring 35 which is fixed to the body 21 of the upper die, being fitted in embracing relation to a reduced lower end portion of said body, as shown. The grooved faces of the jaws 32 are designed to cooperate with the grooved ring 35 for effecting the coiling of the upper edge of the tubular sheet metal blank 4 into the terminal roll or bead form shown at 36 in Fig. 2.

A ring 37 is designed to be stationarily carried by the frame of the press at an appropriate level in overhanging concentric relation to the lower die, as shown. Said ring constitutes means whereby, as the upper die is reciprocated downwardly with respect to the lower die, the ring segments 23 are collapsed, or forced radially inward, with respect to the body 21 of the upper die to the position wherein they abut upon said body and upon each other for compressing the upper end of the blank 4 into the desired neck form, as shown. Said ring 37 is shaped interiorly to provide an upper downwardly and inwardly disposed bevel, or inclined wall surface, 38 and a lower vertically disposed wall surface 39 whereon, as the upper die is reciprocated, said ring segments 23 ride for inducing the alternate closing and opening radial movements thereof. In the elevated position of said upper die a downwardly and inwardly inclined under surface 40 formed on the lower end of each of said ring segments and which corresponds to the beveled or inclined internal surface 38 of the ring 37 rests upon the last mentioned surface, as shown in Fig. 1. As said upper die, carried by the ram of the press, is lowered, the said engaged surfaces 38 and 40 coact to effect a gradual inward travel of the segments 23 against the yielding force exerted by the springs 26. At the instant when said segments have become fully seated with respect to the body 21 of the upper die, they ride off the beveled surface 38 of the ring 37 and thence pass vertically through said ring with said body 21, their outer walls being then embraced by and riding on the vertical wall surface 39 of said ring, the latter constituting both a guide for said segments and means whereby their collapsed relation is rigidly maintained during the neck and rim-roll forming operation.

As is obvious, the upper end portion of the tubular sheet metal blank 4 is gradually drawn inwardly as the upper die is lowered with respect to the lower die, until, in the completely lowered position of said upper die, it occupies the seated closely-embracing relation to the neck 19 of the crown member 2 of said lower die, as shown in Fig. 2. Further, in the final part of the downward reciprocation of the upper die, the jaws 32 of said segments cooperate with the ring 35 for rolling in the sheet metal blank 4 the terminal roll or bead 36, the latter being formed within the complemental grooves or channels 33 and 34 provided, respectively, in said jaws and said ring 35. Moreover, in the final part of the downward reciprocating movement, the crown member 2 of the lower die and the thereby-carried ring 14 are thrust downwardly against the yielding force exerted by the compression springs 3, carrying therewith the blank 4 for effecting the turning upon the lower edge portion of said blank of the annular terminal flange 8.

Manifestly, in the return, or upward, reciprocating movement of the upper die, the shaped pail body is elevated therewith, the rim-roll 36 being seated upon the jaws 32. When the segments 23 are expanded outwardly following the elevation thereof to the level at which the beveled under surfaces 40 thereof engage the inclined internal surface 38 of the ring 37, said rim-roll becomes disengaged from said jaws, permitting removal of the formed pail body.

What is claimed is—

1. Die mechanism for forming a reduced neck and a rim roll on a cylindrical sheet metal body, said mechanism comprising a lower die, an upper die reciprocable relative

to said lower die, said lower die having its upper portion reduced and presenting the contour required for said neck, said upper die comprising a body member, a plurality of ring segments radially movable into and out of complemental embracing relation to said member, yieldable means normally maintaining said segments in expanded relation, said segments having jaw portions on their lower ends, a stationary guide ring through which said body member and said segments are reciprocated relative to said lower die and whereby said segments are actuated to move inwardly to positions in which said jaw portions conformably embrace the reduced portion of the lower die.

2. Die mechanism for forming a reduced neck and a rim roll on a cylindrical sheet metal body, said mechanism comprising a lower die, an upper die reciprocable relative to said lower die, said lower die having its upper portion reduced and presenting the contour required for said neck, said upper die comprising a body member, a plurality of ring segments radially movable relative to said body member, means normally maintaining said segments in expanded relation to said member, said segments having their lower ends shaped interiorly to correspond to the contour of the reduced portion of the lower die, and means whereby, upon lowering of the upper die, said segments are collapsed inwardly into cooperative relation to said reduced portion of the lower die.

3. Die mechanism for forming a reduced neck and a rim roll on a cylindrical sheet metal body, said mechanism comprising a lower die, an upper die reciprocable relative to said lower die, said lower die having its upper portion reduced and presenting the contour required for said neck, said upper die comprising a body member, a plurality of ring segments radially movable relative to said body member, means normally maintaining said segments in expanded relation to said member, said segments having their lower ends shaped interiorly to correspond to the contour of the reduced portion of the lower die, means whereby, upon lowering of the upper die, said segments are collapsed inwardly into cooperative relation to said reduced portion of the lower die, and complemental roll-shaping means formed on said segments and the lower portion of said body member of the upper die.

4. Die mechanism of the character described, comprising a lower die and an upper die, said lower die including a base portion and a crown portion, the latter being vertically movable relative to the former, yielding means normally holding said crown portion in elevated relation to said base portion, said lower die being adapted to receive in embracing relation thereto cylindrical sheet metal blanks, the crown portion being reduced exteriorly to form a neck, the upper die including a body member, a plurality of ring segments collapsible and expansible into and out of embracing relation to said body member, means normally yieldingly maintaining said segments in expanded relation to said body member, the lower end portions of said segments being shaped to form inwardly facing jaws having a contour to correspond with that of the neck of the lower die, and means for effecting the collapse of said segments as said upper die is lowered relative to the lower die.

5. Die mechanism of the character described, comprising a lower die and an upper die, said lower die including a base portion and a crown portion, the latter being vertically movable relative to the former, yielding means normally holding said crown portion in elevated relation to said base portion, said lower die being adapted to receive in embracing relation thereto cylindrical sheet metal blanks, the crown portion being reduced exteriorly to form a neck, the upper die including a body member, a plurality of ring segments collapsible and expansible into and out of embracing relation to said body member, means normally yieldingly maintaining said segments in expanded relation to said body member, the lower end portions of said segments being shaped to form inwardly facing jaws having a contour to correspond with that of the neck of the lower die, means for effecting the collapse of said segments as said upper die is lowered relative to the lower die, and complemental means borne by said segments and an adjacent portion of said upper die body whereby a roll rim is formed on the adjacent end of a blank carried by said lower die.

6. A die mechanism for forming a contracted neck on a sheet metal body, said mechanism comprising a lower die, an upper die reciprocable relative to the lower die, said lower die having its upper portion of relatively reduced diameter, said upper die including a body and a plurality of complemental ring segments radially movable relative to said body, yieldable means normally maintaining said segments in expanded relation, and a guide member arranged in cooperative embracing relation to portions of said segments and adapted upon lowering of said upper die to effect inward movement of said segments into cooperative relation to said reduced portion of the lower die.

7. In a die mechanism for forming a contracted neck and a terminal rim roll on a sheet metal body, said mechanism comprising a lower die, an upper die reciprocable relative to the lower die, said lower die having its upper portion of relatively reduced diameter, said upper die including a body and a plurality of complemental ring segments radially movable relative to said body, yield-

able means normally maintaining said segments in expanded relation, a guide member arranged in cooperative embracing relation to portions of said segments and adapted upon lowering of said upper die to effect inward movement of said segments into cooperative relation to said reduced portion of the lower die, and complemental roll forming means borne by said segments and an adjacent portion of the upper die.

In testimony whereof, I affix my signature.

CHARLES H. ROLLASON.