March 12, 1968 A. PODESTA ETAL 3,372,527

CAP CRIMPING TOOL

Filed Nov. 23, 1965 5 Sheets-Sheet 1

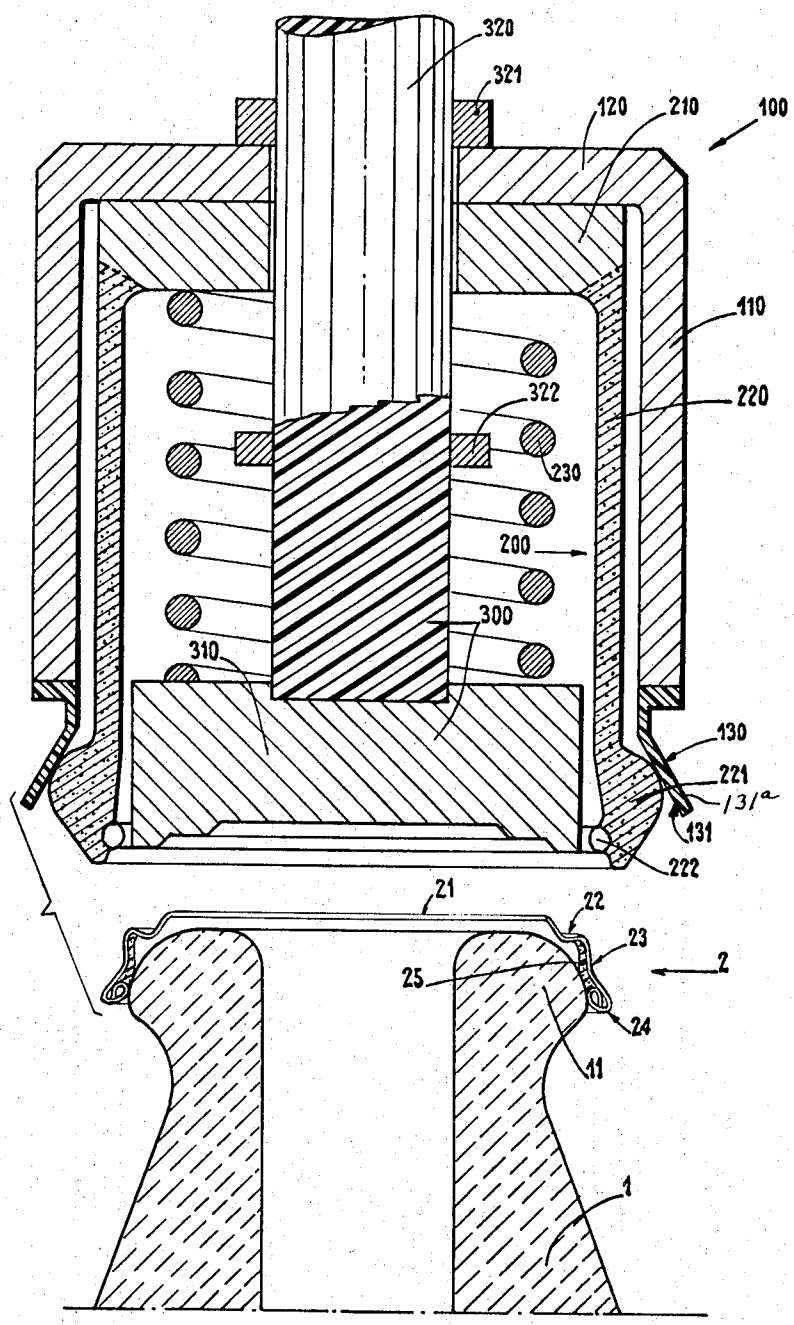


FIG. 1

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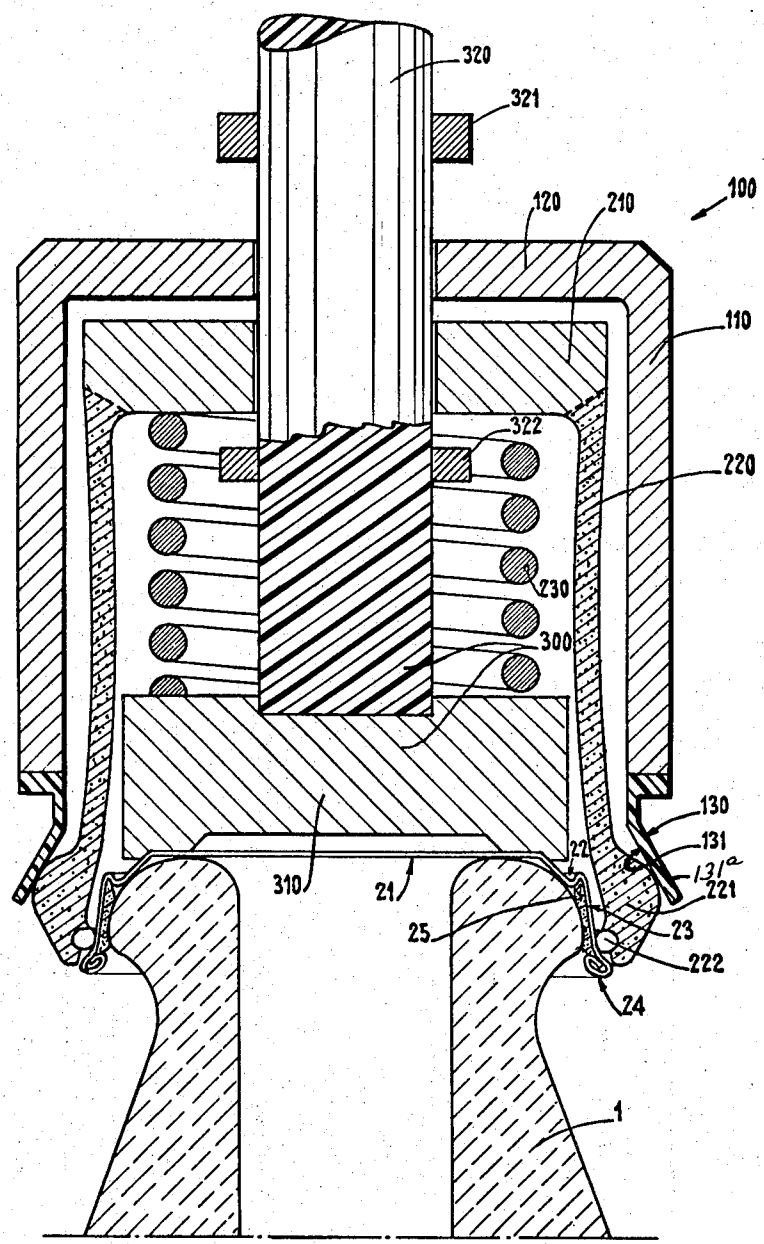
320
321
120
210
100
110
322
220
230
300
130
131
131a
221
22
310
21
25
23
222
24
1

FIG. 2

CAP CRIMPING TOOL

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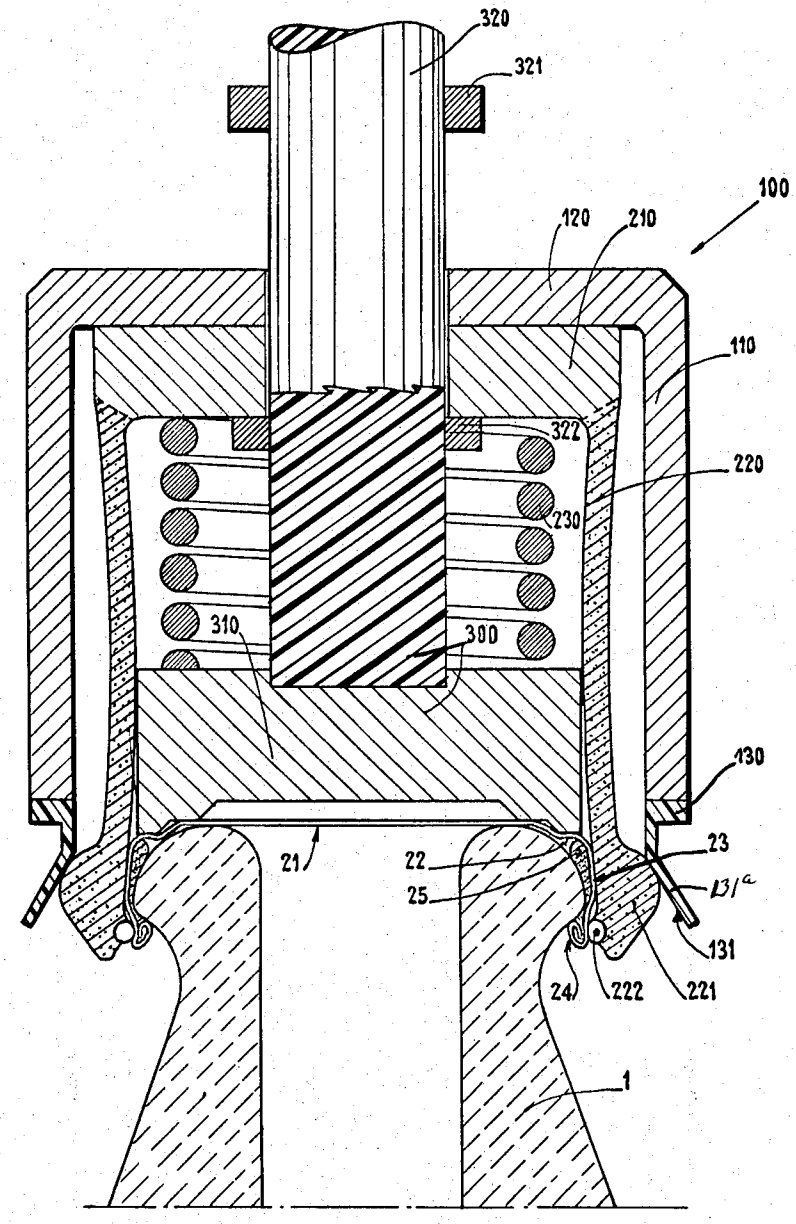
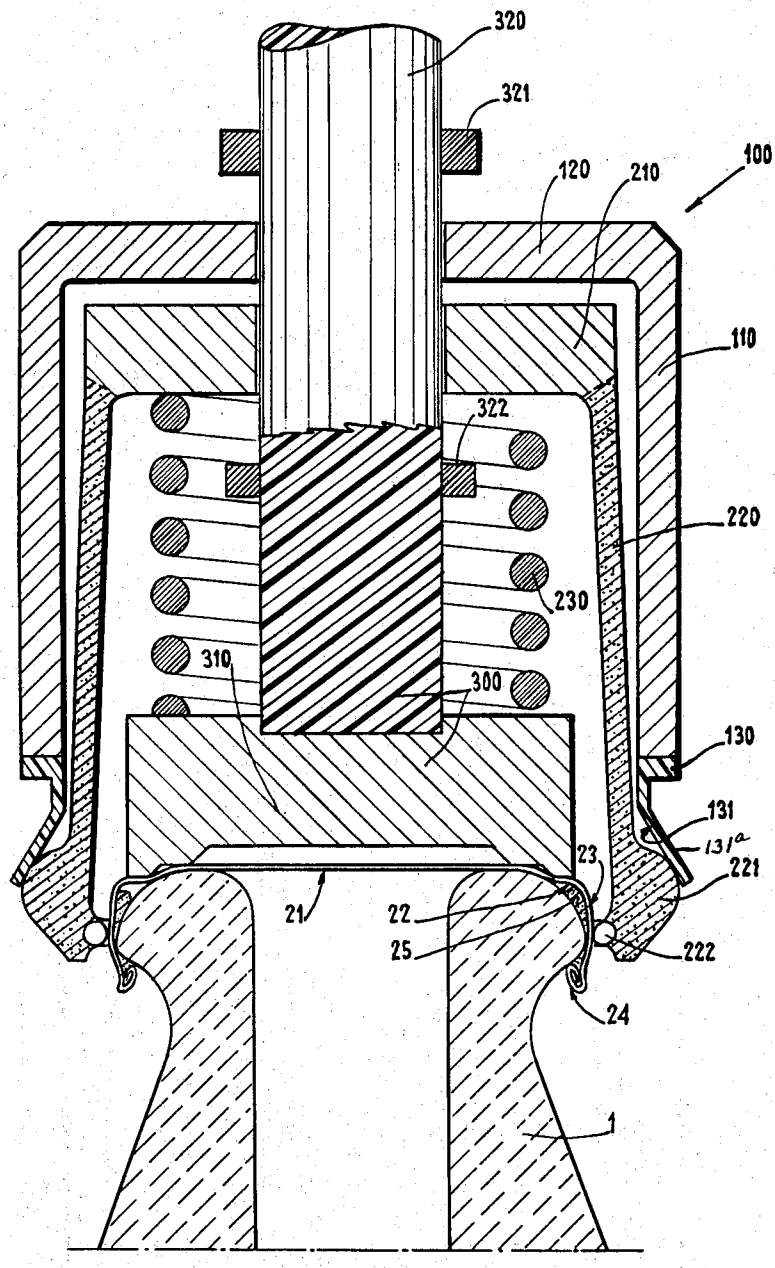



FIG. 3


320
321
120
210
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110
322
220
230
310
300
130
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131a
221
23
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22
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222
24
1

FIG. 4

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CAP CRIMPING TOOL

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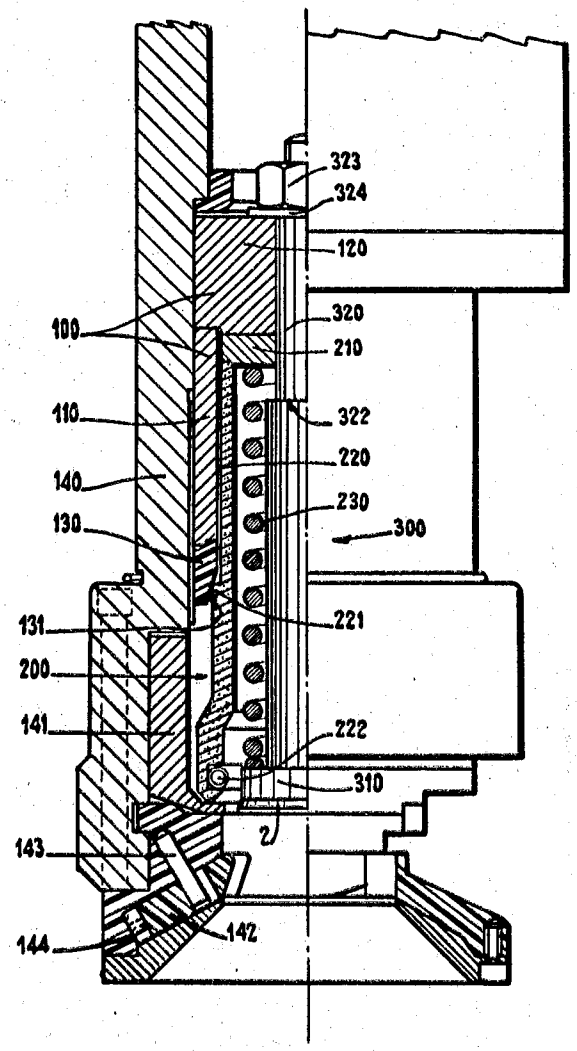


FIG. 5

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3,372,527

# CAP CRIMPING TOOL

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Claims priority, application France, Nov. 24, 1964, 996,102, Patent 1,423,880
8 Claims. (Cl. 53—358)

This invention relates to a crimping device for capping the mouth of a container and it relates more particularly to a capping device for mounting a deformable metal or plastic closure in sealing engagement with a beaded or grooved portion about the mouth of the container.

A device of the type described should be capable of application of a cap in sealing engagement with the mouth of the container sufficient to resist displacement in response to the high internal pressures which might exist within the container but without such force as to cause rupture of the container and which permits disengagement of the cap to be effected without damage to the cap or container.

It is an object of this invention to produce a tool of the type described which is effective for operation in a simple and efficient manner to crimp a cap about a ring or groove which may form a part of the mouth of a container to effect a sealing relationship therebetween and which operates to crimp a cap onto the mouth of a container to effect a sealing relationship which resists inadvertent disengagement responsive to pressures within the container, which does not create excessive pressures to cause rupture of the container, and which can be displaced for access to the interior of the container without damage either to the cap or container.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings in which—

FIG. 1 is a sectional elevational view of a fragmentary portion of the crimping tool embodying the features of this invention with the elements shown in position of use for mounting a cap onto the mouth of a container;

FIG. 2 is a sectional elevational view similar to that of FIG. 1 showing the elements in an intermediate stage of operation for crimping the cap onto the container;

FIG. 3 is a sectional elevational view similar to those of FIGS. 1 and 2 showing the elements in position upon completion of the crimping operation;

FIG. 4 is a sectional elevational view similar to those of FIGS. 1 to 3 showing the relative position of the elements during disengagement following completion of the crimping operation; and

FIG. 5 is a detailed sectional elevational view of a fragmentary portion of the crimping device suitable for commercial operation.

The invention will be described with reference to the placement of a cap 2 in sealing engagement onto a ring 11 of a hollow body 1 represented in the drawings as an annular bead 11 provided at the mouth of a glass bottle or container 1.

The cap 2, which is formed of a slightly resilient deformable material, such as of metal, plastics and the like, has a relatively flat central body portion 21 having a skirt or flange 23 depending continuously from the outer edges of said body portion with an intermediate connecting section 22 shaped somewhat in the form of the letter S. The lower end portion of the skirt or flange 23 is provided with a curvilinear portion 24 wound inwardly to provide a beaded rim. A packing 25 is provided as a lining on the inner portions of the skirt portion for effecting a sealing relation between the closure cap 2 and the lip of the container about which the cap is crimped. It will be understood that the described cap is given by way of illustration, but not by way of limitation, since caps of other constructions can be employed with the tool of this invention for crimping onto the mouth of a container.



The crimping tool comprises an outer sleeve portion 100 which is made up of an elongate cylindrical section 110 having a crosswise dimension between the walls which is greater than the outer wall to wall dimension of the beaded portion 11 of the container 1. The cylindrical section 110 terminates at its upper end in a flat crosswise extending plate 120 and at its lower end in a depending resilient stop member 130 having a guide surface 131 on the inner face of a resilient frustoconically shaped depending skirt portion 131a. The sleeve portion 100 forms a part of a tool carrier in which the other parts hereinafter described move relative thereto.

The crimping tool comprises a pusher assembly 300 which includes an elongate rod 320 axially slidable through an opening in the plate 120 of the sleeve portion 100 and a pusher plate 310 fixed on to the lower end of the rod located within the outer sleeve portion 100 and in which the pusher plate 310 is dimensioned to be less than the distance between the walls of the cyindrical section 110 for axial displacement therein. The rod 320 is provided with a pair of stops in the form of an abutment 321 fixed to a portion of the rod outside of the sleeve portion 100 and another abutment 322 fixed to a spaced portion of the rod within the cylindrical section 100 thereby to limit the amount of relative movement between the pusher assembly 300 and the sleeve portion 100.

The crimping tool is completed by an annular punch 200 which is located between the pusher assembly 300 and the sleeve portion 100 and in which the annular punch comprises an upper supporting ring 210 having a central opening through which the rod 320 is freely slidable to permit relative movements between the annular punch 200 and the cylindrical section 100 and the pusher assembly 300. Depending from the periphery of the supporting ring 210 are a plurality of resilient blades 220 arranged in side by side relationship which together define a contour approximating the contour of the bead or ring 11 of the hollow body or container 1. The blades are dimensioned to have a length corresponding to the length of the sleeve portion whereby the lower end portions of the blades are adapted slidably to engage the inner surfaces 131 of the frusto-conically shaped skirt portions 131a of the sleeve portion 100 to displace the resilient blades 220 inwardly responsive to movement of the lower end portions of the blades upwardly relative to the skirt. For this purpose, the blades 220 are provided at their lower ends with an outwardly projecting bulbous or curvilinear portion 221 which defines a collar in sliding engagement with the inner cam surfaces 131. The blades 220 are also provided at their lower end portions with a crosswise extending recess or groove in the inner face which functions as a seat for a helical spring member 222, such as a helical spring which is closed on itself at its outer terminals.

Means are provided constantly to urge the punch assembly 200 in the direction away from the pusher plate 310 and in the direction towards the plate 120 of the sleeve portion 100. For this purpose, there is provided a coil spring 230 located within the area defined by the blades 220 and about the rod 320 with one end of the spring bearing against the inner surface of the ring plate 210 while the other end bears against the outer surface of the pusher plate 310. The coil spring 230 operates to urge the elements in a direction to bring the stop 321 into

engagement with the upper plate **120** and with the ring **210** in raised position in engagement therewith to define the normal inoperative position, as illustrated by the arrangement of elements shown in FIG. 1 of the drawings.

In practice, the cap **2** can either be secured to the base of the tool for crimping onto the mouth of the container or it can be prepositioned on the mouth of the container, as shown in FIG. 1.

In operation, the tool is moved by the sleeve section **100** in the direction towards the container or the container is moved in the direction towards the tool or, in the alternative, the elements may be moved simultaneously in the direction towards each other for engagement therebetween. For purposes of illustration, description will hereinafter be made of the crimping operation with the tool remaining stationary while the container is raised in the direction towards the tool with the cap **2** positioned on the mouth of the container.

During the initial stages of the operation, the cap **2** on the mouth of the container engages the pusher assembly **300** to effect upward displacement thereof in opposition to the coil spring **230**. In response to such upward displacement of the pusher assembly, the stop **321** is raised from engagement with the plate **120** and the rolled edge **24** of the cap is caused to slide downwardly about the bead **11** of the container to cause deformation of the cap with the lateral portion **23** being rendered oblique. The spring **222** on the inner face of each of the blades **220** comes into alignment with the bead on the neck of the bottle to cam the blades **222** outwardly whereby the collar **221** slidably engages the inner surfaces **131** of the sleeve section **100**. This brings about a movement of the annular punch **200** downwardly relative to the sleeve section **100**, as illustrated in FIG. 2.

As the container continues to move upwardly relative to the tool, the spring **222** engages the outer surfaces of the rolled edges **24** of the cap. Since the resilient blades **220** are contained by the frusto-conical section **130** of the sleeve section **100**, they are incapable of outward displacement and thus operate to urge the rolled edges **24** of the cap inwardly beneath the bead **11** of the container to crimp the cap onto the container. At the same time, the lower stop **322** comes into engagement with the support plate **210** whereby the annular punch **200** is compelled to follow the rising movement of the container and pusher assembly. This causes the collar **221** to slide upwardly over the frusto-conical surface **131** of the sleeve section to cam the lower ends of the blades for displacement in the inward direction.

At the end of the upward displacement of the container, the stop **322**, the supporting ring **210** and the plate **120** of the sleeve section **100** are in contact one with the other with the collar **221** located in its uppermost position of adjustment whereby the pressure exerted by the spring **222** on the rolled edge **24** of the cap will be at a maximum thereby to insure most efficient and effective crimping of the cap onto the mouth of the container, as shown in FIG. 3. The additional material required to permit the described deformation for effecting the crimping action is made available from the S-shaped section **22** in the intermediate portion of the cap.

It will be noted that, in contrast to present devices effecting crimping operations simply by radial crimping of the cap onto the bottle neck, the apparatus described effects true crimping of the cap onto the neck of the bottle. The latter plays an active role in the operation since it brings about stretching of the cap and therefore more effective application of the skirt of the cap onto the ring or bead **11** notwithstanding any imperfections which may exist in the glass or bead. This action is made possible, on the one hand, by the flexibility provided by the spring **222** on the ends of the blades **220**, and, on the other hand, by the action of the spring **230** which provides for better orientation for application of the cap onto the bead **11** by the pusher member **310**, even before the annular punch **200** becomes effective to commence its action.

To disengage the tool from the hollow body and from the cap crimped in sealing relationship onto the mouth of the container, the hollow body of the container **1** is displaced in a downwardly direction. Downward movement is followed by the pusher member **200** in which the annular punch remains in engagement with the folded portion **24** of the cap but away from the stop **322**. Since the outer sleeve section **100** remains stationary, the collar **221** slides downwardly over the frusto-conical surface **131** so that the lower ends of the blades **220** are able to move outwardly from their original position and to follow the downward movement of the pusher member, possibly with some delay. The ring **210** moves out of contact with the lower stop **320** and the elements take the position illustrated in FIG. 4.

From this point on, it only remains for the container to become completely disengaged. The spring **222** is maintained in engagement against the lateral portion **23** of the cap in response to the combined action of the frusto-conical surface **131** and the spring **230**. After disengagement, the tool automatically returns to the starting position illustrated in FIG. 1 and is ready for another cycle of operation.

A tool of the type described is designed to provide for the continuous capping of identical bottle necks. Slight differences which might exist in the shape of the neck will in no way impede the effective operation of the tool because of the resiliency of the blades **220** and of the springs **222**.

The collar formed by the assembly of the projections **221** and the frusto-conical section **130** are shown as being located in the lower portion of the punch. Instead, they may be raised in such manner as to occupy the position intermediate below the lower portion and the median portion of the blades **220**. However, there is obviously no advantage in positioning the elements in the vicinity of the upper portion of the blades. This arrangement is utilized in the actual model of the tool shown in FIG. 5.

In this modification, the pusher rod is illustrated as being formed of two portions of different diameter whereby the shoulder formed by the change in diameter is effective to function as the lower stop **322**. The upper stop is provided by the nut member **323** and its washer **324**. The collar **221** of the annular punch is raised and so is the frusto-conical section **130** against which the collar slides.

The sleeve section **100** is fixed to an outer envelope **140** which carries the stop **141** which limits movement of the base of the punch while preventing excessive deformation of the blades. The envelope **140** also carries a device intended for receiving and centering the cap. This device comprises three fingers **142** which are adapted to slide in a seating in which their sliding movement is limited by a pin **143**. A metal spring **144** urges the fingers of the tool in the direction towards the tool pin.

Other means may be utilized for retaining the cap on the pusher member or in the vicinity of the latter, such for example as a small magnet in the event that the caps are made of a magnetic material, or a drop of weakly adhering adhesive in the event that the caps are made of a non-magnetic metal, a non-magnetic alloy, or of a plastic material.

With the aid of the tool thus described using caps formed of 0.21 mm. aluminum sheet, it has been possible to obtain a closure which did not yield until a pressure of 15 bars had been attained. The disengagement is extremely gentle and has no harmful effects on the crimped cap. Finally, the pressure existing on the neck of the bottle along its axis is sufficiently low so that no breakage occurs even when capping thin walled bottles. The lower pressure exerted on the bottle neck makes it possible to provide the latter with only a single ring or bead **11** thereby to enable elimination of the conventional counter-ring. Finally, the apparatus will function in the desired manner even when the calibration at the mouth of the bottle is not maintained within narrow limits, as is often the case in commercial practice.

It will be understood that changes may be made in the details of the construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

We claim:

1. A tool for crimping a cap onto the beaded or grooved mouth of a container in which the cap is a sheet member having a central body portion, an intermediate expandable portion extending outwardly from the body portion, a skirt portion depending from the outer edge of the intermediate portion and a bead on the end of the skirt, said crimping tool comprising the combination of a stationary outer sleeve section, a pusher assembly and an annular punch mounted intermediate the sleeve section and the pusher assembly, said sleeve section comprising a cylindrical section having a crosswise dimension greater than the crosswise dimension of the cap and having a frusto-conical section adapted to be in crosswise alignment with the cap but spaced outwardly therefrom in position of use, said pusher assembly comprising a pusher plate located within the cylindrical section of the sleeve section and contoured at its bottom side to engage the cap and a rod connected to the top side of the pusher plate and mounted for axial displacement relative the sleeve section, said annular punch comprising a supporting ring and a plurality of resilient blades depending from the periphery of said ring in side by side relationship between said cylindrical section and said pusher plate with each of the blades having an outwardly extending bulbous portion forming a collar in crosswise alignment with the frusto-conical section of the cylindrical section when in position of use and a seat on the inner surface and a resilient coil spring mounted in said seat in crosswise alignment with said collar and in which the annular punch is mounted on the rod for axial sliding movement thereon relative to the sleeve section and the pusher assembly, means on the rod for engagement with said annular punch when in raised position and for engagement with the sleeve section when in lowered position thereby to define the limits of movement of said pusher assembly and punch relative to the sleeve section, and means constantly urging said punch in the direction away from the pusher plate towards raised position.



2. A crimping tool as claimed in claim 1 in which the bulbous portion is on the end of the blades of the annular punch.

3. A crimping tool as claimed in claim 1 in which the bulbous portion is adapted to be disposed between the skirt of the cap and the frusto-conical section on the cylindrical sleeve section when in position of use.

4. A crimping tool as claimed in claim 1 in which the means for limiting movement of the pusher assembly and punch relative to the sleeve section comprises abutments fixed to the rod in axially spaced apart relation.

5. A crimping tool as claimed in claim 1 in which the seats in the blades comprise crosswise extending recesses in the inner faces of the blades in which the coil spring is received.

6. A crimping tool as claimed in claim 1 in which the coil spring is formed with flattened ends.

7. A crimping tool as claimed in claim 1 in which the means constantly urging the pusher assembly axially in the direction away from the punch assembly comprises a coil spring located within the punch assembly and about the rod with one end of the spring bearing against the punch assembly while the other end bears against the pusher plate.

8. A crimping tool as claimed in claim 1 in which the frusto-conical section which forms a part of the cylindrical section comprises a resilient member in which the inner surface provides a cam surface in position to be engaged by the collar on the blades of the punch to effect lateral displacements thereof responsive to relative axial movements.

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