

May 16, 1939.

R. A. TERRELL

2,158,312

MACHINE FOR MAKING A BARREL

Filed Feb. 7, 1936

4 Sheets-Sheet 2

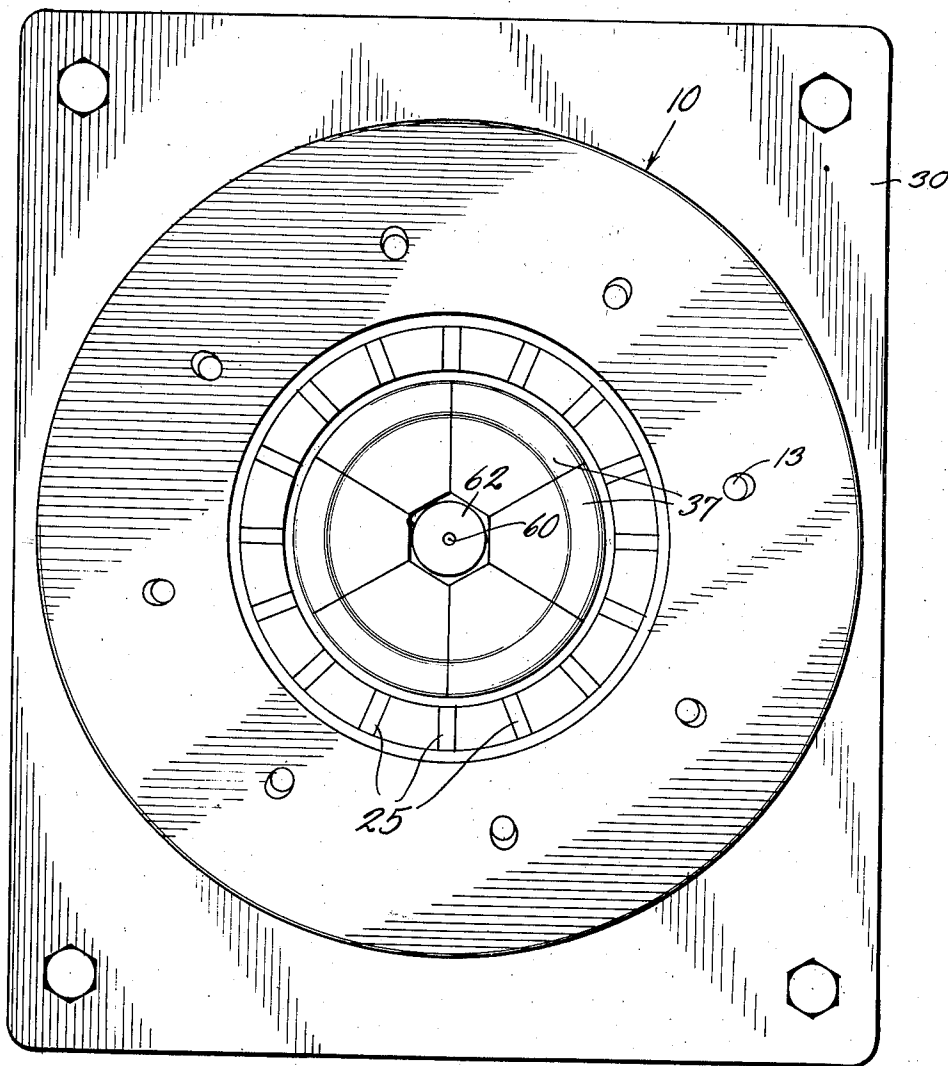


Fig. 2.

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4 Sheets-Sheet 3

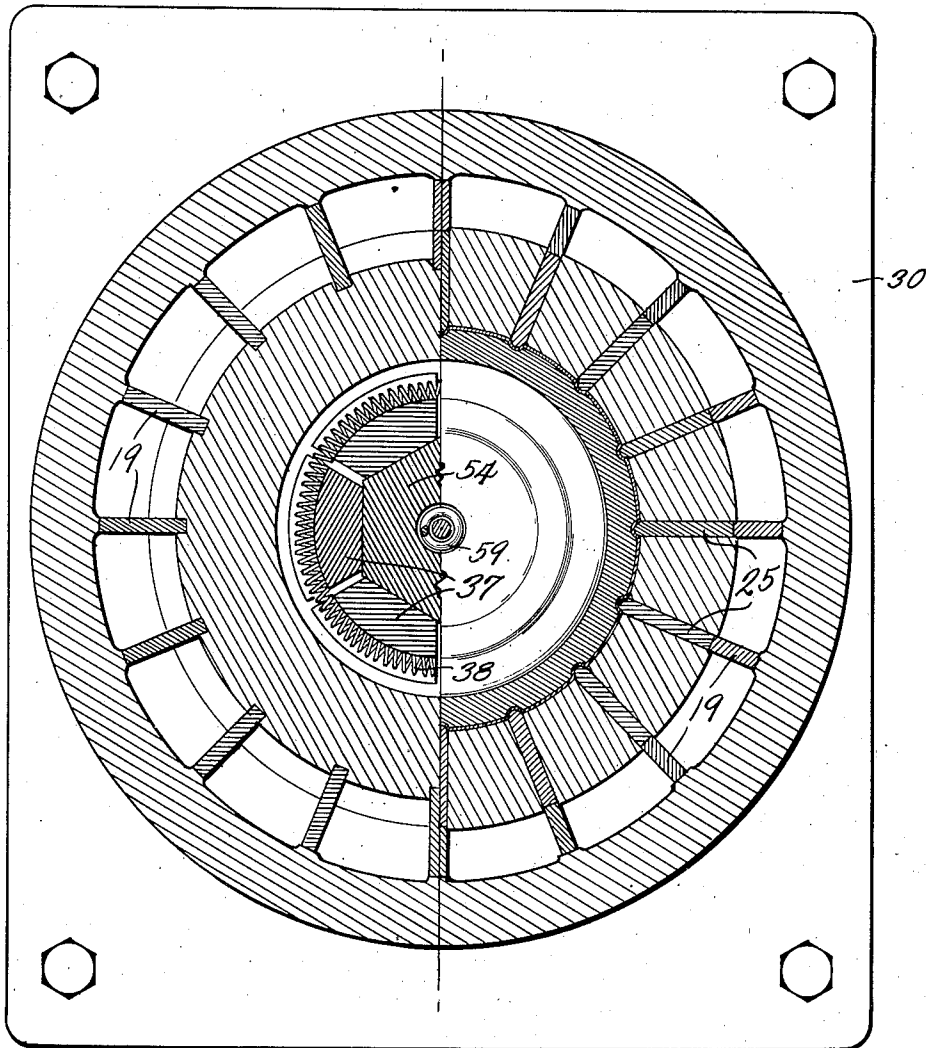


Fig. 3.

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4 Sheets-Sheet 4

Fig. 7.

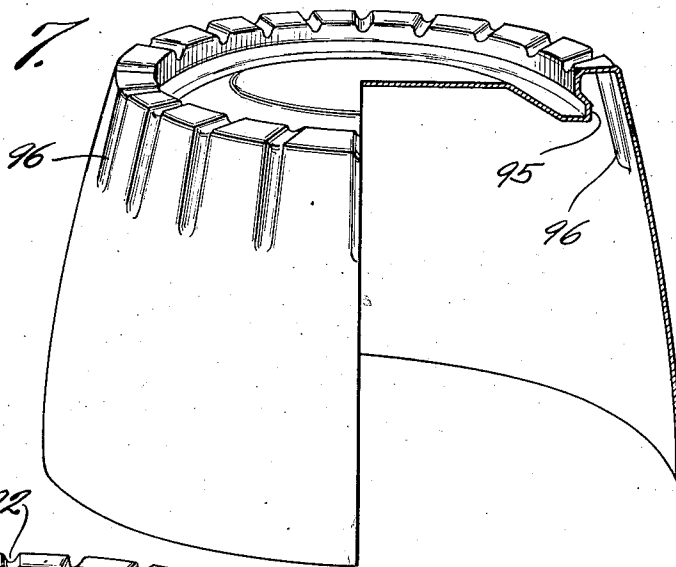


Fig. 6.

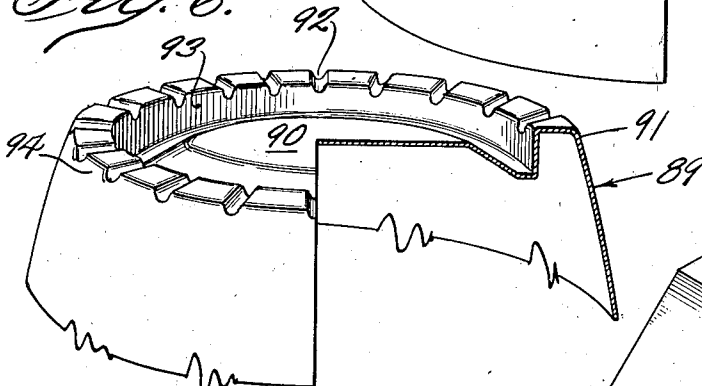


Fig. 5.

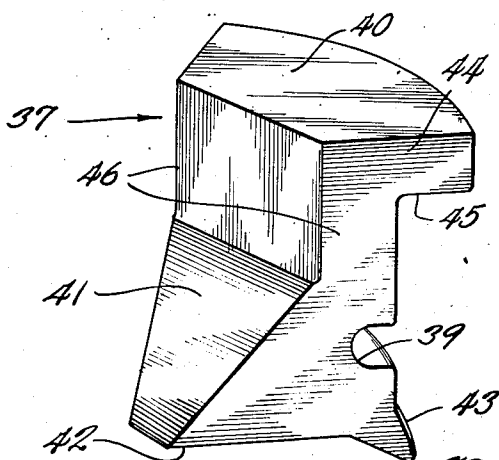
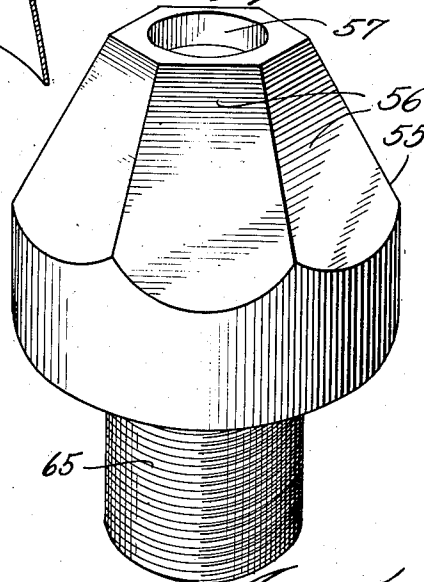


Fig. 4.

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UNITED STATES PATENT OFFICE

2,158,312

MACHINE FOR MAKING A BARREL

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2 Claims. (Cl. 113—48)

This invention has to do with the making of containers, and relates more particularly to an improved machine for forming containers from sheet metal.

One form of sheet metal barrel as presently constructed includes inner and outer shells spaced from one another by an air space or by a space containing an insulating material. The inner shell is sometimes referred to as a drum. The drum constitutes the container proper for the contents of the barrel. Subsequent to assembly of the inner shell or drum, the outer shell is fabricated thereabout. The outer shell may be of two counter parts referred to hereinafter and in the appended claims as half shells, each half shell consisting of an end wall or head of the barrel and substantially half of the side walls of the complete outer shell. Assembly of the half shells is accomplished by telescoping each over its respective portion of the drum until the peripheral edges of the half shell side walls arrive in coaxial abutted relationship. Thereafter the assembly is completed by securing the abutted edges together in some such manner as by welding.

Another object of the present invention is the provision of a novel barrel making machine including complementary series of dies actuable to impress reinforcing sections into a body of sheet metal forming the chime of a barrel.

A further object of the present invention is the provision in a barrel making machine of a carrier of a series of outwardly movable dies and of a series of inwardly movable dies operable upon the inner and outer peripheries of a sheet metal barrel chime to impress reinforcing sections therein.

A still further object of the present invention is the provision in apparatus for making a sheet metal barrel, of a holder member having a die section projecting into a preformed hollow chime, and a plurality of sets of dies complementally movable to impress indentations selectively within the chime while upon such holder.

With the above and other desirable objects in view a form of the invention is hereinafter described in conjunction with the four sheets of drawings hereby made a part of the specification, and wherein:

Fig. 1 is a vertical sectional view taken at a plane disposed axially of a container forming apparatus constructed in accordance with the present invention;

Fig. 2 is a plan view illustrating the lower side

of a die holder constituting a part of the apparatus shown in Fig. 1;

Fig. 3 is a horizontal sectional view taken on the line III—III of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a perspective view of a die of the outwardly expansible die set employed in the apparatus of Fig. 1;

Fig. 5 is a perspective view of a cam member for operating the dies of which one is shown in Fig. 4;

Fig. 6 is a fragmentary perspective view of a partly constructed half shell; and

Fig. 7 is a view similar to Fig. 6, but illustrating a completed half shell.

The same reference characters are used for identifying similar parts shown in the drawings and described hereinafter.

Attention is first directed to Fig. 1 where there is shown in cross section a circular die holder member 10 comprising a lower ring-like part 11 and an upper part 12 also in the general shape of a ring. Parts 11 and 12 are secured together by a series of bolts 13; see Figs. 1 and 2. A second series of bolts 14 having their heads countersunk into the upper face of the ring 12 are spaced about the edge of such ring and passed through apertures 15 therein and screwed into threaded apertures 16 within an upturned flange 17 circumscribing the lower ring-like part 11 of the die holder.

A plurality of spaced apart and radially arranged slots 18 are formed vertically within the upper part 12 of the die holder, such slots being of the same cross section and in alignment with the slots 19 formed within the lower part 11; see Figs. 1 and 3. Each of the slots 18 has a vertical section in registry with a slot 18 and a diagonal section 20 directed downwardly and radially of the holder 10. Secured to the lower side of inclined sections 20 are bearing plates 21. Screws 22 may be used for securing the bearing plates 21 in position. Bearing plates 23 are secured to the upper side of inclined slot sections 20 by means of screws 24. Each inclined slot section 20 contains a die 25 having a nose 25a; see Figs. 1 and 3. Dies 25 slide freely upon the opposed bearing surfaces of the members 21 and 23. Such sliding movement is limited, however, by lugs 26 upon the bearing members 23, and which project into recesses 27 within the upper side of the dies. The purpose of the lug and recess structure will be explained later.

Actuation of the dies 25 is had by means of vertically slidable cams 28 disposed within the

slot sections 18 and 19 of the holder 10. Inclined camming surfaces 29 upon the cam members 28 coact with the outer ends of the dies 25 whereby to force such dies radially inwardly and downwardly of the device incident to a downward movement of the cams 28. The upper ends of vertically reciprocable cams 28 project upwardly beyond the upper face of the cover plate 30 of the die holder. Apertures 31, rectangular in cross section, permit of the passage of the cams 28 through the cover plate. Normally, springs 32 which are seated in recesses 33 below each of the cam members 28, yieldingly urge such cam members toward their uppermost reciprocal limit. Shoulders 34 upon the cam members 28 are adapted to abut against the cover plate 30, thereby determining such uppermost limit. The lower limit of the reciprocable cams 28 is determined by the abutment of said cams with the bottoms of their respective slots 19. A vertically reciprocable compressor head 35 has a bearing ring 36 secured to its lower face and countersunk therein. The bearing ring 36 is adapted to abut against the upper ends of the cam members 28 for forcing the latter downwardly when the compressor head 35 is lowered.

Disposed within the space surrounded by the annulus 12 is a series of radially expansible dies 37 which are held in their normally contractable position by a coiled spring 38 in the form of a loop and resting in grooves 39 within the outer faces of the dies. One of the dies 37 is shown perspectively in Fig. 4. Each of the dies 37 is of similar construction. Referring to Fig. 4, the die 37 will be seen to comprise a flat upper bearing face 40 and an inclined camming surface 41. The lower face 42 of the die 37 is arranged in parallelism with the upper surface 40. The lower surface 42 coacts with an arcuate projecting section 43 for shaping the barrel half shells in a manner later to be described. An arcuate flange-like section 44 extends radially outwardly from the upper part of the die, such radially projecting section providing a bearing surface 45 on its underside. The vertical sides 46 of the die 37 are convergent so that the die will be of a shape adapting other dies of like shape to be placed alongside thereof in arcuate formation.

A circular countersunk section 47 within the upper face of the annulus 12 of the die holder 10 is provided with a flat bearing ring 48 upon which the radially extending sections 44 of the dies 37 rest and are free to slide. A second bearing for the dies 37 is provided in the form of a flat ring 49 countersunk within and secured to the lower face of the cover plate 30. Operating in conjunction with the coiled spring 38 for clustering the dies 37 are springs 50 placed in recesses 51 within the projecting sections 44 of said dies. The springs 50 exert force between the ends of their respective recesses and slugs 52, the latter being constantly pressed against the vertical wall of the recess 47. Air vents 53 permit of freedom of movement of the piston-like slugs 52 within the recesses 51. The cams 37 may be forced radially outwardly by a vertically reciprocable cam 54, which is shown in detail and inverted in Fig. 5.

Said cam 54 has a lower body 55 of relatively great diameter upon which there are formed, in the present embodiment of the invention six inclined camming surfaces 56 which converge downwardly toward the longitudinal axis of the device. The lower end of the cam member 55 has a cut-away portion 57 countersunk at 58 for

receiving a spring 59. The cam 54 has a longitudinal opening 60 disposed axially thereof in communication with the recess 57 and its countersunk portion 58. A bolt 61 is slidable axially within the opening 60. Such bolt has a head 62 threaded upon the lower end thereof. The spring 59 presses against the upper face of the head 62, thereby urging said head and the bolt 61 downwardly, the downward movement being limited by a nut 63 upon the upper end of the bolt 61. A lock nut 64 may be employed for holding the nut 63 in a selected position upon the bolt. The upper body of the cam 54 consists of a neck 65 threaded upon its outer surface for the reception of a nut 66. Countersunk sections 67 within the nut 66 provide engagement means for a wrench whereby the nut may be turned into place upon the neck. Also threaded upon the neck 65 is a lifter member 68 having a flange 69. The flange 69 fits within a flat ring 72 held upon the upper face of the die carrier cover plate 30 by bolts 73. The nut 66 is turned snugly against the lifter member 68, thereby serving as a locking means for holding said member fixedly upon the neck 65. A plurality of springs 74 are seated against the bearing plate 49 and extend upwardly in apertures 75 within the cover plate 30, thereby urging slugs 76 against the lifter member 68. In this manner the springs 74 operate in conjunction with coiled spring 38 and springs 50 in the lifting of cam 54 and retracting the dies 37. Upward movement of the lifter member 68 and of the cam 54 is limited by said member coming in contact with the lower face of the compressor head 35.

Upon the lower side of the annulus 12 and near the central opening thereof are a plurality of flat metal strips 77; see Fig. 1. Said strips 77 are arcuate in shape and bridge the spaces between adjacent inclined slot sections 20. Bolts 78 may be employed for holding the metal strips 77 in place.

All of the apparatus above described is operable in conjunction with means (not shown) for moving it bodily upwardly and downwardly, and for moving the compressor head 35 upwardly and downwardly with respect to the die holder 10. Such means for vertical movement of the die holder and the compressor head will have its function referred to more specifically hereinafter in conjunction with a description of the operation of the present apparatus.

Beneath the die holder 10 and in axial alignment therewith is an annular die member 79. The inner periphery of the die member 79 is substantially cylindrical in contour, whereas the outer periphery slopes downwardly and slightly outwardly and contains a plurality of spaced apart grooves 80 extending axially of the die. In registry with the grooves 80 and forming a continuation thereof are grooves 81 extending radially of the die member 79. Any form of solid support for the die 79 may be employed. In the present instance a block is shown generally at 82 for supporting the die. Between the block 82 and the die 79 is a holder plate 83 which is secured to the block 82 by bolts 84 of which one is shown. A plurality of bolts 85 may be employed for securing the die 79 to the holder member 83 and bolts 86 may be used for holding a plate 87 upon the holder member 83. Anchorage means not shown may be employed for holding the block 82 to the floor 88.

The device is adapted to receive and operate upon partially completed half shells which may 75

be in the form illustrated in Fig. 6. The half shell shown in Fig. 6 has side walls 89, an end or head 90, and a chime 91. A series of radially arranged notches or reinforcing sections 92 may have been formed in the end wall of the chime 91 pursuant to the forming of the half shell. The inner and outer peripheries of the half shell chime 91 and designated respectively 93 and 94 may be perfectly smooth.

The means (not shown) referred to hereinabove is employed for lifting the die holder 10 and the compressor head 35 such a distance from the annular die 79 as will permit of the insertion of a partially formed half shell 89 onto the die 79 in the manner illustrated in Fig. 1. If the half shell 89 at the time of its placement upon the die 79 has radially extending sections 92 therein, such sections will be seated within the grooves 81 of such die. It will be noted that the outer periphery of the holder plate 83 has a paraboloidal contour so as to conform to the side walls of the half shell 89. The inner peripheral surface of the annulus 11 of the die holder 10 likewise conforms to the side walls of the half shell. The outer periphery of the die 79, with the exception of the depressed sections 80 therein forms a uniform continuation of the outer periphery of the plate 83, and likewise conforms to that section of the half shell coming in contact therewith.

After the half shell 89 has been positioned as described upon the die 79, the die holder 10 and a compressor head 35 will be lowered. While such parts are being lowered, the spring 59 is effective to yieldingly press block 62, which is then projected a considerable distance below the lower surfaces 42 of dies 37, against the center of the half shell head 90. Springs 38 and 50 at this time will be effective for retracting or clustering the dies 37, and the springs 74 pressing against plungers 76 and the lifter member 68 will be effective for raising the cam 54 sufficiently to permit of the clustering of the dies 37. As the parts are lowered, the block 62 will first be pressed yieldingly in contact with the head 90 of the half shell, whereby said half shell is pressed firmly into place upon the die 79 and the sides of the holder plate 83. Next, the inner periphery of the annulus 11 will come in contact with the outer side of the half shell side walls whereby such side walls are compressed firmly against the holder plate 83. At this time the dies 25 which therefore were held by the lugs 26 and notches 27 from sliding out of place, have come in contact with the outer periphery of the chime to be displaced thereby a short distance radially outwardly. Springs 32 are at this time effective for holding the cams 28 in their uppermost position to permit of the free outward movement of the dies 25 upon the latter coming in contact with the half shell chime.

While the die holder 10 and the compressor head 35 were in the raised position, the compressor head was separated a short distance from the guide and spacer ring 72, so that the springs 74 were effective for raising the cam 54 with respect to the die holder 10. After the die holder has been positioned with respect to the die 79 and the half shell 89 thereon in the manner described, the compressor head is lowered with respect to the die holder and into the position relative thereto shown in Fig. 1. Such closing of the vertical distance between the compressor head and the die holder brings the compressor head concurrently into contact with the lifter member 68 and with the upper ends of the cams 28 there-

by depressing said cams and the cam 54 with respect to the die holder. As a consequence of the downward movement of the cams 28 against the resistance of the springs 32, the dies 25 are caused to contract downwardly and inwardly against the chime of the half shell. The noses 25a upon the dies 25 compress the material of the end wall of the chime 91 further into the sections 81 within the die 79 while the lower and inner edges of the dies 25 are effective for depressing the material of the outer periphery of said chime into the indentations 80 of the die 79. Downward movement of the cam 54 brings the camming surfaces 56 thereof against the camming surfaces 41 of dies 37, thereby causing such dies to expand to bring their arcuate projecting sections 43 into contact with the inner peripheral wall 93 of the chime 91 and expand it outwardly to form a finger grip 95 shown in Figures 1 and 7. While the dies 37 are being expanded radially outwardly to form the finger grip 95, the block 62 is held firmly against the half shell head 90 by means of the spring 59 to prevent buckling of such end wall. The head 90 is further held by the lower surfaces 42 of the dies 37.

After the die holder 10 and the compressor head 35 have been lowered upon the half shell 89 and thereby contracted the dies 25 and expanded the dies 37, the half shell will appear as shown in Figure 7. Reinforcing sections 96 will have been formed by the inner ends of the dies 25 while the finger grip section 95 will have been formed by the expansible dies 37. The radially extending sections 92 traversing the arcuate end wall of the chime 91 may have been deepened by the noses 25a of cams 25, or should the half shell have contained no sections 92 at the time of insertion into the device, such sections 92 may be formed entirely by the noses 25a.

Subsequent to the lowering of the die holder 10 and the compressor head 35, such parts are then elevated, the compressor head being first elevated to permit of contraction of the expanded dies 37 to withdraw the projecting sections 43 thereof from within the finger grip section 95, the die holder 10 being thereafter elevated together with the compressor head entirely free from the finished half shell, so that the latter may be lifted from the die 79. The process may then be repeated upon other half shells 89 which may be successively telescoped onto the die 79.

The process, it will be seen, comprises a succession of operations for forming a half shell from a flat metal blank. Such blank is first compressed into the shape of a half shell having thereon a chime section free of depressions in its outer and inner peripheral side walls and thereafter the blank is acted upon by two series of dies, one expansible and the other contractible, effective to impress such depressions in the side walls of the chime. If desired, reinforcing sections may be depressed within the annular end wall of the chime by the contractible set of dies.

What I claim as new and desire to secure by Letters Patent is:

1. In a sheet metal forming apparatus particularly adapted for forming the head of a container shell, an inner die for receiving said shell thereabout including an upstanding rim portion having an internal die surface and an external die surface, an outer composite die assembly adapted to engage said container shell and form the same about said inner die surfaces, said composite outer die assembly comprising a reciprocable compressor head, centrally located

reciprocable cam means engageable by said compressor head for operation thereby, a plurality of radially outwardly movable dies having complementary cam surfaces cooperating with said cam means for being moved radially outwardly thereby when said cam means is operated by said compressor head, whereby to press a portion of said shell into engagement with said internal die surface, said radially outwardly movable dies being provided with radially extending guide portions disposed axially outside of the extremes of said cam sections, cooperating guide means on said composite guide assembly for receiving said guide portions, a first and second resilient means tending to retract said radially outwardly movable dies, said first resilient means being located axially between the extremes of said complementary cam surfaces of said radially outwardly movable dies and said second resilient means being located axially outside the extremes of said cam surfaces, a plurality of radially inwardly movable dies arranged to engage a portion of said shell against said external die surface, said radially inwardly movable dies being provided with cam operating surfaces engageable by a second reciprocable cam means for effecting the operation thereof inwardly, said second cam in return being engaged by said compressor head simultaneously with the engagement of said compressor head with said centrally located reciprocable cam means.

2. In a sheet metal forming apparatus particularly adapted for forming the head of a container shell, an inner die for receiving said shell thereabout including an upstanding rim portion having an internal die surface and an external die surface, an outer composite die assembly adapted to engage said container shell and form the same about said inner die surfaces, said

composite outer die assembly comprising a reciprocable compressor head, centrally located reciprocable cam means engageable by said compressor head for operation thereby, a plurality of radially outwardly movable dies having complementary cam surfaces cooperating with said cam means for being moved radially outwardly thereby when said cam means is operated by said compressor head, whereby to press a portion of said shell into engagement with said internal die surface, said radially outwardly movable dies being provided with radially extending guide portions disposed axially outside of the extremes of said cam sections, cooperating guide means on said composite guide assembly for receiving said guide portions, a first and second resilient means tending to retract said radially outwardly movable dies, said first resilient means being located axially between the extremes of said complementary cam surfaces of said radially outwardly movable dies and said second resilient means being located axially outside the extremes of said cam surfaces, a plurality of radially inwardly movable dies arranged to engage a portion of said shell against said external die surface, said composite die assembly being further constructed to define a plurality of radially inwardly and downwardly extending guides for guidably receiving said radially inwardly movable dies, said radially inwardly movable dies being provided with cam operating surfaces engageable by a second reciprocable cam means for effecting the operation thereof inwardly, said second cam in return being engaged by said compressor head simultaneously with the engagement of said compressor head with said centrally located reciprocable cam means.

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