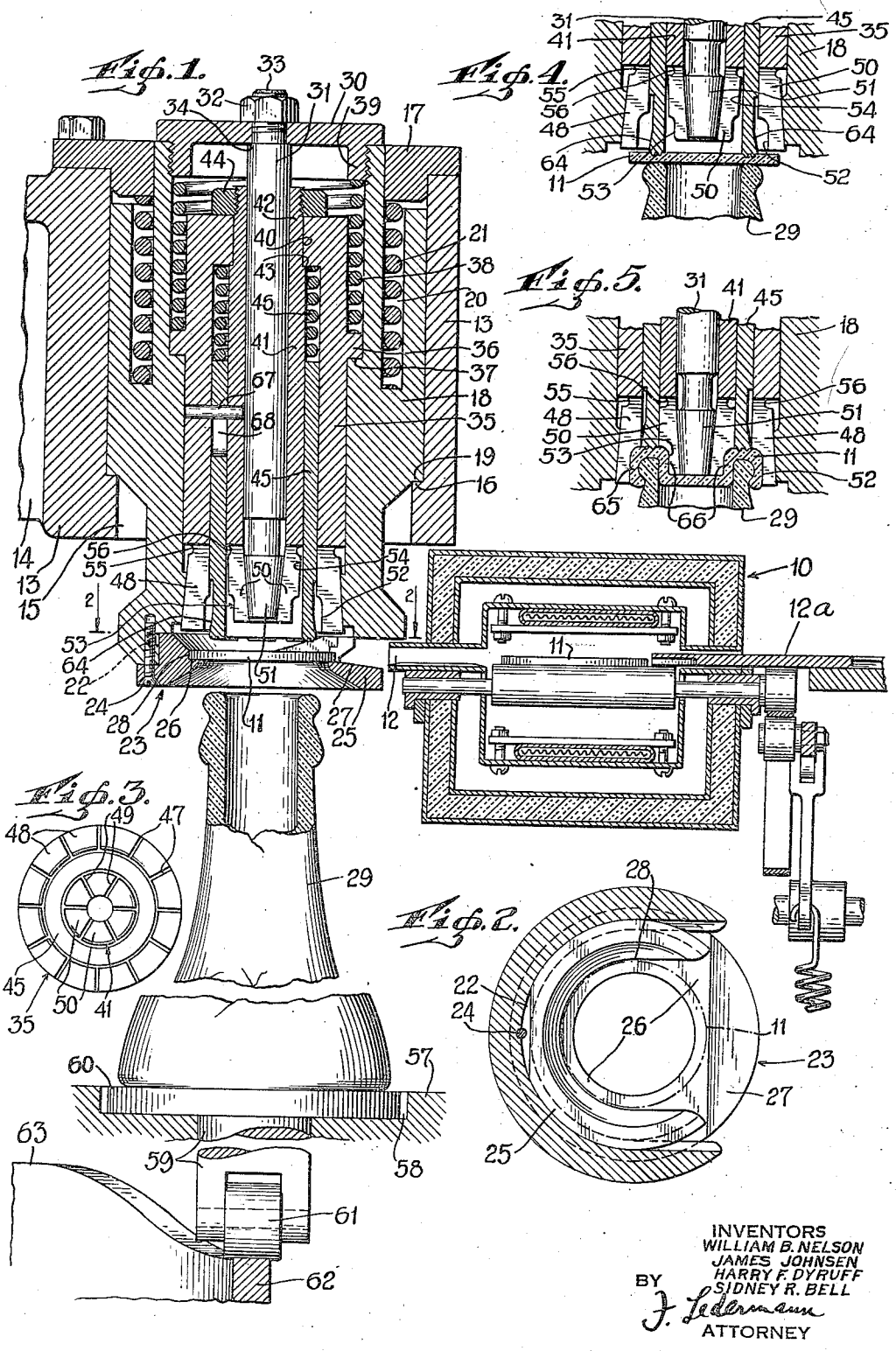
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BOTTLE CAP FORMING AND SEALING MACHINE

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BOTTLE CAP FORMING AND SEALING MACHINE

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4 Claims. (Cl. 226—83)

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This invention relates to machines, dies or punches for capping or crowning bottles, jars, or containers generally, and aims to provide a novel, practical and efficient machine for simultaneously shaping a bottle cap out of a blank disc and sealing the same on the bottle. Any material which may be found suitable may be used for the blank discs, but discs of plastic material of any suitable kind, of which polystyrene may be cited as one example, are preferred.

The above general object as well as other and more specific objects of the invention, will become apparent in the following description, wherein characters of reference refer to like-numbered parts in the accompanying drawing. It is to be noted that the drawing is intended for the purpose of illustration only, and that it is neither intended nor desired to limit the invention in any manner to any or all of the details of construction illustrated excepting insofar as they may be deemed essential to the invention as defined in the appended claims.

Referring briefly to the drawing,

Fig. 1 is a longitudinal sectional elevational view of the cap forming and sealing device, showing also in cross-section a discharge housing from which the blank discs are discharged into the device.

Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a bottom plan, or face, view of the punch shown in Fig. 1.

Fig. 4 is a fragmentary view similar to Fig. 1, showing the bottle and its relation to the parts of the punch in an intermediate cap-forming or crowning position.

Fig. 5 is a view similar to Fig. 4, showing the same parts in their final positions when the cap has been formed and sealed on the bottle.

It will be noted that the drawing of the instant application is identical to Sheet 5 of the drawings of an application for patent for "Blank disc feeding and heating means for bottle capping machines" filed by the same applicants on May 10, 1944, Serial No. 534,906, and that the instant application therefor constitutes a divisional application of the above-identified application.

When plastic blank discs are used in carrying out the instant invention, it is necessary that they be heated to a sufficiently high temperature prior to entering the capping and sealing machine or punch. Such a heating means is set forth in the above-identified application, and only the terminal end of the same is therefore

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shown in the drawing of the instant application. This heating means constitutes the housing 10 along or in which the blank discs, of which but one is shown at 11, are fed to a position just inside the opening or outlet 12 through which the disc 11 is ejected from the housing 10, by means of the ejector 12.

The instant machine comprises a crowner head 13 supported on a frame shown fragmentarily at 14 and having a bore 15 therethrough provided with an internal peripheral shoulder 16; the head 13 has a ring 17 at the top bolted to the head. A tubular housing 18 is slidably mounted within the opening 15 and is provided with a complementary shoulder 19 engaging the shoulder 16 as a limit stop. A circular recess 20, open at the top, contains a coiled spring 21 which obviously normally urges the housing 18 downward. Owing to the small amount of upward movement permitted the housing 18, the spring 21 serves primarily as a cushion.

The lower end of the housing 18 has an open recess 22 in which a blank disc receiver and positioner 23 is secured by a screw 24. The latter comprises essentially a ring 25 having a horizontal upper surface 26 and a downwardly sloping surface 27 at the front thereof. A U-shaped guide wall 28, open at the forward end adjacent the sloping surface 27, surrounds the upper flat surface 26 of the ring 25. This device is of standard construction and is adapted to receive a blank disc 11 and position the same preparatory to capping the bottle 29, from the discharge opening 12 of the housing 10.

The upper internal wall of the housing 18 is threaded to receive the threaded flange of a cap 30. An axial stem 31 is supported in the cap 30 by a nut 32 screwed upon its protruding reduced end 33, the peripheral shoulder 34 of the stem restraining the stem in fixed position, in association with the nut, with respect to the cap 30. A sleeve 35 is slidably mounted within the housing 18 and is provided with a flange 36 adapted to engage as a limit stop the shoulder 37 intermediate the height of the sleeve 35 and above which the diameter of the latter is enlarged to provide room for housing a coiled spring 38 whose upper end is in contact with the flange 39 of the cap 30. The spring 38 rests upon the flange 36 and normally urges the sleeve 35 downward.

An internal collar 40 is provided on the upper end of the sleeve 35. A sleeve 41 is slidably mounted on the stem 31 and has a reduced upper end 42 which registers in the collar 40 with the latter clamped between the shoulder 43 at the

base of the reduced end 42 and a nut 44 screwed down upon the threaded extremity of the sleeve 41. A sleeve 45 is slidably mounted between the sleeves 35 and 41 and the upper end thereof terminates at a distance below the shoulder 43 to provide room for a coiled spring 46 which normally urges the sleeve 45 downward. Evenly spaced radial slits or slots 47 are cut upward into the lower extremity of the sleeve 35 to provide peripherally spaced radial fingers 48 thereby possessing an amount of yieldability or resiliency. Similarly, radial slots 49 are cut upward to substantially the same horizontal level into the lower extremity of the sleeve 41 to provide yieldable peripherally spaced radial fingers 50. The outer peripheral wall of the fingers 48 is conical, and the inner peripheral wall of the fingers 50 is shaped like an inverted cone. The lower end 51 of the stem 32 is tapered complementarily to the inverted-conical wall of the fingers 50 and terminates, as seen in Fig. 1, at a level very slightly above the lower ends of the fingers 50, and it is apparent that owing to the slight yieldability of the fingers 50 the tapering end of the stem may be slid downward with respect to these fingers to the same level as their lower extremities, as seen in Fig. 5. The lower portion of the inner cylindrical wall of the fingers 48 is similarly cut away at 52 and the upper and lower extremities of this cut-out are rounded, as shown. Similarly, the lower portion of the outer cylindrical wall of the fingers 50 is cut away at 53, and the upper and lower extremities of the cut-out 53 are also rounded, as shown. Moreover, the diameter of the outer cylindrical wall of the fingers 50 is also slightly reduced at 54 above the annular cut-out 53 to provide space for the fingers 50 to swing outward for a limited distance. The upper extremities of the fingers 48 and 50 are reduced in thickness, as shown at 55 and 56, respectively, to make the fingers more readily yieldable or flexible about their anchorages.

Capping and sealing of the bottles by the instant machine is accomplished in one of two ways; either the punch is pressed down upon the bottle, or the bottle is raised into the punch. The latter form of operation is illustrated and described herein. A table 57 is dished out at 58 and the dished out portion of the table has a vertical opening therethrough in which a post 59 is slidably mounted. A seat 60 is rigid on the post 59 and is adapted to lie flush with the table top when in lowered position. The bottle 29 is adapted to be placed on the seat 60. Any means may be provided to lift the seat 60 and hence the bottle toward the punch, and as an instance of such means the lower end of the post 59 is forked to receive a roller 61 which rides on a cam 62. Only a portion of the cam is shown, but it is of course assumed that beyond the peak 63 of the cam the latter again curves downward, not shown, so that the bottle may be lowered from the punch upon completion of the crowning operation.

Whether the device is operated by pressing the punch down upon the bottle, or by urging the bottle up against the punch, is obviously immaterial, as the functioning of the various members of the punch will be the same in either case. Assuming that the latter method of operation is being used, immediately after the blank disc 11 has entered the receiver 23, the bottle 29, the disc 11, and the various parts of the punch will be in their respective positions shown in Fig. 1. As the bottle begins to rise toward the punch,

the upper rim of the bottle will first come in contact with the disc 11 and will then lift the latter against the lower peripheral edge of the sleeve 45 (which is conically widened as shown at 64), and the various parts are then positioned as shown in Fig. 4. As the bottle continues to rise further, the sleeve 45 is pressed back against the spring 46. The disc 11 has, as mentioned above, been heated so that upon entering the receiver 23 it is readily pliable, so that further upward movement of the bottle, which forces back the sleeve 45, causes the lower ends of the fingers 48 to turn down the outer portions of the disc 11 against the side wall of the bottle mouth and simultaneously causes the lower ends of the fingers 50 to push down the central portion of the disc. The spring 38 is more resistant than the spring 46, so that when the former has reached the peak of its compressibility the latter remains yieldable; hence, still further rising of the bottle forces the sleeve 45 further upward. Since the sleeves 35 and 41 are locked together, while they have thus been moving upward the tapered end 51 of the stem 31 has been getting wedged into the conical interior wall of the fingers 50 and spreading them, and the amount of this wedging and spreading is at its maximum when the bottle has reached the top of its rise; the positions of the various elements at this time are shown in Fig. 5. As here seen, the cap has been formed and simultaneously sealed on the bottle, the peripheral apron 65 having, owing to the pliability of the disc, been formed and pushed in under the lip of the bottle to lock the cap thereon. Simultaneously the peripheral wall of the well 66 of the finished cap has been forced outward against the inner wall of the bottle by the expanding fingers 50 and has thus been tightly locked thereagainst. The lower edge of the sleeve 45 is shown, in Figs. 1, 4 and 5, provided with embossed lettering so that the finished cap will bear the imprint thereof on its topmost annular surface, not shown, in order to advertise the name of the manufacturer of the beverage. Upon completion of the forming and sealing of the cap on the bottle, the bottle again descends to the position shown in Fig. 1 and the various parts of the punch reassume their original positions therein shown.

Obviously, modifications in form and structure may be made without departing from the spirit and scope of the invention. A pin 67 extending through both sleeves 35 and 41 passes through a longitudinal slot in the sleeve 45 to provide upper and lower limit stops for the latter.

We claim:

1. An apparatus for forming a pliable disc which has been loosely seated on the mouth of a bottle into a skirted cap and for simultaneously sealing the same about said mouth, comprising movable means for engaging and holding the disc against the outer end of said mouth, a sleeve having a tube-like extension on the lower end thereof, said extension having its inner wall substantially cylindrical and its outer wall conical and tapering upward, said extension having a plurality of spaced radial slits therethrough thereby dividing the same into a plurality of spaced yieldable radial fingers anchored at their upper ends to said sleeve, the internal diameter of said extension being substantially equal to the external diameter of the bottle mouth, said extension having an internal peripheral shoulder cut out of the lower edge thereof, means for progressively moving said sleeve axially toward

the bottle thereby causing the lower edge of said extension to turn down the peripheral edge of said disc about said mouth to provide a skirt on said disc, and additional means for progressively compressing said fingers radially against said skirt to urge the wall of said shoulder against said skirt thereby urging said skirt into close contact with the neck of the bottle.

2. The apparatus set forth in claim 1, said additional means comprising a sleeve slidably mounted on said first sleeve and having an extension surrounding said first extension, said second extension having a conical inner surface in slidable engagement with said outer wall of said first extension.

3. The apparatus set forth in claim 1, having an additional sleeve mounted axially above the bottle, said additional sleeve having a tube-like extension at the lower end thereof cylindrical in conformation and of substantially the same diameter as the internal diameter of said mouth, the inner wall of said second extension being inverted-conical in conformation, said second extension having a plurality of radial slits therethrough thereby providing a plurality of spaced yieldable radial fingers anchored at their upper ends to said additional sleeve, said second extension having an external peripheral shoulder cut out of the lower edge thereof, and means associated with said second-named means for depressing the central portion of said disc into said mouth and simultaneously moving down the lower ends of said second-named radial fingers to depress the annular portion of said disc between said central portion and the mouth of the bottle, said means for depressing said central portion of said disc having means for forcing said second-named radial fingers outward to urge the wall of the said peripheral shoulder thereon against the wall of the well thereby formed in said cap.

4. The apparatus set forth in claim 1, having an additional sleeve mounted axially above the bottle, said additional sleeve having a tube-like extension at the lower end thereof cylindrical in conformation and of substantially the same diameter as the internal diameter of said mouth, the inner wall of said second extension being inverted-conical in conformation, said second extension having a plurality of radial slits therethrough thereby providing a plurality of spaced yieldable radial fingers anchored at their upper ends to said additional sleeve, said second extension having an external peripheral shoulder cut out of the lower edge thereof, and means associated with said second-named means for depressing the central portion of said disc into said mouth and simultaneously moving down the lower ends of said second-named radial fingers to depress the annular portion of said disc between said central portion and the mouth of the bottle, said means for depressing said central portion of said disc comprising a conical stem slidably mounted in said second extension and having its lower end normally positioned above the lower edge of said second extension, a limit stop for the downward movement of said additional sleeve, and means for moving said stem an additional distance after said additional sleeve has reached said limit stop thereby causing said stem to spread said second-named radial fingers to urge the wall of the said peripheral shoulder thereon against the wall of the well thereby formed in said cap.

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