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1,975,150

MULTIPLE DIE ASSEMBLY FOR FORMING BOTTLE CAPS

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2 Sheets-Sheet 1

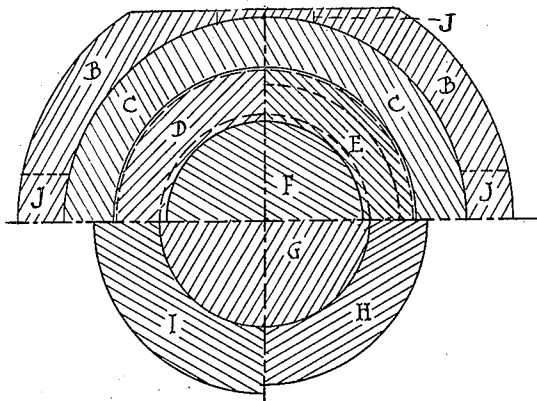


Fig. I

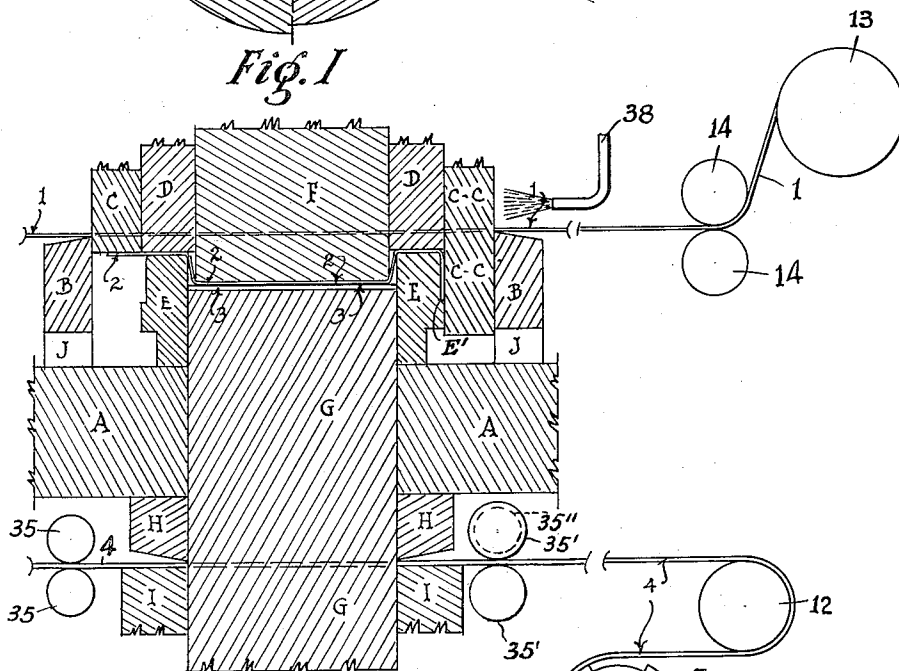


Fig. II

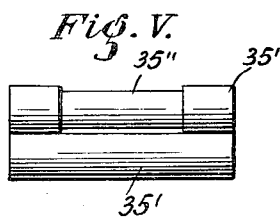
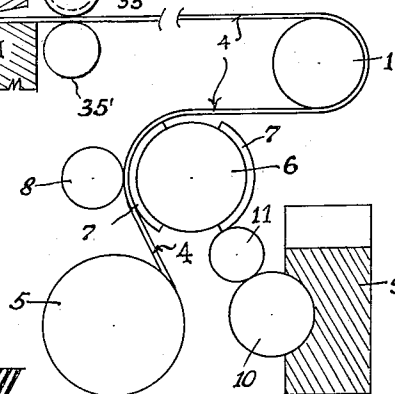


Fig. V

Fig. III



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MULTIPLE DIE ASSEMBLY FOR FORMING
BOTTLE CAPS

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12 Claims. (Cl. 93—1)

This invention relates generally to the formation of paper caps for bottles having a formed annular flange covering the bead of the bottle-mouth, and a central closure disc attached to the inner portion of said cap, and more specifically comprises apparatus for rapidly and cheaply manufacturing the form of bottle-caps shown and described in my Patents Nos. 1,670,450 and 1,670,451.

According to this my invention, I employ a multiple die apparatus for rapidly and accurately forming the outer crimped portion of the cap and at the same time, if desired, cutting and affixing to it the inner closure disc.

The best form of apparatus embodying my invention is illustrated in the accompanying sheet of drawings, in which,

Fig. I is a composite horizontal section through the die assembly taken on different planes, the supporting element and paper feeding mechanism being omitted.

Fig. II is a vertical central section of the dies and die plungers and support for the dies, parts of one of the die members being shown in two positions, and the paper feeding and cap ejecting mechanism being shown diagrammatically.

Fig. III is a diagram of the apparatus for applying adhesive to the strip from which discs are cut for insertion in the caps and for feeding said strip through the dies.

Fig. IV is a view similar to Fig. II but also showing the die actuating apparatus, all parts being in the position assumed at the end of the cap forming operation.

Fig. V is a side view of special feed rollers.

In the said drawings, like reference characters indicate like parts.

A is a base plate forming a foundation for the support of the remainder of the apparatus; B is an annular die having an inner cutting edge and preferably a beveled upper face, as shown, said die being supported upon legs J, J, resting on the foundation plate A; C is a combined blank-cutting and forming ring member or die-plunger, fitting into the die B, and cooperating with the inner cutting edge thereof; D is an upper clamping or holding ring member nested in C and movable relative thereto. This upper ring D cooperates with a lower fixed clamping or holding ring E, which is supported directly on the foundation plate A, and surrounds the mouth of a circular opening therein; F is a vertically reciprocable cylindrical plunger nested in the upper clamping ring D, and having an exterior diameter slightly less than the interior diameter of the

lower clamping ring E; A lower punch plunger, or vertically reciprocable follower G, which is slidable in the opening in the foundation plate A and in the interior of lower clamping ring E, abuts against the lower end of the cylindrical plunger F at the proper time; H is a lower annular die having a cutting edge on its inner lower lip, and a slightly beveled lower face, as shown. This die also surrounds the lower punch plunger G and the lower mouth of the opening in the foundation plate A from which it is supported.

I is a guide ring for the punch plunger or follower G, and also serves as a support and guide for a strip of paper 4, which may be fed between it and the lower annular cutting die H, when follower G is lowered. The ring I is held in fixed position by any suitable support, not shown.

1 represents a strip or sheet of paper from which the crimped upper portion or main body of the bottle cap is formed. This is fed by suitable mechanism, such as feed rollers 14, 14, from a roll 13, these rollers being, of course, intermittently operated by any suitable means; across the face of die B and under the die plungers C, and F and the upper clamping ring member D, when the latter are in raised position; 2 represents a circular cap-forming blank which has been cut from strip 1 and partially formed as indicated in the vertical sectional views; 3 is a closure-disc which is being attached to cap blank 2 in assembled position; and, 4 represents a strip of cardboard, from which disc 3 has been cut by die-plunger or follower G cooperating with the lower annular cutting-die H. The moving elements of the die assembly may be given the properly timed movements by any suitable arrangement of cams, or equivalent mechanism, such as is diagrammatically illustrated in Fig. IV, where 15 represents an upper rotating shaft which is connected by bevel gearing 36 to a lower countershaft 31, and so driven that each makes one complete revolution during each cycle of operations. As there shown, 16, 16, are grooved cams on shaft 15, operating forming die C through cam rollers 17, 17, and slotted links 18, 18, connected to C at 19, 19. Similar grooved cams 20, 20, are connected to a carrier ring D' by cam rollers 21, 21, slotted links 22, 22, and pins 23, 23. Carrier ring D' has a lost-motion connection to upper clamping ring member D through slotted hangers 28, 28, fast on D', and pins 29, 29, set in D and engaging the slots in said hangers. Compression springs 30, 30, normally hold this lost-motion connection in extended position. 24 is another grooved cam operating die plunger F through

cam roller 25, and slotted link 26 having a pin connection 27 to F. The lower die plunger and follower G is reciprocated by lower countershaft 31, crank 32, connecting rod 33 and pivot connection 34. As indicated, each of links 18, 22, and 26 has its upper portion slotted to a point 37 so as to receive the shaft 15 in such slot and have its upper end guided by such shaft.

In operation, the members C, D, F and G are withdrawn at the beginning of each cycle of operation, so as to permit the strips 1 and 4 to be fed across the die openings. Strip 1 may have any desired legends previously printed thereon. When the paper 1 is in position across die B, the punch plungers C and F are forced down substantially as a unit, together with upper clamping member D in such a manner that the combined cutting and crimping ring C cuts out the blank 2 and the upper clamping or holding ring D forces the same down upon the lower clamping ring E with a light pressure (preferably spring controlled as by springs 30, 30) just sufficient to produce the necessary frictional grasp on the blank to maintain it smooth while its central portion is being dished downward by the subsequent further movement of the cylindrical plunger F into the position shown in the vertical sectional view. Thereafter, or while the above-described operations are in progress, the cutting and crimping ring C also descends further, forming the outer peripheral portion of the blank 2 down around the lower clamping ring E, as indicated in Fig. IV, and at the right hand side of Fig. II.

Preferably, the lower, exterior portion of the lower clamping ring E is provided with a double faced annular section having an upper cutting edge E' and an exterior diameter equal to the interior diameter of the combined cutting and crimping ring C. Consequently, further downward motion of the ring C into the position C, C, shown at the right hand side of Fig. II and in Fig. IV, will trim off any irregular edges of the crimped blank and deposit same in the open spaces within and between legs J, J, from which spaces they may be ejected by an air jet, or by any other desired means.

After the dished portion 2 of the cap has been formed by the downward movement of the plunger F, as above described, the lower punch plunger or follower G rises and cooperates with the lower annular die H to cut a disc 3 from the strip 4, and then carries the same up through the central opening of the die assembly, pressing it against the under surface of the dished blank 2.

Prior to this last described action, a spot of adhesive material is deposited upon the strip 4 in such position as to be upon the upper surface of disc 3 when cut therefrom, and this serves to hold the disc in its final position within the cap interior. This adhesive material may be deposited upon the strip 4, as it is advanced toward cutting position, by any convenient apparatus operated in unison with the die assembly above described, the result being the deposit on said strip 4 of small masses of adhesive properly spaced apart so that each will come within the periphery of the disc to be cut therefrom in the manner above described. An arrangement of means for so applying an adhesive material to the strip 4 is diagrammatically illustrated in Fig. III, where 6 is a roller carrying two or more liquid adhesive applying pads 7, 7, preferably of lesser diameter than that of plunger G, and 8 is a cooperating pressure roller. Strip 4 is fed to and between

these from roll 5. The adhesive material is supplied to pads 7, 7, by distributor roller 11, which receives it from roller 10 set in an opening in the side of liquid adhesive reservoir 9. As the discs 3, punched out of strip 4, leave a skeleton of such strip, motion may be given to the strip 4 after it leaves the rollers 6, 8, by providing feed rollers 35', 35', also rollers 35, 35, to pull the skeleton strip out of the dies, and thereby pull the strip 4 around guide roller 12. Rollers 35 and 35' should operate intermittently. As the adhesive material is thus applied only to the disc-forming areas of strip 4, there will be none of it left on this skeleton ribbon to gum up rollers 35, 35, and the upper roller 35' is cut away as shown in Fig. V, at 35'', to avoid the spots of adhesive.

The advantages of my invention comprise the rapidity, accuracy and low cost of its operation and the perfection of the caps manufactured thereby.

While I produce perfect bottle caps operating on dry paper and with cold dies, it may be advisable, however, in some cases, to spray water, or other fluid, serving as a lubricant, on the paper, and, also, heat the dies.

Broken line x—x in Fig. IV indicates the preferred level to which the under surfaces of the three members C, D and F would be lifted at the end of each cycle of operations, and the broken line y—y similarly indicates the level to which the top of the follower G should then be raised, carrying the completed cap with it upon completion of the upward throw of crank 32, the latter being assumed to be in a slightly lower position in Fig. IV. This completed stroke of crank 32 would then bring the completed cap (carried by the follower G) to or above the level of the upper surfaces of ring dies B and E so that it could be expelled laterally by a blast of air from nozzle 38 (see Fig. II), or could be otherwise mechanically and automatically ejected from the die assembly.

Various changes could be made in the details of construction herein illustrated to modify the exact character of the operations performed, or shapes produced, without departing from the underlying principle of the invention so long as the general mode of operation hereinabove described is retained in whole or in any substantial part.

The upper portion of the apparatus evidently might be employed to produce the particular form of crimped paper cap shown without employing the follower G and lower cutting die to stamp out and apply the closure disc 3. On the other hand, the punch plunger G in lower die H could be employed to stamp out such discs and apply them to a different form of upper cap cover produced by a different upper die assembly.

While the various parts described are preferably located in the relative positions shown in the drawings, it is quite obvious they will operate equally well in a reversed position, or with the common axis of the movable elements in horizontal or inclined position.

The entire die assembly can be confined to a space of about six inches diameter and about the same depth, if necessary, and the system of cams, levers, toggles, or other trains of mechanism for producing the desired timing of movements of the parts may be of any character embodying good machine design.

The feed motions for the paper and cardboard strips may be produced by feed rollers automatically operated, and obviously a battery or

bank of the die assemblies described may be arranged side by side and operated by one or more cam shafts, and operating on one broad sheet passing through all, or on a series of individual strips of paper, either or all of which may be fed by a single set of feed rollers.

Central dies, or dies otherwise located, may be provided with a spring ejector, or an air jet, or other means of expulsion of the completed cap and cover after its formation as above described.

It will be obvious that caps made on this apparatus are provided with ample skirts, instead of having the abbreviated edge portions customary in caps of this general type heretofore used. Besides serving a useful purpose in protecting the entire pouring lip of the bottle on the inside and outside thereof from the collection of dirt, this ample skirt portion is very valuable as affording an annular space on the web of paper out of which the cap is made, on which may appear advertisements, instructions to users, and other legends, which will be legible after the cap is formed. Such reading matter can, of course, be printed on the flat web of paper in such form that, when the cap portion is cut out from said web and shaped by the dies as herein shown, these legends will be legible upon the circumferential portion thereof.

Having described my invention, I claim:

1. In a multiple die assembly, the combination of an annular die having a circular opening, over which a strip of paper may rest, a lower annular clamping or holding ring of lesser diameter supported in said opening at a slightly lower level, and a set of concentric die plungers and an upper clamping ring above said first mentioned annular die, comprising a centrally disposed former comprising a cylindrical plunger having an external diameter slightly less than the interior diameter of said lower clamping ring, said upper clamping ring surrounding said plunger and adapted to be pressed down on said lower clamping ring, and an exterior combined forming and blank cutting ring fitting into said first mentioned die opening and having an interior diameter such that it may pass down around said lower clamping ring, whereby, when mechanism for reciprocating said set of die plungers and upper clamping ring is provided and operated, the same may first descend substantially as a unit to lightly hold said strip between said clamping rings and cut a circular cap blank from the paper then lightly held between said clamping rings, thereafter the cylindrical former on further descent may form in said blank a depressed central portion within said lower clamping ring, and finally said forming ring may descend to crimp down said outer circumferential portion of said blank around said lower clamping ring.

2. A combination such as defined in claim 1, in which said lower clamping ring has an annular cutting edge formed on the lower portion of its exterior adapted to fit closely into the interior of said descending forming and cutting ring and thereby trim the edges of said cap after they have been crimped by the combined action of said rings.

3. In a multiple die assembly for forming bottle caps the combination of an annular holder for cap-making material, a concentric annular die below said holder, and a set of dies adapted to form a bottle cap from said material upon said holder which are located circumferentially within, and mainly above, said holder, together with a vertically reciprocable plunger movable to a

plane at the limit of its downward movement which is below said lower die and which at all times occupies a position concentric with said die, and mechanism for projecting said plunger up into the interior of said lower die and annular holder after a bottle cap has been formed upon the latter by said first mentioned dies; whereby a disc may be cut from a strip of paper placed below said lower die and above said plunger, when in its lowered position, and thereafter carried by said plunger upward against the lower face of each bottle cap which has first been formed as above described.

4. A mechanism such as defined in claim 3, combined with means for insuring the presence of a body of adhesive material upon the upper surface of said disc, whereby said adhesive material may serve to fasten said disc to the interior of the cap into which it is forced.

5. In a multiple die assembly adapted to cut out, shape and assemble the elements of a composite cap for milk bottles, the combination of a fixed annular die, a fixed holding member nested therein, means for feeding a strip of paper or like material over both said holding member and die, a vertically reciprocable annular cutting and forming die and a plunger within the same both located above and adapted to cooperate with said fixed die and holding member to cut a generally circular portion out of said material, dish downwardly the central portion of the same, and bend down the edges thereof, a second annular die located below said holding member and coaxially therewith, means for feeding a second strip of material beneath said last mentioned die, and a second vertically reciprocable plunger adapted to cooperate therewith, together with means for forcing said last mentioned plunger upwardly through said lower die and into the interior of said holding ring, whereby a disc cut from said second strip of material may be forced up into the interior of the cap formed on said holding ring.

6. An apparatus such as defined in claim 5 combined with an upper holding ring nested between said first mentioned plunger and reciprocable forming die and also reciprocable therewith.

7. An apparatus such as defined in claim 5 combined with an upper holding ring nested between said first mentioned plunger and reciprocable forming die and also reciprocable therewith, together with spring pressure means for forcing downward said upper holding ring.

8. An apparatus such as defined in claim 5 combined with an annular guide for said lower plunger the upper annular surface of which is adapted to also serve as a guide for said second strip of material.

9. An apparatus such as defined in claim 5 combined with means for applying adhesive material to spaced apart areas of the surface of said second strip of material so located as to be within the perimeters of the discs to be subsequently cut therefrom.

10. An apparatus such as defined in claim 5 combined with means for applying adhesive material to spaced apart areas of the surface of said second strip of material so located as to be within the perimeters of the discs to be subsequently cut therefrom, comprising a roller having a raised portion of its surface of substantially circular area and of a diameter less than the interior diameter of said lower die, and means for depositing adhesive material on said raised

surface, while said strip is being fed over said roller and in contact with said raised portion of its surface.

11. An apparatus for making composite caps for bottles comprising, in combination, means for cutting a generally circular piece of material from a strip thereof and bending down the outer edges thereof, mechanism for feeding the strip of material to such means, a punch and die mechanism for punching discs out of a second strip of material, and means for feeding such second

strip to said punch and die mechanism, said punch also being adapted during a continuation of its disc cutting motion to force said disc into and against the surface of the interior of the cap formed by the first above mentioned means. 80
12. An apparatus such as defined in claim 11, combined with means for placing adhesive material between said cap and disc surfaces before they are brought into contact one with the other. 85

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