Jan. 3, 1967 W. F. LODDING 3,295,293

METHOD OF APPLYING SNAP-CAPS TO RESILIENT CONTAINERS

Filed Sept. 13, 1963

FIG. 1

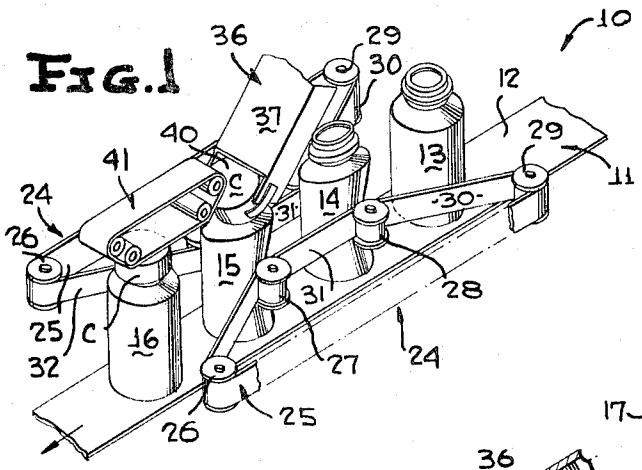


FIG. 5

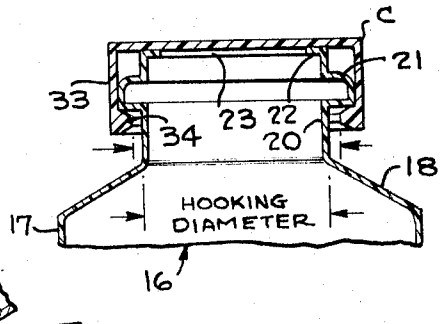


FIG. 2

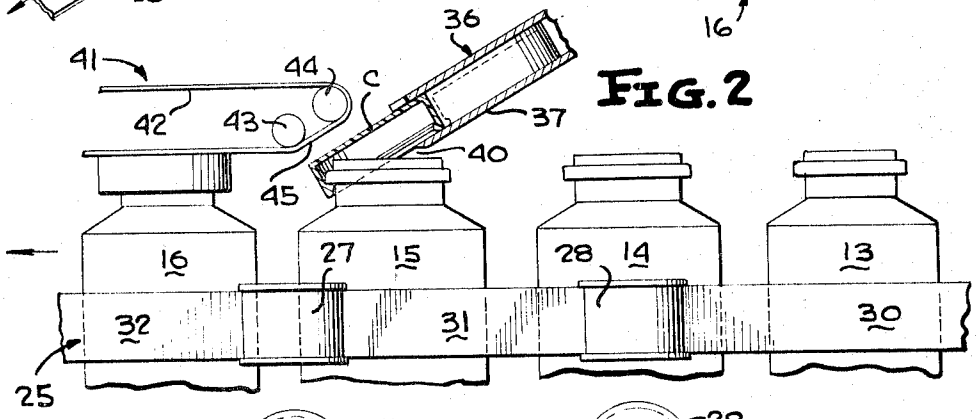


FIG. 3

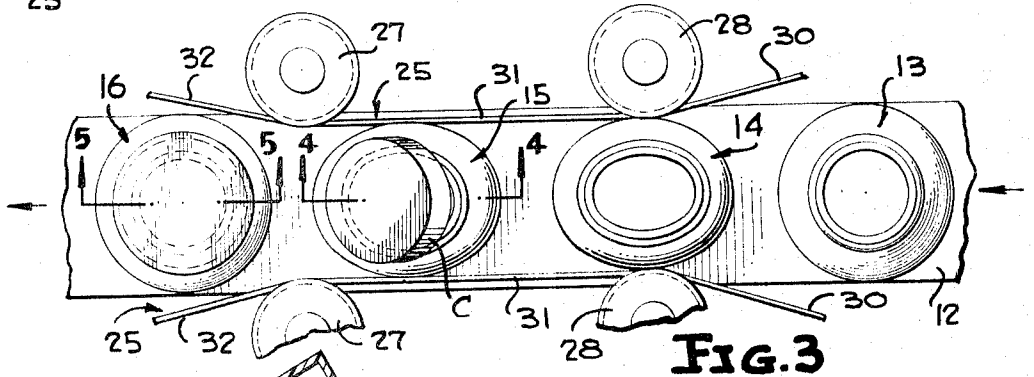
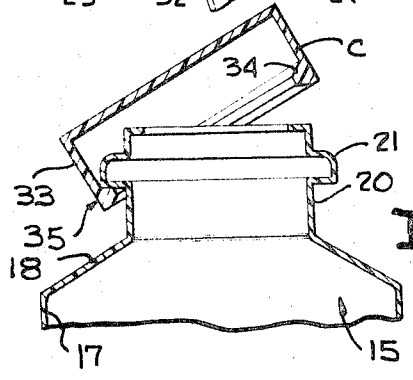


FIG. 4



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METHOD OF APPLYING SNAP-CAPS TO RESILIENT CONTAINERS

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11 Claims. (Cl. 53—40)

This invention relates to a novel method of and apparatus for applying and securing a closure to a neck of a resilient container, and in particular, to a novel method of applying and securing a snap-closure to a snap ring of a container neck by temporarily deforming the neck to facilitate greater radial penetration of a hooking ring of the closure beneath the snap ring of the container neck.

An object of this invention is to provide a novel method of securing a closure to a neck of a resilient container by applying forces against portions of the resilient container to temporarily deform a neck of the container, positioning a closure upon the neck while the neck is temporarily deformed, progressively relieving the forces applied against the resilient container and simultaneously therewith, securing the closure to the neck of the resilient container.

Still another object of this invention is to provide a novel method of securing a closure to a neck of a resilient container by transporting the resilient container along a predetermined linear path, applying forces against portions of the resilient container in a direction substantially normal to the predetermined path to temporarily distort an upstanding neck of the container to a generally elliptical configuration, applying a closure to the neck while the neck is temporarily distorted or deformed, progressively relieving the applied forces to permit the neck to rebound toward the original configuration thereof, and simultaneously with this last step, securing the closure to the neck of the container.

A further object of this invention is to provide a novel method of applying and securing a closure to a neck of a resilient container comprising the steps of transporting a resilient container having a body terminating in an upstanding neck along a predetermined path, applying forces against the body of the resilient container in a direction substantially normal to the predetermined path to temporarily deform the body and the upstanding neck to a generally elliptical configuration, positioning a closure upon the deformed neck at an angle inclined to the axis of the resilient container, permitting the body and neck of the resilient container to return toward the original contours thereof, and substantially simultaneously therewith, canting the closure from the inclined position to a position substantially normal to the axis of the container to secure the closure upon the neck of the container.

A further object of this invention is to provide a novel method of applying a closure having a peripheral, cylindrical skirt terminating in a radially inwardly directed locking portion to a resilient, cylindrical, tubular neck of a container terminating in a radially outwardly directed locking portion comprising the steps of temporarily deforming the neck to a substantially elliptical configuration, positioning the locking portion of the closure beneath the locking portion of the neck at an angle inclined to the axis of the container, and permitting the neck to rebound toward the original non-deformed configuration thereof substantially simultaneously with the application of a force adapted to cant the closure to a position substantially normal to the axis of the container.

Still another object of this invention is to provide novel apparatus particularly adapted for applying a closure to a neck of a resilient container including transport means for conveying a plurality of spaced, resilient containers along a predetermined path, feed means for supplying successive ones of a plurality of closures above the path for the application thereof to a neck of an associated container, and means being provided adjacent the predetermined path for deforming the neck of each container to a generally elliptical configuration as each closure is applied to the neck of an associated container.

A further object of this invention is to provide a novel apparatus of the type immediately above-described, in which the deforming means are a pair of belts arranged on opposite sides of the predetermined path, and each of the belts includes means for deforming a body portion of each of the containers to a generally elliptical configuration whereby the necks thereof are also deformed to a generally elliptical configuration.

Still another object of this invention is to provide a novel apparatus of the type immediately above-described, and in addition, to provide means for securing each of the applied closures to a respective neck of each of the containers, and so arranging the pair of belts with respect to the securing means that each of the containers rebound toward the original contour thereof during the securing of the closures to each of the containers.

With the above, and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a fragmentary top perspective view of a novel apparatus constructed in accordance with this invention, and illustrates a conveyor belt transporting a plurality of resilient containers along a predetermined path, a pair of side belts, an overhead chute, and an overhead belt.

FIGURE 2 is an enlarged fragmentary side elevational view of the apparatus of FIGURE 1, with certain portions shown in section for clarity, and illustrates a closure projecting from the feed chute during the application thereof to a neck of one of the plurality of resilient containers.

FIGURE 3 is a fragmentary top plan view of the apparatus of FIGURE 2, with certain elements of the latter figure removed for clarity, and illustrates the side belts cooperating to deform a centermost two of the plurality of resilient containers and the necks thereof to a generally elliptical configuration and a closure applied to the deformed neck of one of the centermost containers.

FIGURE 4 is an enlarged fragmentary sectional view taken along line 4—4 of FIGURE 3, and more clearly illustrates a hooking ring of the closure positioned beneath a snap ring of the neck of the container during the deformation of the neck to a generally elliptical configuration.

FIGURE 5 is an enlarged fragmentary sectional view taken along line 5—5 of FIGURE 3, and illustrates a closure secured to a neck of a resilient container by the novel apparatus of this invention.

A novel apparatus constructed in accordance with this invention for applying and securing a closure to a neck of a resilient container is best illustrated in FIGURE 1 of the drawings, and is generally designated by the reference numeral **10**.

The apparatus 10 includes conveyor means 11, which may, for example, be an upper conveyor belt run 12 of a conveyor belt driven in a conventional manner to move the upper conveyor belt run 12 from right-to-left as viewed in FIGURE 1 of the drawing. The upper conveyor belt run 12 establishes a generally linear path of travel for each of a plurality of substantially identical, upright containers 13 through 16.

Since each of the containers 13 through 16 is substantially identical, a description of the container 16 will be sufficient for a complete understanding of this invention. However, it is to be understood that this description of the container 16 is equally applicable to the containers 13–15. The container 16 is best illustrated in FIGURE 5 of the drawings and comprises a substantially tubular, cylindrical body 17 formed from a resilient, plastic material, such as polyethylene. While the material from which the contianer 16 is constructed is preferably plastic material, the container 16 can be constructed from metallic material provided such material is highly resilient, i.e., possesses the ability to rebound, spring back or return to an original configuration after being deformed and the forces of deformation have been removed.

The body 17 of the container 16 includes an upwardly tapering shoulder 18 terminating in a resilient neck 20. The neck 20 has an integral, radially outwardly directed peripheral locking portion or snap ring 21. The neck 20 terminates in a lip 22 defining an opening or spout 23. The diametrical dimension between the exterior surfaces of the neck 20, excluding the snap ring 21, is generally referred to as the "hooking diameter" of the container 16.

With particular attention again directed to FIGURE 1 of the drawing, deforming means 24 are arranged along the predetermined path established by the upper conveyor belt run 12 of the apparatus 10. The deforming means 24 comprises a pair of identical, opposed side belts 25, 25. Each of the side belts 25 of the deforming means 24 is entrained about a plurality of identical pulleys 26 through 29. Each of the pulleys 26 through 29 includes a shaft (unnumbered) suitably journaled in a housing which is in turn supported in a conventional manner adjacent the upper conveyor belt run 12. Either or both of the pulleys 26 and 29 are driven in a conventional manner to drive each of the side belts 25 in synchronizm with the speed of the upper conveyor belt run 12 while the pulleys 27 and 28 are idler pulleys freely rotatably mounted on their associated shafts.

The side belts 25 are spaced above the upper conveyor belt run 22 (see FIGURE 1) and lie on opposite sides of a longitudinal center line of the conveyor belt run 12, as is best illustrated in FIGURE 3 of the drawings. Identical upstream portions 30, 30 of each of the side belts 25, 25 converge toward each other between the pulleys 29 and the pulleys 28 (see FIGURE 3) to establish a converging entrance for guiding the plurality of containers 13–16 toward central, parallel portions 31, 31 of the side belts 25 between the pulleys 27 and 28. Belt portions 32, 32 of the side belts 25, 25 diverge beyond the pulleys 27, 27 toward the pulleys 26, 26.

The central, parallel portions 31, 31 of the side belts 25, 25 are spaced from each other a distance substantially less than the diameter of each of the bodies (generally 17) of the resilient containers 13–16. Thus, as containers are conveyed by the upper conveyor belt run 12, each container is first guided by the converging portions 30, 30 of the belts 25 toward the central, parallel portions 31, 31 of the side belts 25, 25. The container 13 of FIGURES 1 through 3 of the drawings is illustrated generally in this position. As a container is transported by the upper conveyor belt run 12 between the central parallel portions 31, 31 of the side belts 25, 25, these central, parallel portions 31, 31 apply forces against the container bodies along a line substantially normal to the predetermined path of travel established by the conveyor belt run 12. These forces temporarily deform the bodies and the necks of the containers to a generally elliptical or oblong configuration between the pulleys 28 and 27. The containers 14 and 15 are both illustrated in this temporarily deformed conditon. After a container is conveyed beyond the pulleys 27, 27 it rebounds to the original configuration thereof, as is illustrated by the container 16 of FIGURES 1 and 3.

The purpose for temporarily deforming the necks of the resilient containers by conveying the same between the central parallel portions 31, 31 of the deforming mechanism 24 is to facilitate the application of a closure or snap-cap C upon the neck of each of the containers 13–16. A conventional closure or snap-cap C includes a depending peripheral skirt 33 terminating in an inwardly radially directed locking portion or hooking ring 34 (see FIGURES 4 and 5). During the application of such a snap-cap C, to a container, it is conventional to incline the snap-cap approximately ten to thirty degrees from the horizontal. This angular relationship between a conventional snap-cap and container permits the "hooking ring" of the snap-cap to engage beneath the snap-ring in a manner well known in the prior art. However, in attempting to so apply a snap-cap upon a container, the hooking ring contacts the snap-ring of the container at two points of tangency between the inclined hooking ring of the closure and the generally horizontally disposed snap-ring of the container. These two points of contact prevent satisfactory penetration of the hooking ring beneath the snap ring of the container. However, by temporarily deforming each of the containers 13 through 16 by conveying the same between the central portions 31, 31 of the side belts 25, 25 of the apparatus 10, the neck of each of these containers, as well as the snap ring 21 thereof is temporarily deformed to a generally elliptical or oblong configuration. This deformation of the neck 20 of each of the containers 13–16 in effect, reduces the diameter of each of the snap rings 21 to enable the hooking ring 34 to penetrate or project completely beneath the snap ring 21 of each of the containers 13 through 16, in a manner clearly illustrated in FIGURE 4 of the drawings.

The neck 20 of the resilient container 15 of FIGURE 4 is elongated in a direction parallel to the path of travel of the upper conveyor belt run 12 (see FIGURE 3) and reduced in a direction normal to the path of travel because of the deforming forces applied against the body 17 of the container 15 by the parallel, central portions 31, 31 of the deforming mechanism 24 in a manner heretofore described. The snap ring 21 of the container 15 is, of course, similarly deformed. This deformation of the snap ring 21 shifts the two tangential points of contact between the snap ring 21 of the container 15 and the hooking ring 34 of the inclined closure C to the right (as viewed in FIGURE 4) as compared to the positions of these tangential points of contact in conventionally applied closures when the snap ring is circular. This shifting of the tangential points of contact between the snap ring 21 of the container 15 and the hooking ring 34 of the closure C permits full and complete penetration of the hooking ring 34 beneath the snap ring 21 at a leading edge area generally designated by the reference numeral 35 in FIGURE 4.

The closures C are presented for application to the containers 13–16 by means of a feed mechanism 36. The feed mechanism 36 includes an overhead, tubular feed chute 37 supported in a conventional manner at an inclination of approximately 10–30 degrees to the upper conveyor belt run 12 of the apparatus 10. The feed chute 37 has a pair of spring fingers 38 (only one being illustrated in FIGURE 1). The spring fingers 38 straddle an open area 40 through which the necks of the containers 13–16 pass as they are conveyed by the upper conveyor belt run 12 from right-to-left as viewed in FIGURE 1 of the drawing. As each of the containers

is conveyed through the area **40**, a leading portion of the deformed snap ring **21** of the containers is guided into an associated closure C above the hook ring **34** thereof and draws the closure completely out of the chute **37** against the gripping force of the opposed gripping fingers **38**. This application of a closure to the temporarily deformed neck of a container is clearly illustrated by the container **15** and closure C of FIGURE 2 of the drawings.

Immediately after each closure or snap-cap C is applied to an associated temporarily deformed neck of a container, such cap is secured to the container by a securing mechanism **41** comprising a continuous overhead belt **42** entrained about a plurality of pulleys. Two pulleys **43** and **44** are supported in a conventional manner adjacent the chute **37**. An inclined portion **45** of the belt **42** between the pulleys **43** and **44** is disposed at an angle substantially identical to that of the chute **37** with respect to the horizontal. It should also be particularly noted that a vertical plane through the axes of the pulleys **27, 27** of the deforming mechanism **24** passes through the axis of the pulley **43**. This positioning of the pulleys **27, 27** and **43** allows the inclined portion **45** of the belt **42** to cant a closure, such as the closure C on the neck of the resilient container **15**, in a clockwise direction simultaneously with the progressive relieving of the forces applied by the central, parallel portions **31, 31** of the side belts **25, 25**. That is, as soon as the longitudinal axis of a temporarily deformed container passes the plane through the pulleys **27, 27** and **43**, the forces applied against the body of the container are progressively relieved by the diverging arrangement of the portions **32, 32** of the side belts **25, 25** and simultaneously therewith, the closure is canted or snapped upon the neck of the container. A closure C of FIGURE 5 is illustrated in its fully secured position upon the neck **20** of the resilient container **16**, after passing beyond the pulley **43** of the securing mechanism **41**.

While an example disclosure of apparatus for applying and securing a closure to a neck of a resilient container is disclosed herein, it is to be understood that changes in the disclosed apparatus, as well as the method may be made without departing from the spirit and scope of this invention as defined in the appended claims.

I claim:

1. A method of securing a closure to a neck of a resilient container comprising the steps of applying forces against portions of a resilient container to temporarily deform a neck of the container, positioning a closure upon the neck while the neck is temporarily deformed, relieving the applied forces to reshape the neck and therewith securing the closure to the neck of the resilient container.

2. A method of securing a closure to a neck of a resilient container comprising the steps of transporting a resilient container having an upstanding neck along a predetermined path, applying forces against portions of the resilient container in a direction substantially normal to the predetermined path to temporarily deform the upstanding neck, positioning a closure upon the neck while the neck is temporarily deformed, relieving the applied forces to return the neck toward substantially the original configuration thereof, and therewith securing the closure to the neck of the resilient container.

3. A method of securing a closure to a resilient neck of a container comprising the steps of temporarily deforming the resilient neck of the container, placing a closure upon the deformed neck at an angle inclined to the axis of the container, reshaping the resilient neck and canting the closure to secure the closure upon the neck of the container.

4. A method of securing a closure to a neck of a resilient container comprising the steps of transporting a resilient container having an upstanding neck along a predetermined path, applying forces against portions of

the resilient container in a direction substantially normal to the predetermined path to temporarily deform the upstanding neck, positioning a closure upon the neck at an angle inclined to the axis of the container, relieving the applied forces to return the neck toward substantially the original configuration thereof, and canting the closure from the inclined position to secure the closure upon the neck of the container.

5. A method of securing a closure to a neck of a resilient container comprising the steps of transporting a resilient container having a body terminating in an upstanding neck along a predetermined path, applying forces against the body of the container in a direction substantially normal to the predetermined path to temporarily deform the body and the upstanding neck, positioning a closure upon the deformed neck at an angle inclined to the axis of the container, permitting the body and neck to return toward substantially the original configurations thereof, and canting the closure from the inclined position to secure the closure upon the neck of the container.

6. A method of securing a closure to a neck of a resilient container comprising the steps of providing a resilient container of the type having an upstanding tubular neck terminating in a radially outwardly directed locking portion and a closure of the type having a peripheral skirt terminating in a radially inwardly directed locking portion, transporting the container along a predetermined path, applying forces against portions of the container in a direction substantially normal to the predetermined path to elongate the body and the upstanding neck in a direction parallel to the predetermined path, positioning the locking portion of the closure beneath the locking portion of the neck at an angle inclined to the axis of the container, relieving the applied forces to return the body and neck toward their original configurations, and canting the closure from the inclined position to secure the closure upon the neck of the container.

7. A method of securing a closure having a peripheral cylindrical skirt terminating in a radially inwardly directed locking portion to a resilient, cylindrical tubular neck of a container terminating in a radially outwardly directed locking portion comprising the steps of temporarily deforming the neck to an elliptical configuration, positioning the locking portion of the closure beneath the locking portion of the neck at an angle inclined to the axis of the container, returning the neck toward the original cylindrical configuration thereof and simultaneously canting the closure from the inclined positions to secure the closure upon the neck of the container.

8. A method of applying a closure having a peripheral cylindrical skirt terminating in a radially, inwardly directed locking portion to a resilient, cylindrical tubular neck of a container terminating in a radially, outwardly directed locking portion comprising the steps of temporarily deforming the neck to an elliptical configuration, positioning the locking portion of the closure beneath the locking portion of the neck at an angle inclined to the axis of the container, returning the neck toward its original configuration, and canting the closure from the inclined position to secure the closure upon the neck of the container.

9. Apparatus particularly adapted for applying a closure to a neck of a resilient container comprising transport means for conveying a plurality of spaced, resilient containers along a predetermined path, feed means for supplying successive ones of a plurality of closures above said path for the application of each closure to a neck of an associated container, and means adjacent said path for deforming a neck of each container as each closure is applied to a neck of each container.

10. The apparatus as defined in claim **9** wherein said deforming means are a pair of belts each arranged on

opposite sides of said path, and each of said belts include means for deforming a body portion of a resilient container whereby the neck thereof is deformed to a generally elliptical configuration.

11. The apparatus as defined in claim **9** wherein said deforming means are constructed and arranged to permit progressive reshaping of the neck of the container and means are provided for securing the closure to the container simultaneously with the progressive reshaping of the neck of the container.

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