Dec. 7, 1937. R. N. CUNDALL ET AL 2,101,533

FOIL CAPPING MACHINE

Filed April 24, 1935 3 Sheets-Sheet 1

Fig. 1.

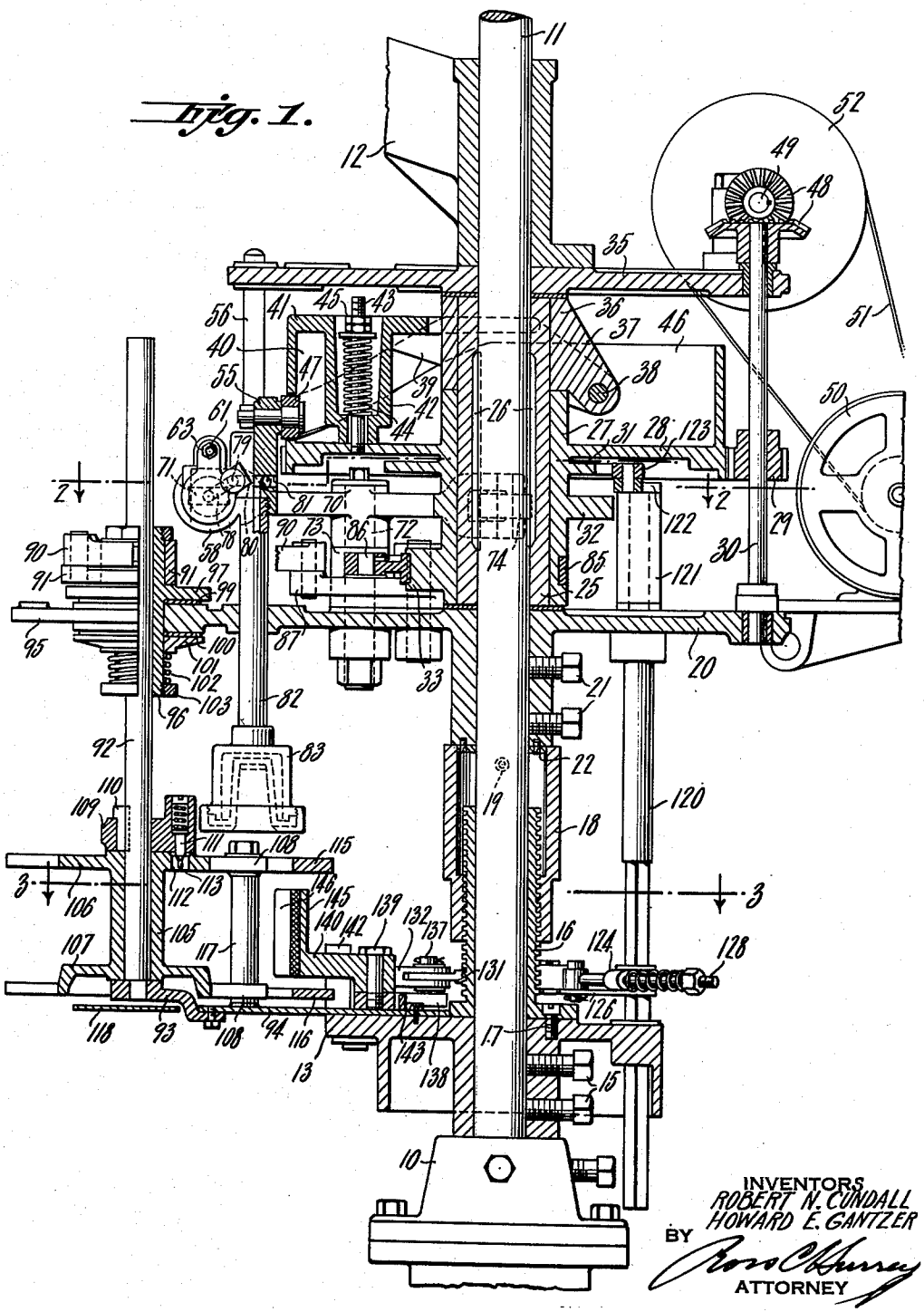

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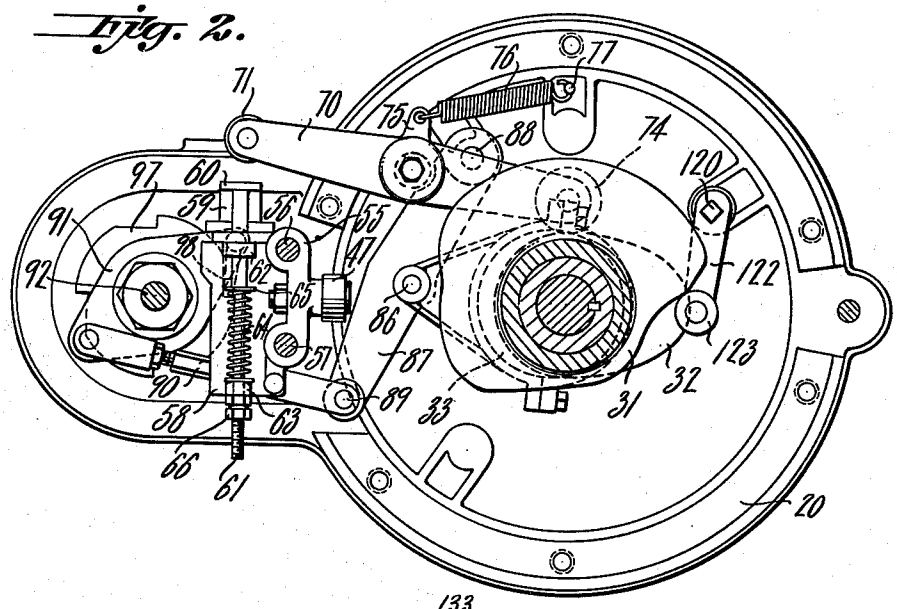
Fig. 2.



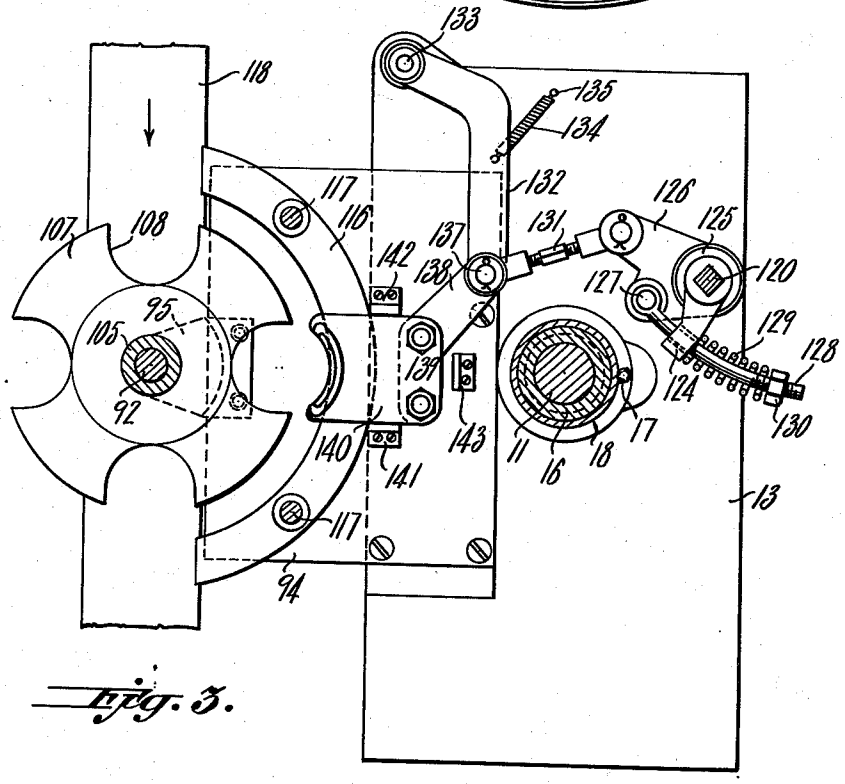


Fig. 3.

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Fig. 5.

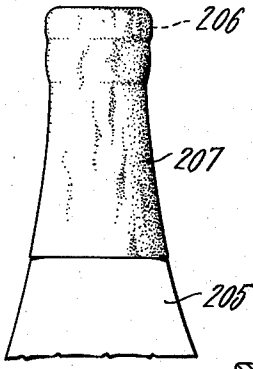


Fig. 4.

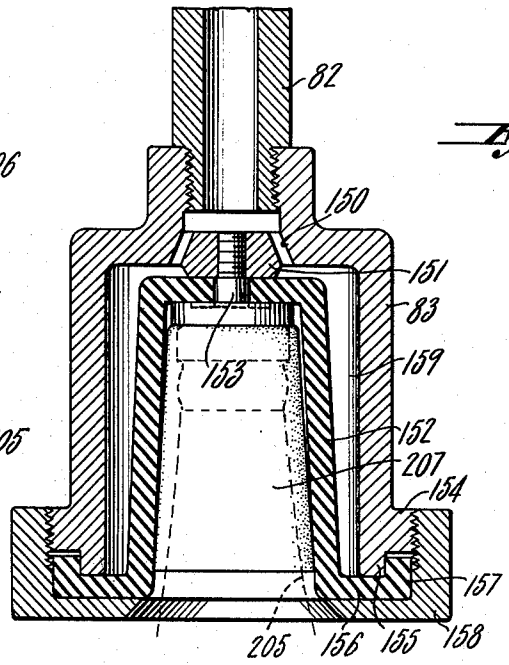


Fig. 6.

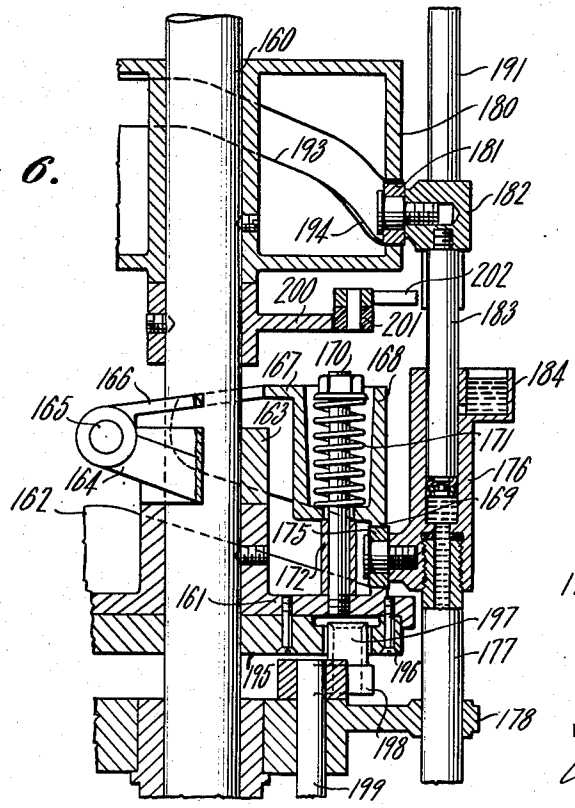
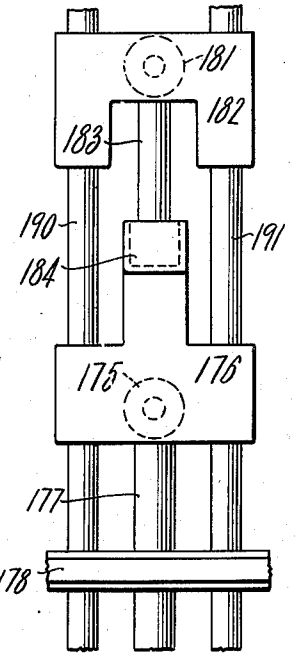


Fig. 7.



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2,101,533

UNITED STATES PATENT OFFICE

2,101,533

FOIL CAPPING MACHINE

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Application April 24, 1935, Serial No. 17,952

3 Claims. (Cl. 226—85)

This invention is an improvement in foil capping machines and is designed with the object of enabling bottlers to apply foil caps to the necks of previously capped or corked bottles, at relatively high speed and inexpensively, as the bottles come from a capping or cork inserting machine. Heretofore the application of foil caps has been limited to a relatively few types of bottled goods primarily because the process of applying such caps has been slow and expensive. Such foil caps may now be obtained at very slight cost in practically unlimited quantities and there is no reason for such caps not being widely used except that the application thereof limits production and requires a large number of manual operations. Our invention is designed to apply foil caps to bottles regardless of how fast they are ejected from the capping or corking machine.

A second object of our invention is to devise a machine, capable of applying foil caps in a smooth, neat manner, employing hydraulic pressure means without necessitating the purchase of separate pumps and motors for driving such pumps, our machine being self-contained and capable of being driven from the line shaft of the capping or corking machine.

Other objects and advantages of our invention will be apparent from the following description taken in connection with the accompanying drawings wherein like numerals refer to like parts throughout.

Referring to the drawings:

Fig. 1 is a side view, mostly in section, of the machine constituting our invention;

Fig. 2 is a plan view in section taken along line 2—2 of Fig. 1;

Fig. 3 is a plan view in section taken along line 3—3 of Fig. 1;

Fig. 4 is a vertical section taken through the foil capping chuck used in our machine and constituting a part of our invention, showing the neck of a bottle therein having a foil cap applied to the bottle but before pressure is applied to the chuck;

Fig. 5 is a partial view of a foil-capped bottle;

Fig. 6 is a partial view in cross-section of a modification of our invention; and

Fig. 7 is a partial view in elevation of details of Fig. 6.

Referring to Fig. 1, the machine comprises a standard 10 from which rises a fixed non-rotating post 11, the top of which may be braced by an arm 12. Above the standard 10 is a supporting bed plate 13 fixed to post 11 by locking bolts 15. A threaded collar 16 is supported on the bed plate 13 and is prevented from rotating with relation to the post 11 by a bolt 17. A threaded sleeve 18 is engaged with the threaded collar 16, rotation thereof enabling parts of the machine supported by the sleeve 18 to be vertically adjusted with respect to the supporting bed plate 13. A locking bolt 19 maintains sleeve 18 in adjusted position. Supported by sleeve 18 is a table 20 prevented from rotation by locking bolts 21 threaded into an integral hub. A spacing ring 22 fixed to the end of the hub prevents sleeve 18 from being displaced from its position concentric to post 11. Supported above table 20 is a sleeve 25 fixed to post 11 by keys 26, this sleeve merely serving to increase the effective diameter of the post in order that larger bearing surface may be provided for parts which rotate around the post. Surrounding the sleeve 25 is an outer sleeve 27, not keyed to the sleeve in order that it may rotate about the post 11. Integral with sleeve 27 is a disc 28, the flange of which is formed with gear teeth meshing with the teeth of a pinion 29 fixed on a vertical shaft 30. Rotation of shaft 30 drives the disc 28 and rotates sleeve 27 and a plurality of eccentric devices fixed thereto, in this instance a cam 31, a second cam 32 and an eccentric 33. For simplicity of illustration sleeve 27, disc 28 and eccentric devices 31, 32 and 33 are illustrated as an integral member, but it will be appreciated that the parts are machine-finished separately and united after they have been formed either by keys (not shown) or welding, etc. Shaft 30 is supported by table 20 and extends upward through a table 35 supported by a spacing collar 36 on post 11 above sleeve 27 and rotatable thereabout. The collar 36 may be formed integral with sleeve 27 or joined thereto but is preferably caused to rotate with respect to post 11 by the following means. A lug 37 extending from one side of the collar carries a pin 38 to which is pivotally attached spaced arms 39 (one of which is shown in Fig. 1) carrying a cam 40 formed as the flange of a member 41. A pocket 42 is formed in member 41, the lower end of which rests upon disc 28. An opening is provided in the bottom of pocket 42 and a stud 43 extends through the opening and is screwed into disc 28. A spring 44 surrounding stud 43 and adjustably compressed by locking nuts 45 rests upon the bottom of pocket 42. Cam 40 is therefore caused to rotate about post 11 with the disc 28, and is spaced from disc 28 a minimum distance controlled by the depth of the bottom of pocket 42 but may have a limited upward move-

ment by pivoting about pin 38 while compressing spring 44. The flange of disc 28 is formed into a cam 46 concentric with and rotating about post 11, the majority of the flange at the side adjacent pin 38 being level, while the opposite part of the cam is shaped to conform with the contour of cam 40, there thus being provided a track upon which a roller 47 may ride. Shaft 38 is rotated by bevel gears 48 driven by a shaft 49 which may be an extension of the power shaft of the capping or bottling machine, or may be a separate shaft driven by any other suitable means such as motor 50, belt 51 and pulley 52.

Roller 47 is mounted upon a member 55 (Fig. 2) carrying two upright rods 56 and 57. Rods 56 and 57 are slidably guided in openings in plate 35 so that roller 47 may rise and fall but will not be allowed to twist sideways or shift laterally in any respect. Integrally supported by member 55 is a cylinder 58 within which is mounted a plunger 59 adapted upon reciprocation thereof to force a certain amount of a contained fluid out of cylinder 58 or upon retraction to suck the fluid back into cylinder 58. A plate 60 is mounted upon the exposed end of plunger 59 and extends upward above the top of cylinder 58 and carries a rod 61 extending over the top of cylinder 58 parallel to plunger 59 and slidably guided in ears 62 and 63 integral with cylinder 58. A spring 64 surrounding rod 61 and compressed between ears 63 and a flange 65 tends to return plunger 59 against any operative force and will return the plunger when the operative force is released. Adjustable lock nuts 66 mounted upon rod 61 on the opposite side of ear 63 limit the movement of plunger 59. Operative force is applied to plunger 59 by a rocking lever 70 carrying a roller 71, which roller merely eliminates friction between lever 70 and plates 60. Lever 70 is pivoted to table 20 upon an upright stud 72 and is spaced from table 20 by a collar 73. The opposite arm of lever 70 carries a roller 74 which rides upon the surface of cam 32. Cam 32 is so shaped that plunger 59 will be quickly inserted and withdrawn once during each revolution of disc 28. An integral lug 75 carried by lever 70 has a spring 76 attached thereto, the opposite end of which extends to a pin 77 rising from table 20. Spring 76 causes roller 74 continuously to ride upon the surface of cam 32 thereby relieving the burden upon spring 64 which retracts the plunger. The end wall of cylinder 58 below ear 63 is provided with a laterally extending passageway 78 through which fluid escapes and enters the cylinder. The side wall of cylinder 58 is provided with a connecting longitudinally extending passageway 79 extending to the center of member 55, and connected to passageway 79 is an outwardly extending passageway 80 plugged at its outer end by a screw 81. A vertical pipe 82 is threaded into member 55 and the passage therethrough connects with passageway 80. The opposite end of pipe 82 supports the capping chuck 83 which will be described later.

From the description thus far it will be apparent that the chuck 83 is vertically reciprocated once during every revolution and is resiliently forced downward at its lowermost position. During the time that it is held at its lowermost position fluid will be forced into chuck 83 and released therefrom. A bottle having a foil cap slipped thereover is positioned and held under and in line with chuck 83 prior to the descent thereof by the following mechanism.

Eccentric 33 carries an eccentric strap 85 which, at the side adjacent the chuck, is extended and carries a pivot pin 86. A rocking lever 87 is pivoted to 86 and one end thereof is pivoted at 88 to table 20. The free end of lever 87 carries a pivot pin 89 to which is joined an adjustable link 90. Link 90 is pivoted to a plate 91 freely rotatable about an upright shaft 92 supported by an extension 93 of a table 94 carried by and fixed to supporting bed plate 13. Shaft 92 is rotatable and its upper end is supported in an extension 95 of table 20, which likewise guides pipe 82 in its vertical reciprocation. Immediately surrounding shaft 92 and fixed thereto is a sleeve 96 rotatable in a bearing in extension 95, the hub of member 91 being rotatable about sleeve 96. Integral with sleeve 96 is a ratchet 97 having a plurality of teeth, as illustrated, four. The opposite end of plate 91 carries a spring-pressed dog 98 cooperating with the teeth of ratchet 97 to rotate shaft 92 partially at every rotation of disc 28, the rotation thereof extending only a quarter of a complete revolution. During the time that chuck 83 descends and plunger 59 is operated lever 87 is rocked back to cause dog 98 to engage with the next tooth of ratchet 97. Mounted between extension 95 and ratchet 97 is a friction plate 99 and a similar friction plate 100 is held against the opposite surface of extension 95 by a disc 101 supported by a spring 102 and a flange 103 on sleeve 96. Adjustment of flange 103 will adjust the pressure with which discs 99 and 100 are pressed against extension 95, thereby adjustably holding shaft 92 against accidental reversing movement. The lower end of shaft 92 has a starwheel 105 loosely mounted thereon. Starwheel 105 has spaced flanges 106, 107 within which are pockets 108 of sufficient depth to engage a bottle that is placed therein. Mounted above the starwheel 105 is a collar 109 keyed to shaft 92 by a key 110. A spring-pressed pin 111 carried in collar 109 engages with an opening 112 in flange 106 to cause rotation of the starwheel with shaft 92. The lower end of pin 111 is bevelled and is formed with a frangible tip or nipple 113 extending below the bevelled portion. The bevelled portion allows some slight movement of the starwheel 105 in case of a partial jam and forces pin 111 up against the force of its spring. In case the bottle being fed by the starwheel should absolutely jam, the nipple 113 will be broken from pin 111 and shaft 92 may rotate without carrying the starwheel with it. In this manner breakage of the operating parts of the machine is prevented. Spaced guide rails 115 and 116 are carried by posts 117 rising from the table 94. A bottle placed in a pocket adjacent the edge of table 94 by a conveyor 118 of suitable type will be fed into position beneath chuck 83 by the pocket 108 and guide rails 115, 116. After being capped the next movement of starwheel 105 redeposits the bottle back on the conveyor 118. It will be appreciated that any suitable conveyor may be used or that the bottles may be positioned manually.

In order accurately to position and positively hold the bottle during the time that the chuck is in operation the following mechanism is provided.

A vertical rock shaft 120 is carried by bed plate 13 and table 20 and is free to move longitudinally with respect to bed plate 13. The portion of shaft 120 above table 20 is surrounded by a collar 121 supporting a lever 122 which is

keyed to the shaft. The free end of lever 122 carries a roller 123 which rides upon the surface of cam 31. The lower portion of shaft 120 is squared and slidably mounted thereon is a member 124 which is rocked in accordance with the movement of roller 123 on cam 31. A collar 125 is also mounted on shaft 120 below member 124 and supports a member 126 which is free to rotate about the shaft. Pivoted to member 126 at 127 is a curved rod 128. A spring 129 encircling rod 128 is retained between member 124 and a nut 130. Rocking of member 124 by cam 31 compresses spring 129 which tends to cause member 126 to follow member 124. An adjustable link 131 is pivoted to member 126 and to one end of a lever 132 pivoted at 133 to the supporting bed plate 13. A spring 134 extending from lever 132 to a pin 135 tends to return member 126 against the tension of spring 129. Members 126 and 131 form a toggle which, when partially straightened by the rotation of cam 31, forces lever 132 outward against the tension of spring 134. Pivoted to the joint of link 131 and lever 132 at 137 is a member 138 resting upon the surface of table 94. Fixed to member 138 by bolts 139 is a clamp 140 guided for longitudinal movement between guides 141 and 142 mounted upon table 94. An abutment 143 mounted upon table 94 limits the releasing movement of the clamp. The surface of clamp 140 adjacent starwheel 105 is formed with a flange 145 conforming to the contour of a bottle and preferably provided with an inner lining 146 of leather or other friction material. Upon the toggle 126, 131 being straightened, clamp 140 will be forced to grip a bottle held in the starwheel, and upon the roller 123 riding down on the low points of cam 31 the clamp will be retracted under the tension of spring 134. Link 131 is adjustable to determine the movement of the clamp and likewise the tension of spring 129 is adjustable to provide greater or lesser gripping pressure of the clamp.

The timing of this device is such that the clamp is operated and released during the time that starwheel 105 is stationary and chuck 83 is in operation. The clamp will be released before the next rotative movement of starwheel 105 occurs.

The operation of the machine having been explained with sufficient clarity, the operation of the chuck will now be described.

Pipe 82 is threaded into the chuck 83 which comprises an inverted rigid cup-shaped member. The passageway through pipe 82 communicates with one or more passages 150 extending into the body of the chuck and communicating with the interior thereof. A central boss 151 spaces an internal, resilient cup 152 from the end of chuck 83, cup 152 being held in place by a larged-headed stud 153, the head of which is preferably covered by resilient material. The rim of chuck 83 is provided with an externally threaded flange 154 and a depending edge 155. The lower edge of cup 152 is formed with a lateral flange 156 and a vertical edge 157. A flanged member 158 having internal threads on the flange thereof is screwed onto the externally threaded flange 154. The member 158 compresses portion 156 against edge 155, and edge 157 will likewise be compressed and expanded to form a sealed joint. The center of member 158 has an opening therethrough of substantially the size of the mouth of the resilient member 152, the opening preferably being bevelled as illustrated. The side walls of member 152 are preferably tapered to conform substantially with the normal taper of a bottle neck, and are spaced from the side walls of chuck 83 to form a cavity 159.

A bottle held in position by the starwheel and the clamp will have its neck enveloped by the descending chuck 83 to an extent determined by the adjustment of the upper portion of the machine with relation to the standard 10. The relationship of cams 32 and the chuck-supporting and depressing cams 46 and 40 is such that the plunger 59 will be operated as soon as the chuck has descended to its lowermost position. The fluid being forced into the cavity 159 will apply uniform pressure simultaneously at all points of the wall of member 152, compressing it against the neck of the bottle held therein. The head of stud 153 is sufficiently spaced from the inner wall of member 152 to allow inward movement thereof, and the lateral extension 156 of member 152 may be stretched to allow inward movement of the wall of the compressing cup. In this fashion the entire surface of the foil cap is gripped and moved inward against the neck of the bottle, without the formation of irregular ridges such as were formed by hand application. The result thereof is illustrated in Fig. 5. The pressure is not held to any great length of time due to the sharp contour of cam 32, and immediately after the retraction of plunger 59 the cup 152 will expand due to its own resilience and the suction of the retracted plunger 59, whereupon the chuck 83 is raised and the starwheel rotated to eject the bottle and bring the next bottle forward.

In Figs. 6 and 7 we have illustrated a modification of our invention which embodies the same principles of operation. In this form of the device a vertical shaft 160 is rotated by suitable means (not shown). Fixed to shaft 160 is a rotating disc 161 having an edge formed into a vertical cam 162. A collar 163 loosely mounted above the hub of disc 161 is provided with a projecting lug 164 on which is mounted a pivot pin 165 to which is pivoted arms 166 carrying a member 167 having a pocket 168 therein. The lower surface of member 167 defines a cam 169, paralleling cam 162. A stud 170 threaded into disc 161 and extending through pocket 168 causes member 167 to rotate with the disc. A spring 171 resiliently presses cam 169 downward against a limiting collar 172. A roller 175 is guided upon cam 162 and resiliently pressed downward along the low part of the cam by the upper cam 169. Roller 175 is carried by a member 176 which is hollowed to form a vertical cylinder. Threaded into the lower end of cylinder 176 is a pipe 177 guided for free vertical movement in a plate 178 loosely mounted on a collar fixed to the vertical shaft 160. Shaft 160 rotates without causing rotation of plate 178. Suitable guides 190 and 191 prevent disalignment of roller 175 about the axis of pipe 177. Fixed to shaft 160 is a box cam 180 having a cam track formed in its outer flange. A roller 181 is guided in the cam track and is carried by a member 182 supporting a vertical plunger 183, member 182 being guided by guides 190 and 191. An extension of member 176 forms a tank 184 communicating with the top of cylinder 176 and providing a reserve supply of fluid. Plunger 183 is reciprocated once for each revolution of shaft 160 and, as previously explained, causes the compression of the resilient cup 152 positioned in the chuck 83 threaded onto the end of pipe 177. Member 182 carrying roller 181 is slidably guided by spaced guide rods 190 and 191 supported by

the plate 178, and likewise member 176 is slidably guided by guide rods 190 and 191. Cam 180 is provided with a portion 193 parallel to cam 162 so that during the time that roller 181 is riding on the portion 193 plunger 183 will move downward at the same rate that cylinder 176 is moving so that no movement of fluid will occur. The portion 193 of cam 180 is followed by a sharply inclined portion 194 occuring above the lowest part of cam 162 so that as cylinder 176, and the chuck attached thereto, reaches its lowermost position there will be relative movement of plunger 183 and cylinder 176 to create a flow of fluid and compressive action of the cup 152. Plunger 183 is retracted before the chuck begins to rise in order that the cup 152 may expand before relative movement of the chuck and bottle occurs. Fixed to the bottom of disc 161 are cams 195 and 196 guiding therebetween a roller 197 mounted upon arm 198 supported by table 178 and rocking a vertical rock shaft 199 similar to rock shaft 120 and controlling a bottle clamp, such as clamp 145. A cam 200 fixed to shaft 160 guides a roller 201 mounted upon a lever 202 operating a starwheel through mechanism such as disclosed in Figs. 1 and 2. It will be appreciated that the essential elements of the modification are disclosed with sufficient particularity to be understood and that the mechanical details of connections between lever 202 and rock shaft 199 and the mechanism operated thereby are relatively immaterial to the disclosure of the modified construction.

In Figs. 4 and 5 we have illustrated a bottle neck 205, the bottle being closed by a conventional crown cap 206. In Fig. 4 the ordinary type of foil cap 207 is illustrated before the same has been compressed by the chuck, while in Fig. 5 the foil cap is shown as applied, illustrating the manner in which the flexible compressing cup forces the foil to conform to the contour of the bottle neck. Our device is therefore useful regardless of the type of bottle, since the chuck does not need to be adjusted or changed to cap any ordinary type of bottle.

By "foil cap" is meant a partially formed semi-rigid cup-shaped article, the thickness and rigidity of which may vary to a great extent. The ordinary type of foil cap is a thin substantially non-rigid article, the sole purpose of which is to provide a neat and attractive bottle. Special types of caps are formed of thicker material and are of a much greater degree of rigidity in order that they might be forced by a substantial compressive action to assume the contour of the bottle neck to which they are applied, but will not ordinarily lose the shape into which they are formed. Such a rigid cap is useful inasmuch as the lower portion thereof may be connected to the upper portion by a detachable strip or other separable means, the upper portion cooperating with screw threads on the neck of the container as a replaceable screw cap. It can be seen that our device can be quickly adjusted to apply light pressure to very flexible foil caps and heavy pressure to very rigid foil caps.

Although we have illustrated and described but two forms of the invention, we do not intend to be limited to the mechanical details of these two forms, since alterations in arrangement and details thereof will be apparent to those skilled in the art and our invention is to be determined solely by the scope of the following claims which are to be broadly construed.

We claim:

1. A machine for applying foil caps to the necks of containers comprising, a resilient, fluid-pressure operated, cup-shaped member adapted to envelop the neck of the container, means to lower said member over the neck of a container positioned therebeneath and to elevate said member, a pump associated therewith, means to operate said pump to apply uniform pressure to the external surface of said member when lowered and to release the pressure before said member is elevated, said member and said pump being rigidly connected to move as a unit.

2. A machine for applying foil caps to the necks of containers comprising, a resilient, fluid-pressure operated, cup-shaped member adapted to envelop the neck of the container, means to lower said member over the neck of a container positioned therebeneath and to elevate said member, a pump associated therewith, means to operate said pump to apply uniform pressure to the external surface of said member when lowered and to release the pressure before said member is elevated, said member and said pump being rigidly connected to move as a unit, all of the foregoing means comprising a plurality of associated eccentric devices operating as a unit.

3. A machine for applying foil caps to the necks of containers comprising, a chuck having a rigid outer wall and a resilient cup shaped member therein adapted to envelop the neck of a container, means to move said chuck to and from an operative position relative to the neck of a container, a pump rigidly connected to and movable as a unit with said chuck, and means to operate said pump to force a fluid between the adjacent walls of said chuck and said member to apply uniform pressure to the external surface of said member when the chuck is in operative position, and to release the pressure before said chuck is moved from operative position.

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