

June 1, 1937.

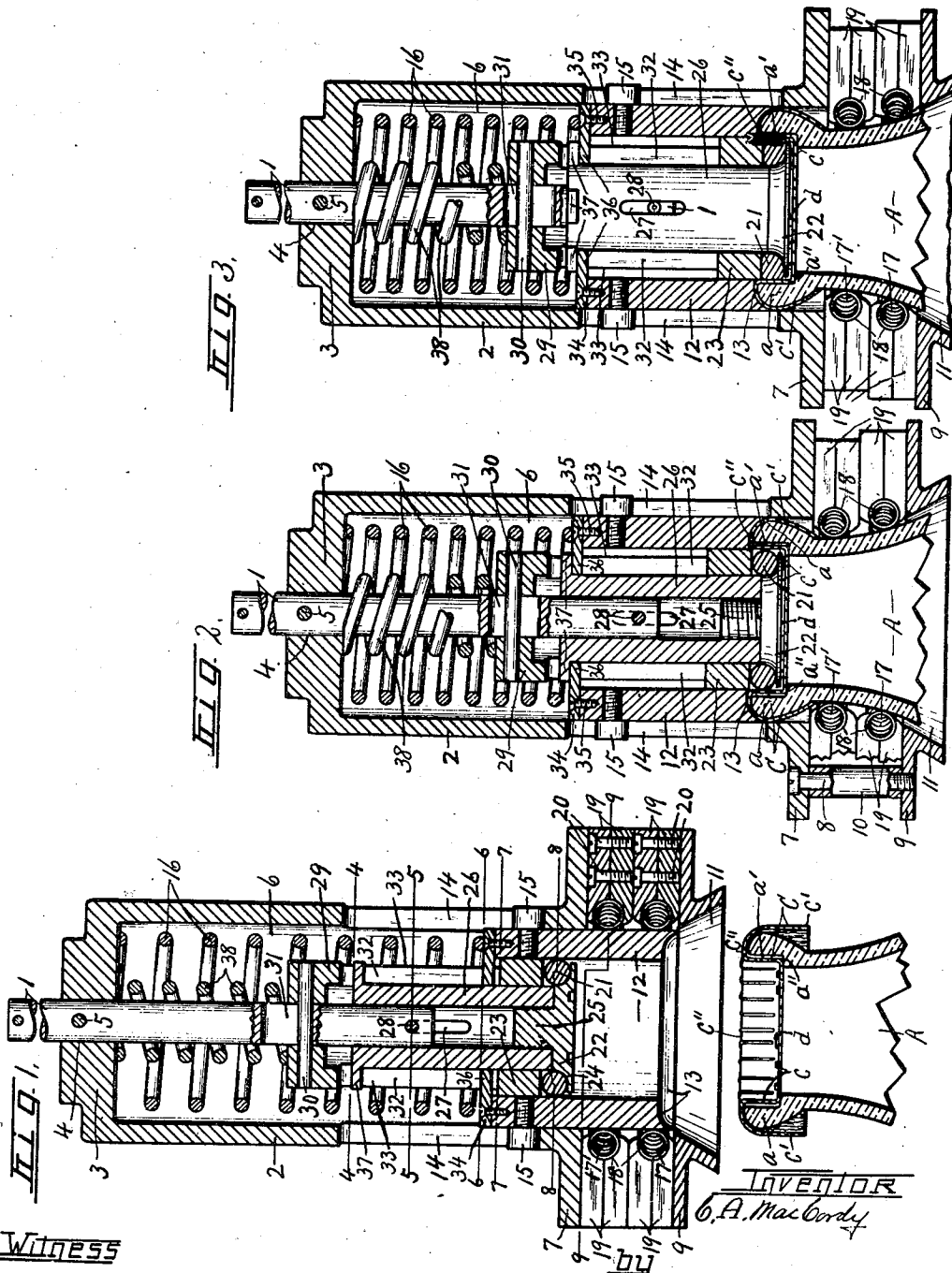
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2,082,167

BOTTLE CAPPING MACHINE

Filed Jan. 2, 1934

2 Sheets-Sheet 1



WITNESS

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2 Sheets-Sheet 2

FIG. 4.

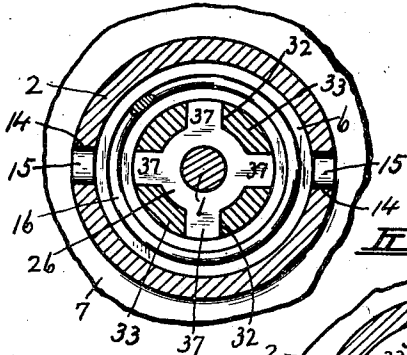


FIG. 5.

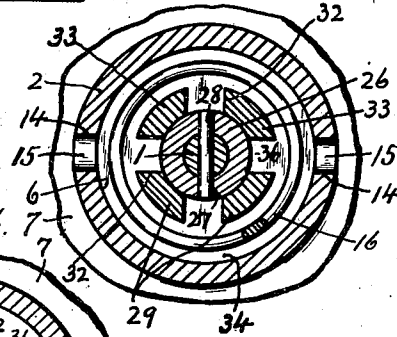


FIG. 6.

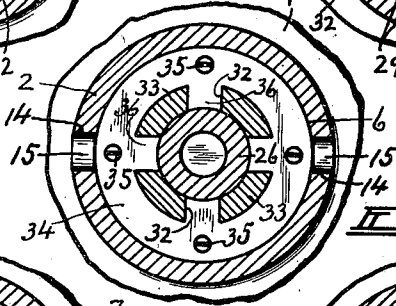


FIG. 7.

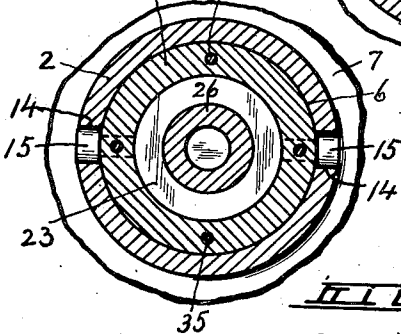


FIG. 8.

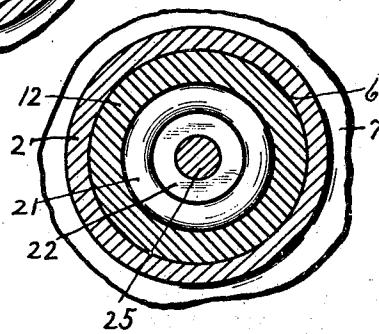
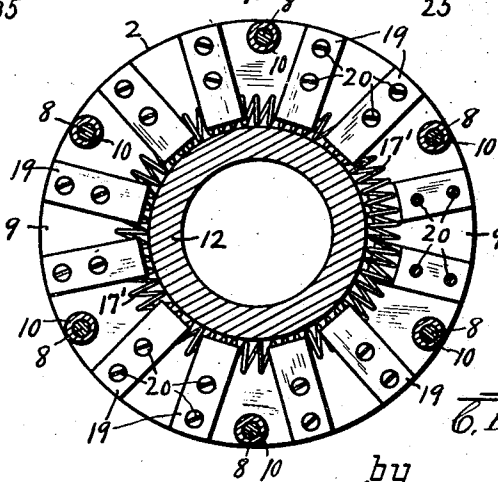


FIG. 9.



WITNESS

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2,082,167

BOTTLE CAPPING MACHINE

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Application January 2, 1934, Serial No. 704,899

13 Claims. (Cl. 226—83)

This invention relates to a method of and apparatus for closing the mouths of bottles and commonly known as bottle-capping machines and is adapted to be used more particularly in applying the caps which have been preformed under the method and apparatus shown and described in my pending application Serial No. 682,474, filed July 27th, 1933, in which the cap is formed in one piece, preferably from a sheet of light, strong and durable metal having a high degree of ductility, malleability and tenacity, such for example, as tissue aluminum of about the thickness of Cellophane or thin tin foil, capable of being easily molded under pressure to the desired form under atmospheric temperature and of retaining its form under ordinary usage. The cap is provided with a central cup-shaped portion adapted to loosely enter the mouth of the bottle and a skirt portion adapted to loosely surround the head and adjacent portion of the neck of the bottle, while the connecting web between the cup-shaped portion and skirt portion is adapted to rest upon the outer end of the mouth of the bottle.

That is, the exterior diameter of the cup-shaped portion is slightly less than the interior diameter of the mouth of the bottle while the interior diameter of the skirt portion is slightly greater than the exterior diameter of the head of the bottle to enable the cap to be easily placed by hand or otherwise over and upon the mouth of the bottle with the connecting web between the cup-shaped portion and skirt portion resting upon the outer end of the head preparatory to the securing of the cap to the head of the bottle, through the medium of my improved capping machine, the peripheral walls of the cup-shaped portion and skirt portion being corrugated axially about its circumference to allow those parts to be respectively expanded and contracted against adjacent portions of the bottle without liability of stretching the material from which the cap is formed.

One of the objects is to provide the capping machine with means for compressing the skirt of the cap against the outer periphery of the head and neck of the bottle through the medium of an axially movable coil spring ring which is extensible and contractible circumferentially for varying its interior diameter which is normally less than the exterior diameter of the head and neck of the bottle so that when it is moved axially over and upon the skirt of the cap it will automatically compress said skirt firmly against

the head and neck of the bottle under its own tension.

Another object is to provide the capping machine with a resilient ring preferably of soft rubber adapted to be moved axially into the cup-shaped portion of the cap and expanded radially under compression for expanding the peripheral walls of said cup-shaped portion tightly against the inner peripheral walls of the mouth of the bottle without in any way stretching the material from which the cap is formed and thereby to reduce the liability of excess radial pressure which would tend to crack or break the bottle.

A further object is to provide the capping device with means for engaging and holding the connecting web between the cup-shaped portion and skirt of the cap in firm engagement with the outer end of the bottle during the operation of pressing the peripheral walls of the cup-shaped portion and skirt against the bottle and thereby to prevent lateral shifting movement of the cap relatively to the bottle during those pressing operations.

Other objects and uses relating to specific parts of the capping device will be brought out in the following description.

In the drawings:

Figure 1 is a longitudinal vertical sectional view of my improved capping device and upper portion of a bottle with the cap loosely seated thereon, the capping device being shown in its uppermost or inoperative position.

Figure 2 is a similar sectional view of the same parts with the capping device in operative position for holding the cap on the upper end of the bottle and for compressing the skirt inwardly against the outer periphery of the head and neck of the bottle just preceding the compression and resultant expansion of the innermost expanding ring.

Figure 3 is a view similar to Figure 2 except that the inner expanding ring is under compression for expanding the peripheral wall of the cup-shaped portion of the cap against the inner walls of the mouth of the bottle.

Figures 4, 5, 6, 7, 8, and 9 are transverse or horizontal sectional views taken respectively on lines 4—4, 5—5, 6—6, 7—7, 8—8, and 9—9, Figure 1.

In order that the operation of the capping device may be clearly understood, I have shown a portion of a bottle A having an enlarged head or roll *a* provided with the usual annular mouth or opening *a'* and annular shoulder *a''* at the inner end of the recess for receiving and sup-

porting a cap C which is provided with a central cup-shaped portion c and a skirt portion c' connected by a web c''.

The cap C is similar to that shown and described in my pending application previously referred to in that it is made of extremely thin sheet aluminum or equivalent non-corrodible material and that the peripheral walls of the cup-shaped portion c and skirt c' are corrugated or crumpled about the circumference thereof to enable those parts to be expanded and compressed without liability of stretching the material from which the cap is formed.

The cap according to the application referred to, is made in such manner that the exterior diameter of the peripheral walls of the cup-shaped sections c is slightly less than the diameter of the mouth a' of the bottle, while the normal inner diameter of the skirt portion c' is slightly greater than the external diameter of the head or roll a of the bottle, thus permitting the cap to be easily placed by hand or otherwise over and upon the head of the bottle with the connecting web c'' resting upon the upper end thereof, as shown more clearly in Figure 1.

The vertical depth of the cup-shaped portion c of the cap is about equal to that of the mouth b to allow the marginal edges of the bottom of the cup-shaped portion to rest upon the shoulder a'', the bottom of the cup-shaped portion being usually embossed with raised characters d for labeling or other purposes.

The capping device forming the subject matter of the present invention is reciprocally movable vertically toward and from the head of the bottle A co-axial therewith and preferably comprises an upright shaft 1 upon which is mounted a substantially cylindrical hollow head 2 having its upper end closed by an end wall 3 having a central aperture 4 for receiving the shaft 1 which is secured to the top wall 3 by means of a connecting key or cross pin 5 for supporting the head 2 on the shaft co-axial therewith.

The head 2 is provided with a central cylindrical opening 6 extending from the top wall 3 downwardly through the lower end thereof, said lower end being provided with an outwardly projecting annular flange 7 which is connected by means of tie bolts 8 to a similar underlying flange plate 9, said flanges being held in spaced relation by spacing sleeves 10 surrounding the tie bolts 8, as shown more clearly in Figure 2.

The flange plate 9 is provided with a central opening 11 co-axial with the opening 6 in the head 2 and preferably flaring downwardly and outwardly to enable it to receive the head of the bottle with the cap C thereon when the capping device is brought downwardly to its capping position, as shown in Figures 2 and 3, it being understood that the downwardly and outwardly inclined walls of the opening 11 serve to center the head of the bottle with the lower end of the capping device.

The interior diameter of the cylindrical opening 6 is approximately equal to the outer diameter of the skirt c' of the cap C when the latter is resting on the upper end of the bottle to allow the lower end of the head 2 to slide downwardly over the outer periphery of the skirt, as shown more clearly in Figures 1, 2, and 3.

A cylindrical sleeve or tubular member 12 of about the same external diameter as the interior diameter of the head 2 is slidably fitted in the opening 6 and has its lower end provided with a recess 13 of concave cross section corresponding

approximately to the transverse curvature of the upper end face of the head of the bottle, the radial thickness of the sleeve or cylindrical member 12 being approximately equal to the transverse width of the connecting web c'' so that when the ring 12 is brought to its capping position, the upper wall of the recess 13 will engage the connecting web c'' of the cap C and thereby hold it firmly against the upper end of the head of the bottle, as shown more clearly in Figures 2 and 3.

That is, the member 12 constitutes what may be termed a cap-holding sleeve adapted to be moved downwardly a limited distance or until it engages the web c'' of the cap immediately preceding the compression of the skirt against the bottle and also immediately preceding the expansion of the peripheral wall of the cup-shaped portion of the cap, and further, to hold the cap and bottle against upward displacement as the head 2 and parts carried thereby are raised from their cap-applying positions to their normal elevated positions of rest, in a manner presently described.

The head 2 is telescopically fitted over and upon the periphery of the sleeve 12 and is provided with vertically elongated slots 14 arranged in uniformly spaced relation circumferentially for receiving radial studs 15 on the sleeve 12 to hold the head 2 and sleeve against relative angular movement about their common axis while permitting free relative vertical movement of those parts one upon the other, the studs 15 having their inner ends threaded and engaged in corresponding apertures in the sleeve.

A coil spring 16 is arranged within the chamber 6 of the head 2 around the shaft 1 and has its upper end engaged with the lower face of the upper end wall 3 and its lower end engaged with the upper end of the cap-holding sleeve 12 so that the sleeve will normally be yieldingly held in its lowermost position with the studs 15 engaging the lower ends of the slots 14 to limit the downward movement of the sleeve relatively to the head 2, and at the same time, to align the lower end of the sleeve with the upper face of the flange 9 and thus cause the walls of the opening 11 to guide the capped end of the bottle against the concave seat 13 of the sleeve, as shown in Figure 2.

Under these conditions when the shaft 1 with the head 2 thereon is lowered, the sleeve 12 will be similarly lowered until its lower end engages the rim c'' of the cap to hold the cap on the bottle and incidentally to prevent further downward movement of the sleeve whereupon the downward movement of the shaft 1 and head 2 may be continued against the action of the coil spring 16 for compressing the skirt of the cap upon and around the head and neck of the bottle in a manner presently described, thus causing the studs 15 to be guided along their respective slots 14.

One or more, in this instance two, coil spring rings 17 and 17' are mounted in vertically spaced relation in the space between the flanges 7 and 9 on the lower end of the head 2 coaxial therewith to normally extend around and against the periphery of the sleeve 12, the outer periphery of each ring being seated in concave seats 18 on the inner ends of a plurality of retainer blocks 19 which are slidably disposed in uniformly spaced relation circumferentially around the axis of the head 2 in the space between the flanges 7 and 9 for radial movement during the expansion and

contraction of the ring, each block being preferably composed of lower and upper half sections secured together by bolts 20 or equivalent releasable means, as shown more clearly in Figures 1 and 9.

Each of these coil springs 17 and 17' is free to roll or rotate in the seat 18 in the corresponding block 19 and is adapted to protrude inwardly slightly beyond the inner ends of the blocks for normal contact with the periphery of the sleeve 12 when the head 2 is raised to its inoperative position and also to contact with the skirt c of the cap and with the periphery of the neck of the bottle for compressing said skirt upon and around the head and neck of the bottle as the head 2 is moved downwardly to its cap-applying position, as shown in Figures 2 and 3.

As previously intimated, the outside diameter of the sleeve 12 is about equal to the outside diameter of the skirt of the cap or of slightly greater diameter than the outside diameter of the head a of the bottle so that when the lower end of the sleeve 12 is brought into engagement with the upper end of the cap through the downward movement of the head 2, the continued movement of the head will cause the springs 17 and 17' to successively engage and compress the skirt c' of the cap around the mouth and neck of the bottle under a rolling sliding action.

Each of these springs is extensible and contractible circumferentially and is normally of less interior diameter than the exterior diameter of the neck of the bottle and, therefore, considerably less than the exterior diameter of the head of the bottle and sleeve 12 so that when engaged with the periphery of the sleeve it will be expanded longitudinally against its own tension and when moved downwardly across the skirt of the cap it will automatically contract circumferentially, thereby compressing the skirt around and upon the head and neck of the bottle.

During this sliding and rolling action of each of the springs against the skirt of the bottle for compressing said skirt around and upon the head and neck, the inner portions of the helixes will produce a more or less irregular rumpling of said skirt which greatly facilitates the securing of the skirt to the bottle to hold the cap in operative position due to the more or less irregular overlapping of the rumples or wrinkles against the neck of the bottle directly under the head thereof.

This capping device is also provided with suitable means for expanding the peripheral walls of the cup-shaped portion of the cap tightly against the adjacent walls of the mouth of the bottle and for this purpose a ring 21 of soft rubber or equivalent compressible and expansible material is interposed between opposed co-axial annular members 22 and 23 which have a limited relative axial movement toward and from each other for expanding the ring against the peripheral walls of the cup-shaped portion of the cap and thereby forcing said walls tightly against the adjacent walls of the mouth of the bottle, as shown more clearly in Figure 3.

These members 22 and 23 are arranged in axially spaced relation a distance corresponding approximately to the normal cross sectional diameter of one side of the ring 21 which latter has an external diameter approximately equal to the internal diameter of the cap holding sleeve 12.

The lower member 22 is provided with a con-

cave peripheral seat 24 for receiving and supporting the ring 21 and is also provided with a central threaded stem 25 engaging in a threaded socket in the lower end of a tubular plunger 26 coaxial therewith so that the member 22 becomes a detachable part of the plunger with the concave seat 24 projecting radially beyond the periphery of the plunger, as shown more clearly in Figures 1, 2, and 3.

The member 23 preferably consists of a hardened metal ring fitted within the sleeve 12 for vertical sliding movement therein co-axial therewith.

The tubular plunger 26 is fitted within the ring 23 co-axial therewith for slight relative vertical movement sufficient to compress the rubber ring 21 immediately following the operation of compressing the skirt of the cap upon the head and neck of the bottle.

The lower end of the member 22 extends under and engages the lower end of the plunger 26, while the inner diameter of the concave recess 24 is substantially the same as the external diameter of the plunger to form a rigid support against which the inner face of the rubber ring 21 is adapted to abut to prevent inward compression of the ring 21 when subjected to axial pressure through the compression ring 23.

This plunger 26 extends upwardly through the compression ring 23 and some distance above the upper end of the sleeve 12 and is provided in opposite sides thereof with a lengthwise slot 27 for receiving a cross pin 28 on the lower end of the shaft 1, as shown more clearly in Figures 1, 2, and 3, thus permitting a limited relative axial movement of the plunger and shaft for a purpose presently described.

A hollow pressure plunger 29 is fitted over and upon the periphery of the inner plunger 26 co-axial therewith for relative vertical sliding movement thereon, the upper end of the pressure plunger 29 being provided with a cross pin 30 extending through a vertically elongated slot 31 in the adjacent portion of the shaft 1 to hold those parts against relative angular movement and at the same time to guide them in their relative vertical movement.

The upper end of the shaft 1 may be connected to any suitable means for reciprocating the same and the head 2 vertically and is normally held in its uppermost position as shown in Figure 1 so that the cross pin 30 normally rests upon the lower end of the slot 31 for supporting the pressure plunger 29 in its uppermost position.

It will also be noted that the upper end of the slot 27 in the plunger 26 normally rests upon the cross pin 28, thereby normally supporting the plunger 26 and parts carried thereby against undue downward movement when the capping device is elevated to its extreme upward position out of engagement with the top of the bottle, as shown in Figure 1.

The portion of the pressure plunger 29 below the cross pin 30 is provided with a plurality of vertically elongated radial slots 32 extending from the lower end thereof upwardly, said slots being arranged in uniformly spaced relation circumferentially to form a corresponding number of pendant arm 33 which are also arranged in uniformly spaced relation circumferentially.

A hardened metal circular plate 34 is secured by screws 35 or equivalent releasable fastening means to the upper end face of the sleeve 12 and is provided with a plurality of inwardly pro-

jecting wings 36 entering the corresponding vertical slots 32 to form stops for limiting the downward movement of the plunger 26.

The upper end of this plunger is also provided with a plurality of radial wings or stops 37 projecting into the corresponding slots 32 directly over and in axially spaced relation to the underlying wings 36 on the sleeve 12 so that when the head 2 and sleeve 12 are moved downwardly to bring the lower end of the sleeve into engagement with the top of the cap C thereby checking the further downward movement of the sleeve, the continued downward movement of the head for compressing the skirt of the cap on the head and neck of the bottle will cause a similar downward movement of the plunger 26 until limited by the engagement of the stop wings 37 with the stop wings 36 on the upper end of the sleeve at which time the lower end face of the flange 22 on the plunger will be in close proximity to the bottom of the cup-shaped portion of the cap C with just sufficient clearance to avoid engage or crushing of the raised bosses d .

A relatively stiff and heavy coil spring 38 is interposed between the top 3 of the head 2 and upper end of the pressure plunger 29 around the adjacent portion of the shaft 1 and within the coil spring 16 for yieldingly holding the lower ends of the pendant arms 33 of the pressure plunger in engagement with the upper face of the pressure ring 23 and thereby yieldingly holding said pressure ring in engagement with the upper face of the rubber ring 21 preparatory to compressing the latter for expanding the same radially and outwardly from the position shown in Figure 2 to the position shown in Figure 3.

It will be observed upon reference to Figure 2 that the distance between the bottom face of the flange 22 and lower face of the stop flanges 37 on the plunger 26 is substantially equal to the distance between the lower end face of the holding ring 12 and upper face of the stop wings 36 plus the interior vertical depth of the cup-shaped portion of the cap C sufficient to prevent the engagement of the lower face of the flange 22 with the embossed portions d of the cap when the lower end face of the holding ring 12 is engaged with the top of the cap.

One of the objects of making the pressure ring 23 separate from the pressure plunger 29 is to facilitate the assembly of parts 23 and 26 within the part 12. As previously stated, the normal external diameter of the peripheral corrugated walls of the cup-shaped portion of the cap is less than that of the interior diameter of the mouth of the bottle to the extent that when the corrugated walls are expanded in a manner described, the exterior diameter of said corrugated walls will be equal to the interior diameter of the mouth of the bottle to enable all parts of the peripheral walls of the cup-shaped portion to lie closely and firmly against the corresponding walls of the mouth of the bottle.

Operation

Assuming that the capping device is in its normal uppermost or starting position and that the preformed bottle cap has been placed by hand or otherwise over and upon the mouth of the bottle and that the bottle with the cap thereon is moved under the capping device in axial alinement therewith. Then as the shaft 1 and head 2 carried thereby are moved downwardly, the holding sleeve 12 will also be moved in

the same direction through the medium of the coil spring 16 until the lower end of the sleeve engages the top of the cap C, thereby limiting the further downward movement of the sleeve and causing the cap to be held on the mouth of the bottle under yielding pressure through the sleeve while the shaft 1 and head 2 are free to continue their downward movement, thereby causing the spring rings 17 and 17' to successively engage and compress the skirt of the cap tightly around the head and neck of the bottle under their own tension.

During this downward movement of the head 2, the plunger 26 will also be moved downwardly under its own weight aided by its frictional engagement with the downwardly moving plate 34 on the top of the holding sleeve 12 until the stop wings 37 are brought into engagement with the stop wings 36 of said plate at which time the lower face of the flange 22 on the bottom of the plunger 26 will be brought into proximity to the bottom of the cup-shaped portion of the cap but with sufficient clearance to prevent crushing of the embossed portions on said bottom.

As previously intimated, the rubber ring 21 is yieldingly held between the ring member 23 and concave seat 24 of the flange 22 on the bottom of the plunger 26 through the medium of the coil spring 38. As the shaft 1 and head 2 continue their downward movement after compressing the skirt of the cap around the head and neck of the bottle through the medium of the springs 17 and 17', this continued movement compresses the spring 38 between the top of the pressure plunger 29 and top wall 3 of the head 2, thereby forcing said plunger 29 and pressure ring 23 against the upper face of the rubber ring 21 for compressing the latter and thereby expanding the same radially and outwardly to effect a corresponding radial expansion of the peripheral walls of the cup-shaped portion of the cap tightly against the adjacent walls of the mouth of the bottle, it being understood that the peripheral walls of the plunger 26 engaging the inner periphery of the rubber ring 21 are rigid and unyielding to hold the ring against inward contraction so that the axial pressure upon the ring 21 causes the latter to expand radially and outwardly only, thus effecting the desired expansion of the peripheral walls of the cup-shaped portion of the cap against the adjacent walls of the mouth of the bottle without liability of stretching the material from which the cap is formed due to the corrugations formed in the peripheral walls.

It is, of course, understood that while the cap is being applied to the bottle the latter will be firmly supported against downward movement through any suitable supporting means not shown.

It will be noted upon reference to Figure 3 that the head 2 and plunger 29 are slightly lower than shown in Figure 2 and represent the amount of downward movement of the plunger 29 necessary to compress and expand the ring 21 after the downward movement of the plunger 26 has been limited by the engagement of its stop wings 37 with the stop wings 36 on the sleeve 12.

The slot 31 in the lower end of the shaft 1 for receiving the pin 30 and also the slots 32 in the pressure plungers 29 are sufficiently elongated vertically with reference to the pin 30 and stop shoulders 37 respectively to permit sufficient downward movement of the plunger 29 and pressure ring 23 to effect the desired radial expansion of the rubber ring 21 and resultant expansion

sion of the peripheral walls of the cup-shaped portion of the cap against the peripheral walls of the mouth of the bottle without liability of breaking the bottle for the reason that the force of compression is limited by the amount of compression produced upon the spring 38.

In other words, the ring 21 is compressed under the yielding pressure of the spring 38 which, however, is sufficient to effect the desired radial and outward expansion of the ring 21 and resultant expansion of the peripheral walls of the cup-shaped portion of the cap without liability of breaking or cracking the mouth of the bottle.

It will be noted that when the springs 17 and 17' begin to engage the skirt of the cap C, said springs will be more or less distended circumferentially, thereby opening the helixes thereof so that as these open helixes engage the skirt of the bottle with a rolling motion in addition to the sliding motion the spiral positions of the helixes will cause a more or less irregular rumpling and overlapping of the skirt around and upon the head and neck of the bottle and thereby to effect a more secure attachment of the cap to the bottle.

In some instances, the surface of the material from which the cap is formed may be lacquered or otherwise treated in different colors to represent different grades of the contents such as the milk within the bottle, and it is found that the rolling action of the coil springs against these treated surfaces prevents excessive marring of the same so that the skirt of the cap retains its distinctive color.

It is, of course, understood that the bottle to be capped will rest upon a substantial support and that during the downward movement of the head 2 from the position shown in Figure 1 to the position shown in Figure 3, the skirt of the cap will be compressed against the periphery of the mouth and neck of the bottle and simultaneously rumpled or corrugated by reason of the engagement of the helixes of the springs 17 and 17' with said skirt. During this operation, the sleeve 12 will have been brought into holding engagement with the head of the bottle cap to firmly hold the same against the head of the bottle while the ring 21 is being compressed by the ring 23 to expand the ring 21 against the peripheral walls of the cup-shaped portion of the cap for forcing said peripheral walls into close engagement with the inner walls of the mouth of the bottle to form a liquid-tight joint therewith.

It will also be understood that as the head 2 is moved upwardly after securing the cap to the bottle, the sleeve 12 will remain in engagement with the top of the cap until the lower end walls of the slots 14 engage the studs 15 at which time the springs 17 and 17' will have been moved above the head of the cap so that sleeve 12 may hold the cap against upward displacement from the mouth of the bottle and the bottle held against upward displacement from its support until the head 2 has been raised a sufficient distance to release the sleeve 12 from holding engagement with the head of the cap.

As soon as the sleeve 12 has been released in the manner described, the lower flange 9 will be some distance above the head of the bottle and the plunger 26 and ring 13 will have been elevated out of engagement with the cap, thus permitting the removal of the capped bottle by hand or otherwise from the capping device.

The term bottle as used in the specification and claims is intended to comprehend any receptacle

to which the preformed cap may be applied, and although I have shown and described what I regard as the most efficient means for effecting the compression of the skirt of the cap around and upon the head and neck of the bottle and for expanding the peripheral walls of the cup-shaped portion of the cap against the adjacent walls of the mouth of the bottle, it is evident that various modifications may be made to effect the same result without departing from the spirit of the invention.

What I claim is:

1. In an apparatus for securing a skirted cap to the mouth of a bottle upon which the cap has been loosely seated, movable means for engaging and holding the cap against the outer end of said mouth, a coil spring ring extensible longitudinally and having its interior diameter normally less than the exterior diameter of the neck of the bottle, and means including a plurality of spaced radially movable members rotatably connected with the spring ring for moving said ring axially of the movable means and bottle for progressively pressing the skirt of the cap around and against the head and neck of said bottle.

2. In an apparatus for securing a skirted cap to the mouth of a bottle upon which the cap has been loosely seated, means for engaging and holding the cap on the bottle, a circumferentially extensible and contractible spring ring having a normal interior diameter less than the exterior diameter of the head and neck of the bottle, and means for forcing the ring axially of said holding means and bottle over and upon the skirt of the cap whereby said spring will progressively compress the skirt upon the head and neck of the bottle under its own tension and comprising circumferentially arranged radially movable members connected with the ring, and means slidably supporting said members.

3. In an apparatus for securing a skirted cap to the mouth of a bottle upon which the cap has been loosely seated, means for engaging and holding the cap on the bottle, a coil spring ring of normally less interior diameter than the exterior diameter of the head and neck of the bottle, and means for placing said spring axially of said holding means and bottle around and against the skirt of the cap whereby it will automatically compress said skirt against the bottle under its own tension and comprising circumferentially arranged radially movable members connected with the ring, and means slidably supporting said members.

4. In apparatus for applying closures onto containers, yieldably expansible and contractible means adapted to engage about the marginal edges of the closure, a support for normally holding said means expanded to the approximate size of said closure, and means for displacing said yieldable means from said support and into rolling engagement with the marginal edges of the closure to allow said first named means to contract and freely roll over the edges of said closure whereby to compress the closure against the container.

5. In apparatus for applying closures to containers and the like, an expansible and contractible annulus, supporting means therefor coaxial with and normally extending through the annulus, said supporting means normally serving to hold the annulus in an expanded condition approximating the size of the closure, and means for displacing said annulus axially relatively to and beyond the end of said support and into rolling

contact with the marginal edges of said closure to allow the annulus to contract and roll over the marginal edges of said closure whereby to progressively compress the closure against the container.

6. In apparatus for applying closures to containers and the like, an expansible and contractible annulus, supporting means therefor coaxial with and normally extending through the annulus, said supporting means normally serving to hold the annulus in an expanded condition approximating the size of the closure, means for engaging said holding means with the closure to temporarily hold the closure against the container, and means movable relatively to said holding means and rollably engaging said annulus for displacing said annulus from said holding means and into rolling engagement with the closure to allow said annulus to contract and roll over the periphery of said closure whereby to compress the closure against the container.

7. In apparatus for applying over-all bottle caps to containers, said caps having a marginal skirt and a central cup-shaped portion, a reciprocable head including an expansible and contractible member adapted to fit over the outside of the marginal skirt of the cap, and a second expansible and contractible member adapted to be inserted within the cup-shaped portion of the cap, said expansible and contractible members being movably mounted so as to successively produce a contraction of the cap skirt about the mouth of the container and an expansion of the cup-shaped portion of the cap into snug engagement with the inside of the mouth of the container pursuant to reciprocation of the head in one direction, and means for causing said last mentioned expansion to take place after the contraction and release of the skirt by the first mentioned expansible and contractible member.

8. In an apparatus for securing a skirted cap to the mouth of a bottle in which the skirt extends around the head and adjacent portion of the neck of the bottle, means for engaging and holding the cap on the bottle, means comprising a contractible and expansible annulus which is circular in cross section and has a less normal interior diameter than the exterior diameter of the neck of the bottle movable axially of the holding means and along the skirt in engagement therewith for progressively compressing the skirt around and upon the head and neck of the bottle, and means including radially movable members engaging the annulus at intervals and supporting said annulus in rolling engagement with the skirt during the axial movement of said annulus.

9. In a machine for applying a skirted bottle cap to a bottle, a pair of axially spaced self-contracting coil spring rings, means for holding the rings expanded to an inner diameter about equal to the exterior diameter of the head of the bottle co-axial with and adjacent said head, and means rotatably supporting the rings for displacing said rings axially from said holding means and around the skirt of the cap to allow the rings to contract and roll over the surface of said skirt to thereby compress the skirt against the neck of the bottle.

10. In an apparatus for securing a skirted cap to the mouth of a bottle having an outwardly extending shoulder or bead contiguous said mouth and a reduced neck portion below the shoulder or bead, means for engaging and holding the cap on the open end of the bottle, a coil spring ring of less interior diameter than the exterior diameter of the neck of the bottle, and means including a plurality of spaced radially movable members rotatably engaging the spring ring for forcing said ring axially along the bead and neck of the bottle in first one direction and then in the opposite direction whereby the ring may effectively engage the skirt with a rolling motion in both of said directions for progressively compressing said skirt tightly against the bottle bead and neck.

11. In an apparatus for securing a skirted cup-shaped cap to the mouth of a bottle, movable means for engaging and holding the cap on the open end of the bottle, a coil spring ring mounted co-axially with said movable means, means including a plurality of spaced radially movable members rotatably connected with the spring ring for effecting the engagement of said ring with the skirt of the cap and compressing the same tightly against the neck of the bottle, and means for engaging and expanding the peripheral wall of the cup-shaped portion of the cap tightly against the wall of said mouth.

12. In an apparatus for securing a skirted cup-shaped cap to the mouth of a bottle, movable means for engaging and holding the cap on the open end of the bottle, a coil spring ring mounted co-axially with said movable means, means rotatably engaging the ring in circumferential spaced relation for effecting the engagement of said ring with the skirt of the cap and allowing the ring to contract and expand for compressing said skirt tightly against the neck of the bottle, and means for engaging and expanding the peripheral wall of the cup-shaped portion of the cap tightly against the wall of said mouth.

13. In an apparatus for securing a cup-shaped cap to the head of the bottle, holding means for temporarily maintaining the top of the cap against the top of the bottle, an axially compressible and radially expansible ring adapted to be inserted into the cup-shaped portion of the cap, relatively movable supporting elements for the ring slidably mounted for axial movement in the holding means, means for yieldingly producing relative movement of the supporting elements and holding means to bring the ring into the cup-shaped portion of the cap and for expanding the ring and thereby forcing the peripheral wall of the cup-shaped portion tightly against the peripheral wall of the mouth of the bottle, and co-acting means associated with the holding means and one of said supporting elements for limiting the relative movement thereof as the supporting element approaches the bottom of the cup-shaped portion of the cap and thereby prevent said supporting element from coming into pressure engagement with the bottom of the cup-shaped portion of the cap during the expanding of the ring.

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