

Aug. 18, 1970

S. J. KOLL

3,524,294

BOTTLE CAPPING EQUIPMENT AND METHOD

Filed Oct. 20, 1967

3 Sheets-Sheet 1

Fig. 1.

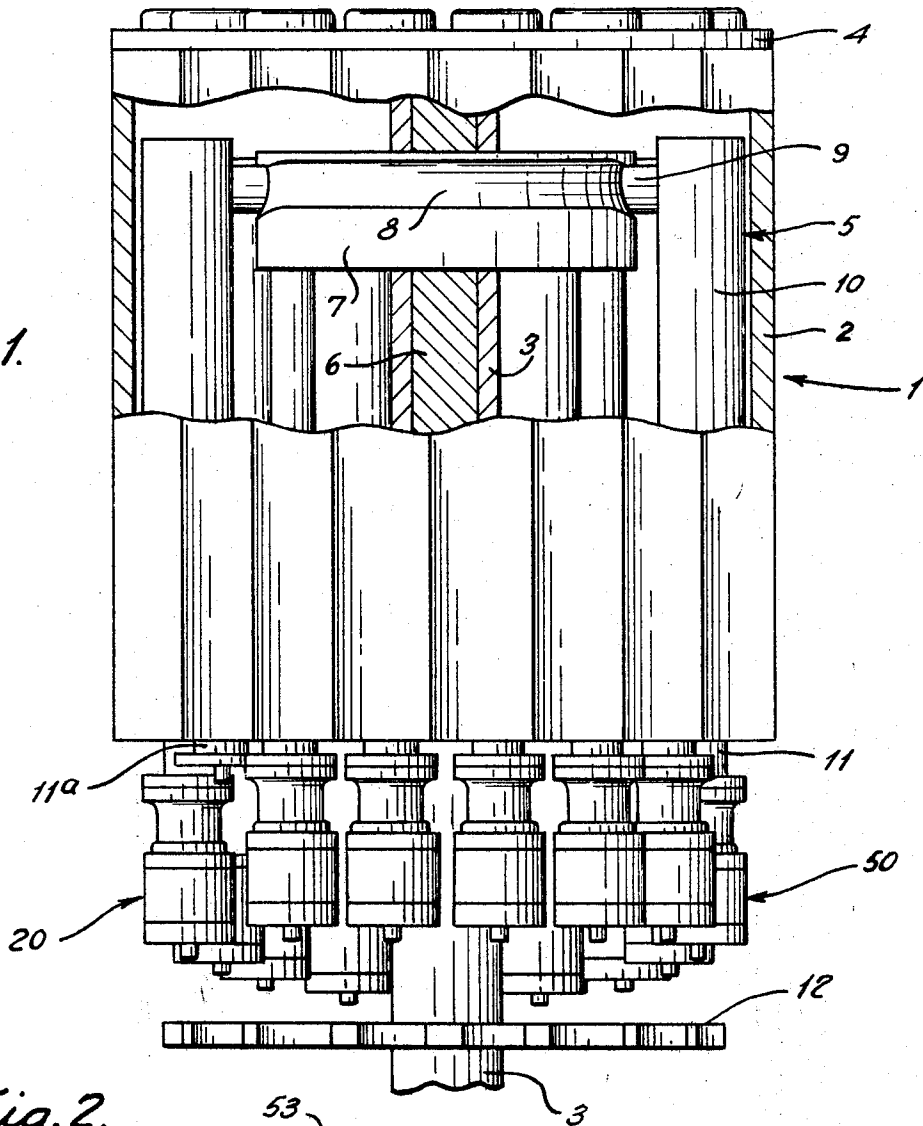


Fig. 2.

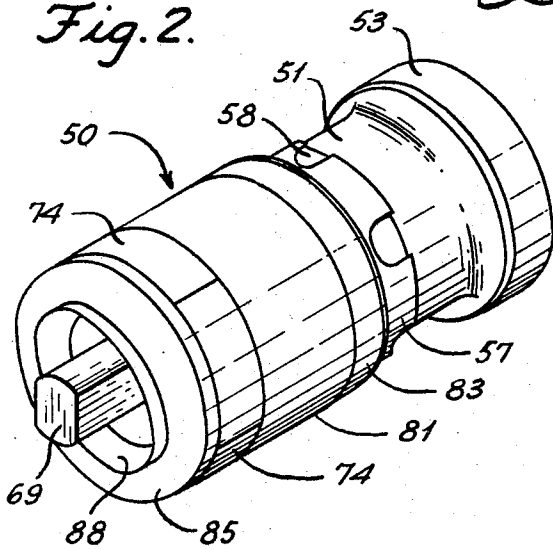
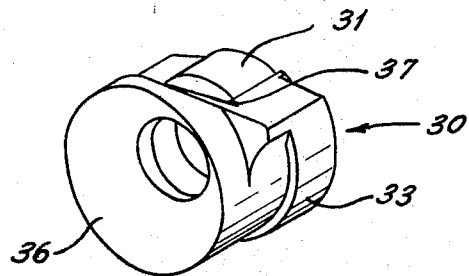


Fig. 3.



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3 Sheets-Sheet 2

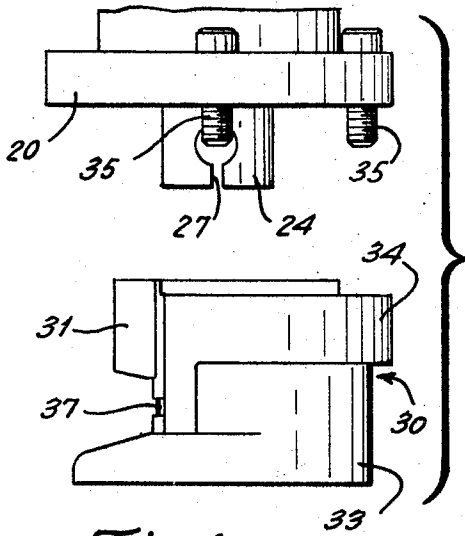


Fig. 6.

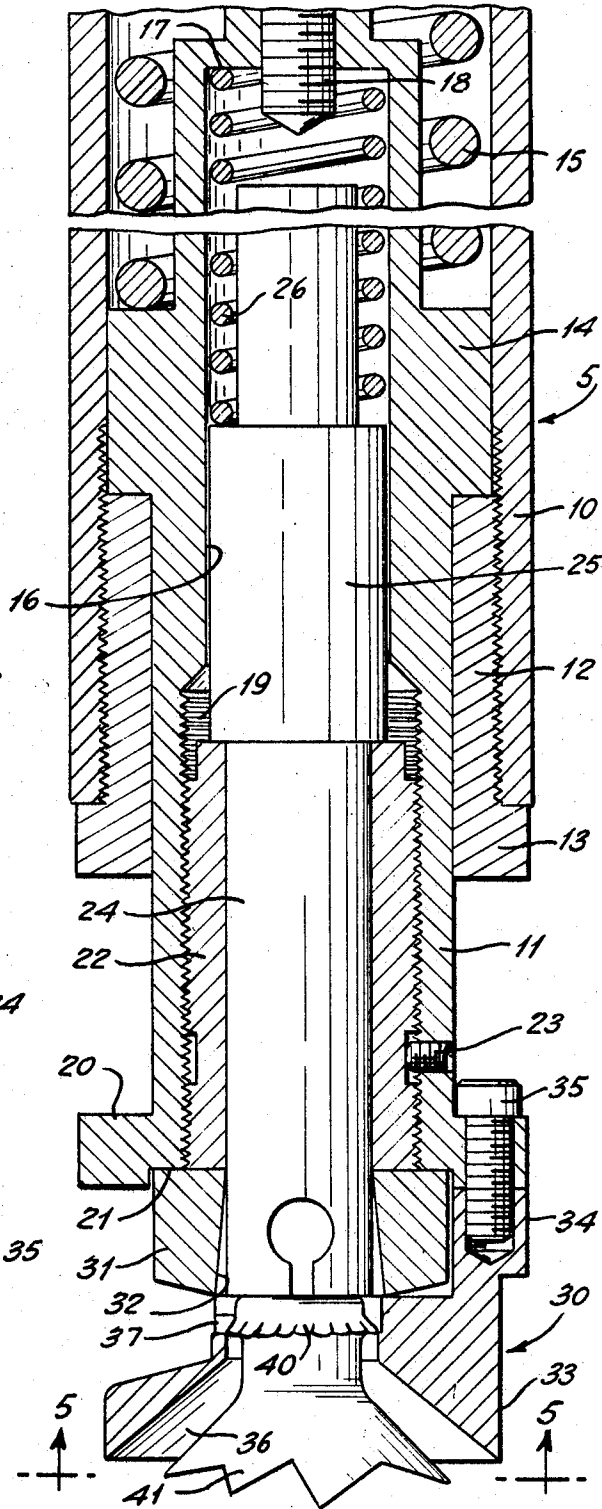
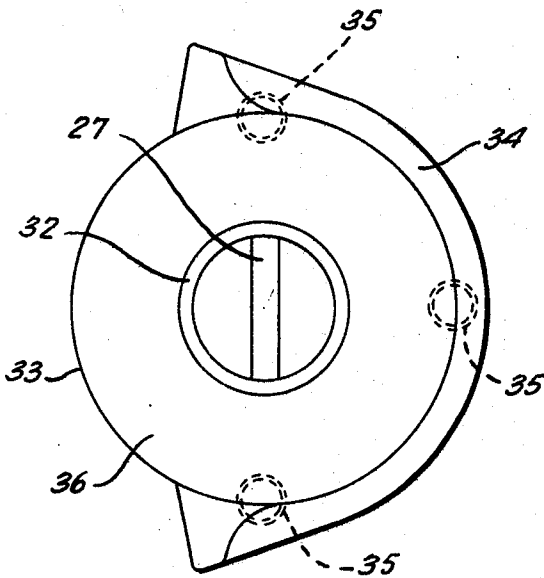


Fig. 4.

Fig. 5.



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3 Sheets-Sheet 3

Fig. 7.

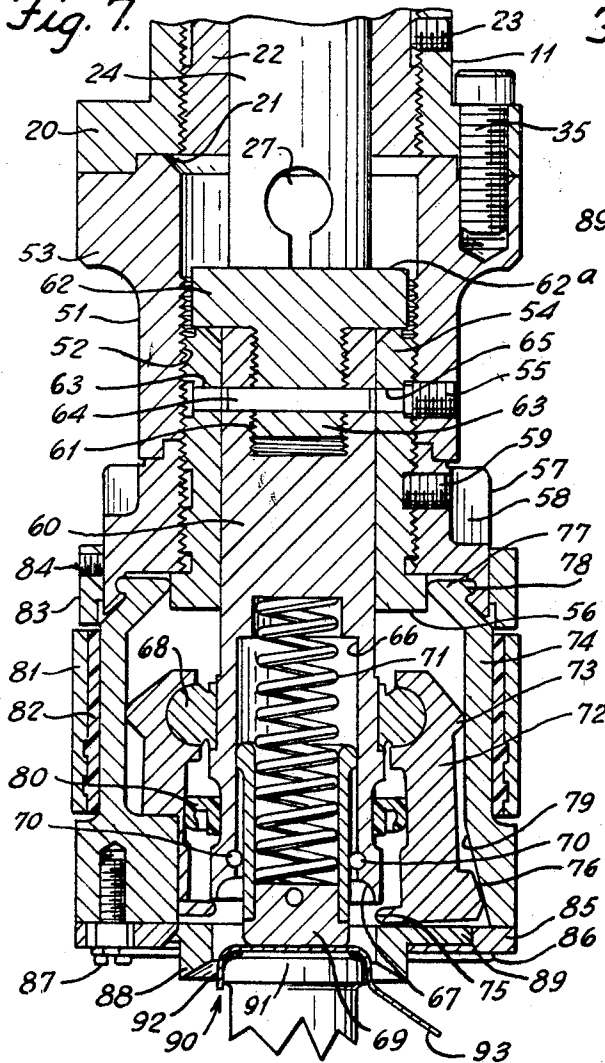


Fig. 8.

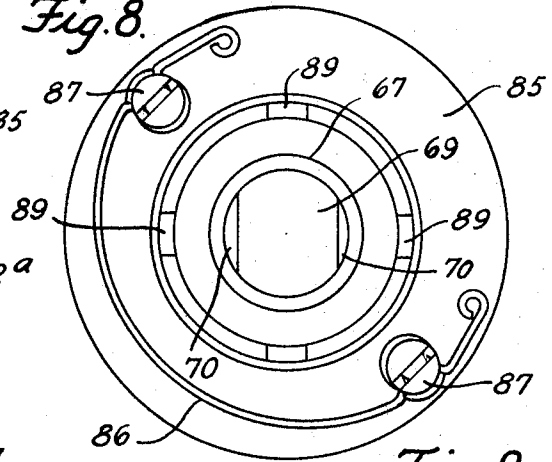


Fig. 9.

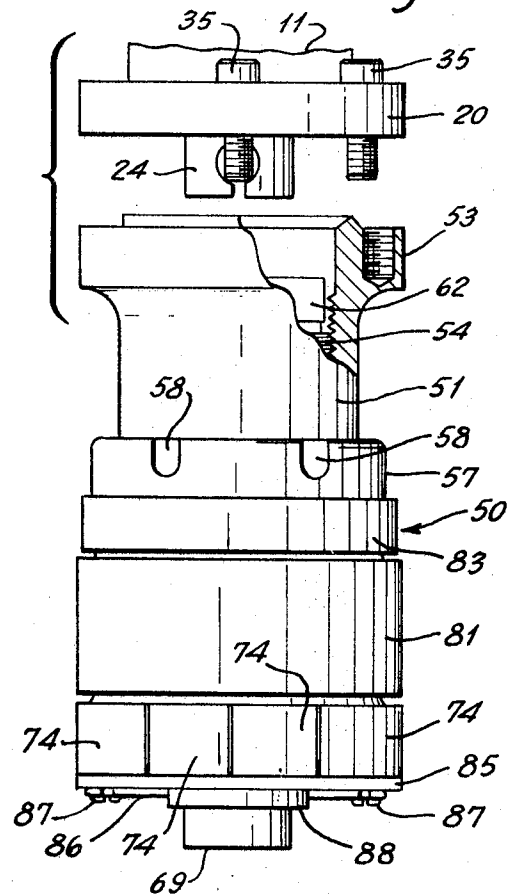
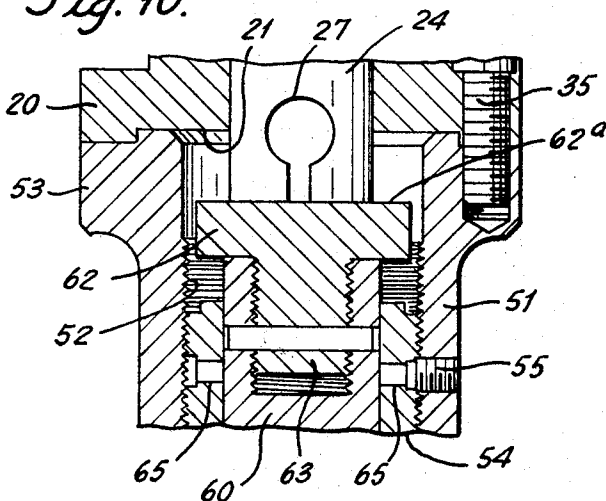


Fig. 10.



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1

2

3,524,294

BOTTLE CAPPING EQUIPMENT AND METHOD
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U.S. Cl. 53—3

9 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for capping bottles in high speed bottle filling operations wherein a plurality of individual cap applying units are housed within a rotatable capping turret. Each unit can be quickly and easily converted for the application of either smooth skirt tear off closures or conventional crowns.

This invention relates to an improved method and apparatus for applying closures to containers and is particularly concerned with high speed bottle capping equipment which can be quickly converted for applying different types of closures.

In the bottling industry containers are filled and capped or crowned in a continuous operation performed by a single piece of equipment called the filler which includes a crowner as an integral part thereof. Illustrative of conventional equipment of this general type is that manufactured and sold by the Crown Cork and Seal Company under the Cemco trade name. The bottles or other containers after having been filled are conveyed by a star wheel underneath a crowner turret within which a plurality of crowner plunger assemblies, each incorporating a crown applying mechanism at the lower end thereof, is slideably mounted to effect the capping operation.

The recent trend toward newly designed hand removable convenience closures has necessitated modification of such existing equipment so that bottling operations can change over from the application of standard crowns to convenience closures. In one instance this changeover has heretofore been accomplished through the relatively costly and time consuming operation of removing the existing crowner plunger assemblies through the top of the crowner turret and modifying said assemblies for reception of cap applying mechanisms for the application of convenience closures. As can be readily appreciated this cumbersome changeover operation has done little to enhance the attractiveness, from the bottler's point of view, of convenience closures. This is particularly true when it is borne in mind that not only does normal maintenance require occasional replacement of these cap applying mechanisms but in addition it has become highly desirable, though wholly impractical with prior art constructions, to convert back and forth between production runs applying standard crowns and runs applying convenience closures with a minimum of lost production time. This degree of flexibility would make it possible, for example, to run different sizes of bottles receiving different closures on the same basic equipment.

Through the advent of the instant invention herein disclosed there is taught a novel method to quickly convert bottle capping equipment so as to alternately apply different types of closures. The unique apparatus herein disclosed for carrying out that method embodies two different interchangeable cap applying mechanisms which can be simply and quickly secured or detached from the lower end of the crowner plunger assembly permanently mounted within the crowner turret.

This invention greatly simplifies the initial change over from a standard crowning operation to the application of convenience closures and the subsequent conversion back

and forth from one to the other in that no modification of the existing parts is necessary. A very minor disassembly step is all that is required.

It is accordingly a principal object of this invention to provide a novel method for alternately securing different types of closure caps over the openings of bottles and other receptacles.

Another object is to provide an improved apparatus for carrying out such method.

Another object is to provide an improved method and apparatus for the conversion of bottle capping operations from the application of one type of closure cap to another.

A further object is to provide an improved method and apparatus for applying either fluted skirt crown caps or smooth skirt tear off closures to bottles by means of the same basic equipment.

A same object is to provide an improved apparatus for crimping tear off type closure caps onto container necks.

A more detailed object is to effect the operation of a segmented crimping annulus through the actuation of a partially disassembled crowning mechanism.

Still further and more detailed objects of the invention will in part be obvious and in part pointed out as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is a vertical elevation of a crowner turret partially broken away for clarity and incorporating tear off type closure applying heads in accordance with the invention;

FIG. 2 is a perspective view of a tear off type closure applying head;

FIG. 3 is a perspective view of a crowner platform and throat assembly;

FIG. 4 is a vertical section of the complete crown applying mechanism and showing a bottle in crowning position;

FIG. 5 is a bottom plan of the crown applying mechanism alone taken on line 5—5 of FIG. 4 and looking in the direction of the arrows;

FIG. 6 is an elevational view of the crown applying mechanism showing a partially disassembled condition;

FIG. 7 is a sectional view of the tear off type closure applying head and showing a bottle in capping position;

FIG. 8 is a bottom plan of the tear off type closure applying head of FIG. 7;

FIG. 9 is a elevational view of the tear off type closure applying head of FIG. 7 but in detached condition; and

FIG. 10 is a fragmentary sectional view showing the relationship of certain parts in crimping position.

In FIG. 1 there is shown a crowner turret 1 incorporating a set of tear off type closure applying heads 50, in accordance with the invention. The basic crowner turret 1 is part of a standard filling equipment employed in high speed bottling operations such as manufactured by the Crown Cork and Seal Company under the Cemco trade name and is seen to comprise a generally cylindrical housing 2 mounted on a central hollow drive shaft 3. The turret 1 is closed at its upper end by a cap 4 and has circumferentially arranged therewithin a plurality of plunger assemblies 5 mounted for vertical reciprocating movement within the turret 1. A fixed center shaft 6 extends through the hollow drive shaft 3 and has a circular disc 7 provided with a cam race 8 secured about the upper portion thereof. A radially inwardly extending cam follower 9 is mounted at the upper end of each of the plunger assemblies 5 so as to ride within the cam race 8.

Each of the plunger assemblies 5 includes an outer cylinder sleeve 10 which surrounds a work imparting shaft

11. A crimping head 50 for applying hand tear off convenience closures is secured to each of the shafts 11 except shaft 11a which has its head 50 detached for purposes of illustration in the manner disclosed by this invention.

Also secured to the hollow drive shaft 3 is a bottle feed star wheel 12 positioned below the turret 1 and rotatable therewith. In operation the bottles are fed in a circular path underneath each plunger assembly 5 of the capping turret 1 by the star wheel 12 and as the cam followers 9 ride down the cam race 8 the plunger assemblies 5 are progressively lowered so that the crimping heads 50 secured to the lower ends thereof seal a closure onto each bottle as rotational movement of the turret and star wheel continues. Upon reaching the lowest point in the cam race 8 the cam follower then moves upwardly again to its initial position thus releasing the crimping head 50 from the bottle whereupon the capped bottle is conveyed by other suitable means (not shown) away from the star wheel 12.

FIGS. 2 and 3 illustrate the two different cap applying mechanisms for interchangeable attachment to the work imparting shafts 11 at the lower end of the plunger assemblies 5. The application of conventional crown caps is effected by engagement of the crowner throat and platform assembly generally indicated at 90, as illustrated in FIG. 3, to the shafts 11. Subsequent conversion to the application of tear off closures is effected by simply detaching the crowner assembly 90 and substituting the crimping heads generally indicated at 50 in FIG. 2.

Considering in detail first the construction of the crowning mechanism, attention is directed to FIGS. 4, 5 and 6 wherein it is seen that the work imparting shaft 11 extends downwardly beyond the cylinder 10 of the plunger assembly 5 and is retained therein by an externally threaded outer bushing 12 provided with a circumferential flange 13 at its lowermost end which bears against the lower end of the sleeve 10. The shaft 11 has a circumferentially enlarged central section 14 which rests against the upper end of the bushing 12. The collar 14 in turn supports a heavy duty overload compensator compression spring 15. The shaft 11 is provided with an axially extending bore 16 closed off by an upper end wall 17 formed with an aperture for reception of a threaded stud 18. The lower end of the bore 16 is internally threaded at 19 and terminates in a radially outwardly extending circumferential flange 20. An annular recessed seat 21 is formed in the lower end surface of the shaft 11 surrounding the bore 16. An exteriorly threaded inner bushing 22 is threadedly engaged within the lower end portion of the shaft 11 and is locked therein by a setscrew 23. A crown cap engaging spindle 24 is housed within the shaft 11 and has a circumferentially enlarged central section 25 which rests upon the upper end of the bushing 22. The upper end of the spindle 24 is surrounded by a compression spring 26 which acts against the upper end of the enlarged section 25 and the shaft end wall 17. The lowermost end of the spindle 24 is split as shown at 27 and magnetized in order to provide means for retaining a steel crown cap thereon.

The crowner assembly 30 is seen to comprise a crowner throat member 31 having a conical inner surface 32. The throat member 31 rests against the lower end of the bushing 22 and the annular seat 21 in the lower end surface of the shaft 11. A crowner platform member 33 holds the throat 31 in place and is provided with a radial shoulder 34 extending part way around the periphery. As seen in FIGS. 4 and 5 three screws 35 secure the platform shoulder 34 to the shaft flange 20. The crowner platform is further provided with a crown cap entrance port 37 and a lowermost conical bottle guide surface 36.

In operation a crown cap 40 is introduced through the entrance port 37 and held in capping position on the lower end of the spindle 24 by the magnetized split portion 27. The plunger assembly 5 is then lowered with respect to a bottle 41. As soon as the undersurface of the crown cap

50 contacts the bottle 41 and is compressed thereagainst the spindle 24 becomes stationary while the shaft 11 continues to move the crowner throat 31 downwardly against the resistance of compression spring 26. The relative movement between the plunger 24 and the crowner throat 31 causes the throat inner surface 32 to engage the fluted crown cap skirt and push it in under the lip of the bottle 41. The axial extent of this movement is controlled by adjustment of the stud 18. Upward movement of the plunger assembly 5 by movement of the cam follower 9 along the cam race 8 restores the parts to their initial position as shown in FIG. 4.

FIG. 6 illustrates the partial disassembly of the crowning mechanism whereby the crowner platform and throat assembly 30 is easily detached from the work shaft 11 through removal of the three screws 35. This step is all that is required to prepare the crowner plunger assembly 5 for conversion of the application of tear off closures.

Considering next in detail the crimping head 50, shown and described to some extent in the copending application of Charles David and Herbert F. Wheaton filed Dec. 15, 1966, entitled "Capping Conversion Apparatus and Method," attention is directed to FIGS. 7, 8, 9 and 10 wherein it is seen that the head 50 comprises a cylindrical adapter member 51 internally threaded adjacent its lower end at 52 and provided with a radially outwardly extending circumferential flange 53 at its upper end. The three screws 35 also secure the adapter flange 53 to the work shaft flange 20. An externally threaded cylindrical bushing 54 is threadedly engaged within the lower end of the adapter member 51 and locked in place by a setscrew 55. A radially outwardly extending flange 56, surrounds the lower end of bushing 54. An internally threaded collar 57 surrounds the lower portion of the bushing 54 above the flange 56 and has a plurality of wrench engaging cavities 58 formed about its exterior surface as seen in FIG. 9. The collar 57 engages the lower end of the adapter member 51 and is locked to bushing 54 by means of a setscrew 59.

Slidably received within the bushing 54 is a tear off closure engaging spindle 60 having an internally threaded bore 61 at its upper end which receives a locking stud 62 having a lower threaded end 63 of reduced cross-section.

The body of the stud 62 overlies the upper ends of the spindle 60 and the bushing 54. A pin 64 locks the stud 62 and the spindle 60 together and is accessible through openings 65 in the bushing 54 upon removal of the adapter member 51. The upper surface 62a of the stud 62 makes direct surface to surface engagement with the lower end surface of the crown cap engaging spindle 24 which in effect connects the two spindles 24 and 60 together into a single continuous unit. The lower portion of the spindle 60 is provided with an axially extending internal bore 66 terminating at its lowermost end in a cap receiving nest 67. A radially outwardly extending supporting collar 68 is fitted about the spindle 60 exteriorly of the bore 66. A cap hold down member 69 consisting of a hollow tubular member closed at its lower end, is slideably received with the spindle bore 66 and retained therewithin by a pair of tangentially disposed roll pins 70. A lightweight helical compression spring 71 extending between the closed lower end of the tubular hold down member 69 and the upper end of the spindle bore 66 resiliently urges the hold down member to a downwardly extended position.

The peripheral surface of the supporting collar 68 has an arcuate convex contour upon which a plurality of annularly arranged sealing jaws 72 is pivotally supported. The jaws 72, in the illustrated embodiment, are twelve in number distributed about the cap receiving nest 67. Each jaw has a radially outwardly extending protuberance 73 adjacent its upper end which slideably contacts the inner surface of an overlying segment 74, more fully described hereinafter, and serves to retain the upper end of the jaw 73 adjacent its upper end which slideably contacts the in-

wardly facing crimping surface 75 is formed at the lower end of each jaw and the outer end portion of each jaw is formed with an inclined cam surface 76.

A segmental closing ring is provided for closing the jaws 72 and their crimping surfaces 75 about the cap skirt. The closing ring is made up, in the illustrated embodiment, of six segments 74, that is, each segment actuates two of the underlying jaws 72 by engaging the cam surfaces 76. The upper end of each segment 74 inclines inwardly into a pivot formation 77 which mates with a pivot seat 78 formed in the lower end of the collar 57. The pivot formation 77 is retained against movement away from the pivot seat 78 by the outer surface of the bushing flange 56. The lower end of each segment 74 is radially enlarged so as to provide an inwardly facing cam surface 79 for contact with the jaw cam surfaces 76. An annulus 80 of resilient material is mounted about the lower portion of spindle 60 having a radially outwardly extending flexible lip which engages the inner surface of the jaws 72 and resiliently urges the jaws outwardly so that the jaw cam surfaces 76 are held in contact with the cam surfaces 79 on the segments 74. The segments 74 forming the segmental closing ring are yieldably contained by an overload compensator spring having a composite interlocked structure comprising an outer cylindrical rigid housing 81 and an inner cylindrical member 82 of resilient deformable material. Vertical upward movement of the spring is prevented by the locking band 83 secured to the collar 57 by setscrew 84.

An annular retainer plate 85 is floatingly mounted below the segments 74 by means of a spring clip 86 which engages the screws 87 extending out of the lower end of two of the segments and through a pair of corresponding elongated openings in the plate 85. An annular combination bottle guide and gripping ear wiper member 88 is in turn floatingly retained within the central opening in plate 85 by means of four radial supporting lugs 89 which nest within the retainer plate 85 beneath the jaws 72.

In operation, once the crimping head 50 is attached to the work shaft 11 by means of the three bolts 35 as shown in FIG. 9, the plunger assembly 5 is lowered with respect to a bottle 41 which has loosely seated thereon a lightweight metal tear off closure 90 comprising a disc-like top 91 surrounded by a smooth depending skirt 92 having a gripping ear 93 of any desired configuration, such as a simple tab or a finger ring, extending outwardly therefrom. The cap hold down member 69 bears against the cap top 91 compressing the spring 71 until the cap nest 67 compresses the cap against the underlying bottle lip and the anvils 75 surround the cap skirt 92. Continued downward movement of the plunger assembly 5 causes the segments 74 to move relative to the vertically stationary spindle 60 with the result that the jaws 72 are cammed radially inwardly against the cap skirt 92. In FIG. 10 it can be seen that the above described relative movement between the tear off cap engaging spindle 60 and the surrounding downwardly moving parts of the plunger assembly 5 causes the upper end of the bushing 54 to move away from the body of the stud 63 which in turn bears directly against the lower end of the crown cap engaging spindle 24 resulting in compression of the spring 26. Thus the necessary force required to compress the cap and its associated gasket against the top of the bottle is supplied by the spring 26 and transmitted through both the spindles 24 and 60. Upward movement of the crimping head 50 restores the parts to their initial relaxed position.

In the event it is desired to convert the equipment back to the application of crown caps the three screws 35 are simply removed enabling detachment of the crimping heads 50 from the work imparting shafts 11. The crowner platform and throat assembly 30 can then be simply secured again to the shafts 11.

From the foregoing it can be seen that this invention

enables the application of either crown caps or tear off convenience closures with the same basic piece of equipment. In applying either crown caps or tear off closures the resistance of the same compression spring 26 must be overcome in order to actuate the cap skirt deforming means. When the plunger assemblies 5 are equipped with the crowner assemblies 30 to apply crown caps 40 the skirt deforming means 31 moves relative to the crown cap engaging spindle 24. When the plunger assemblies 5 are converted to apply tear off closure 90 by means of the crimping heads 50 the skirt deforming means 74 move relative to the tear off closure engaging spindle 60 and the crown cap engaging spindle 24. This arrangement provides for constant bottle capping pressure with both types of closures. The novel utilization of the crowner spindle and compression spring to actuate the substituted crimping head offers a high degree of versatility and economy to existing bottle capping operations.

Changes in and modifications of the method and apparatus of the invention as might suggest themselves to those skilled in the art could be made without departing from the spirit and scope of the invention. It is accordingly intended that all matter contained in the above description, or shown in the accompanying drawing shall be interpreted as being illustrative and not in a limiting sense.

Having described our invention what I claim as new and desire to secure by Letters Patent is:

1. The method of alternately applying standard fluted skirt crown caps and smooth skirt tear off closures to containers through the modification of bottle crowning equipment including a rotatable crowning turret, a plurality of axially reciprocating crowner plunger assemblies mounted in said turret, an axially disposed work imparting shaft rigidly mounted within each said plunger assembly and a downwardly spring biased crown cap engaging spindle movably supported within said shaft, comprising the method steps of attaching a crowner platform and throat assembly to the lower end of said shaft in concentric alignment with said spindle, applying crown caps to containers, detaching said crowner platform and throat assembly from said work imparting shaft, attaching a tear off closure applying head to the lower end of said shaft so as to extend below said crown cap engaging spindle and applying tear off closures to containers.

2. The method as in claim 1 and effecting said attaching of said crowner assembly by surrounding the lowermost end of said spindle with said crowner throat, supporting said throat with said crowner platform and securing said crowner platform directly to the lower end of said work imparting shaft.

3. The method as in claim 1, placing crown caps on containers by means of said crowner throat and platform assembly simultaneously with permanent application thereof and permanently applying tear off closures to containers by means of said tear off closure applying head with said closure and containers in a preassembled condition.

4. The method as in claim 1 and effecting the actuation of said tear off closure applying head through the movement of said downwardly spring biased spindle.

5. Apparatus for securing closure caps to containers, comprising an axially disposed work imparting shaft, means for effecting relative axial displacement between said shaft and a container, a crown cap engaging spindle concentrically housed within said shaft, said spindle having a lowermost downwardly facing end surface for pressure exerting engagement with a crown cap, means for urging said spindle in an axial direction within said shaft, a tear off closure applying head secured to one end of said shaft and an axially disposed tear off closure engaging spindle concentrically housed within said head and operatively connected to said urging means.

6. Apparatus as in claim 5, and including a rotatable crowning turret, a plurality of axially reciprocating

7

crowner plunger assemblies mounted in said turret, said work imparting shaft being rigidly mounted in each of said plunger assemblies.

7. Apparatus as in claim 5, wherein said crown cap engaging spindle and said tear off closure engaging spindle are disposed in end to end abutting relationship. 8

8. Apparatus as in claim 5, said urging means comprising a coiled compression spring for downward urging of said crown cap engaging spindle.

9. Apparatus as in claim 5, said tear off closure applying head including a closure crimping annulus made up of a plurality of radially contractable jaws circumferentially arranged about said tear off cap engaging spindle. 10

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U.S. Cl. X.R.

53—42, 201, 353