Feb. 20, 1968 S. M. LIBIT ETAL 3,369,720

CLOSURE CAP HAVING RESILIENT RETAINING MEANS

Filed May 16, 1966 2 Sheets-Sheet 1

FIG. 1

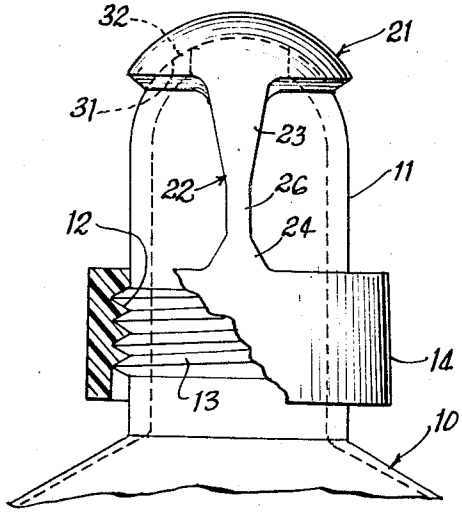


FIG. 2

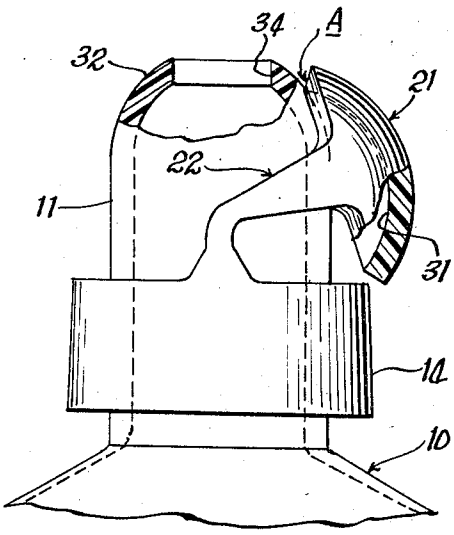


FIG. 3

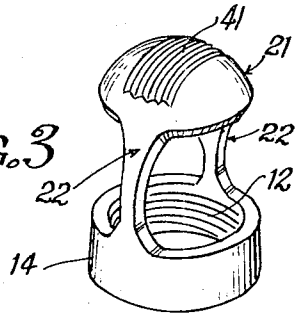


FIG. 4

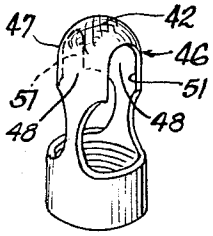


FIG. 5

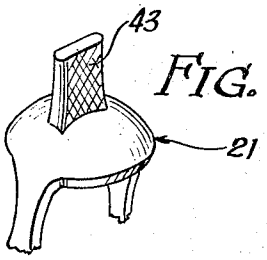


FIG. 6

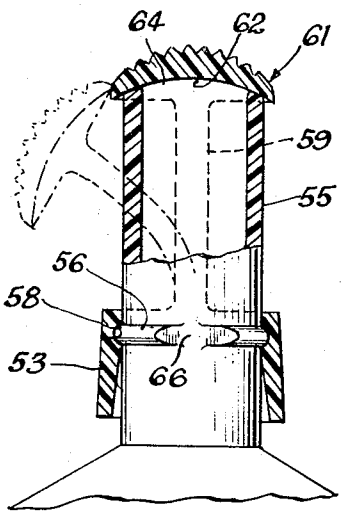


FIG. 7

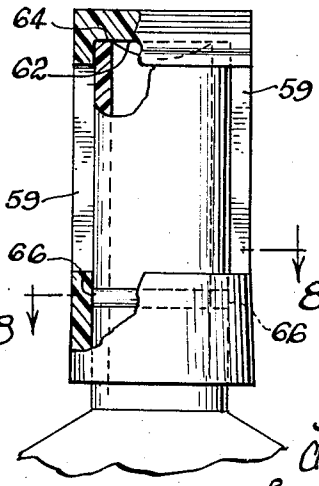
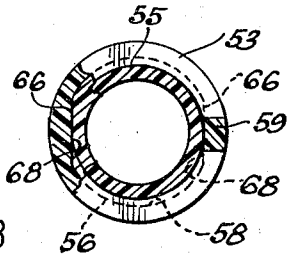


FIG. 8



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Feb. 20, 1968 S. M. LIBIT ETAL 3,369,720

CLOSURE CAP HAVING RESILIENT RETAINING MEANS

Filed May 16, 1966 2 Sheets-Sheet 2

FIG. 9

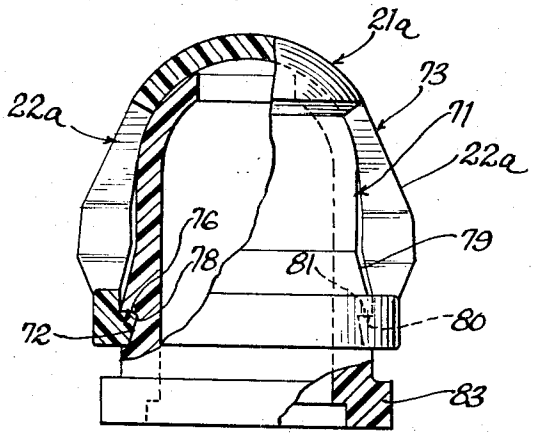


FIG. 10

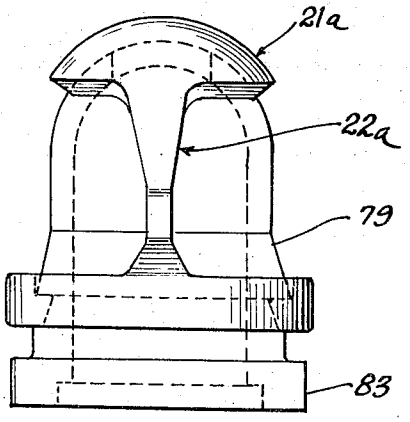


FIG. 11

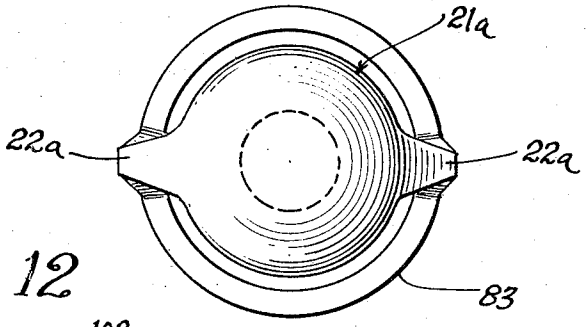
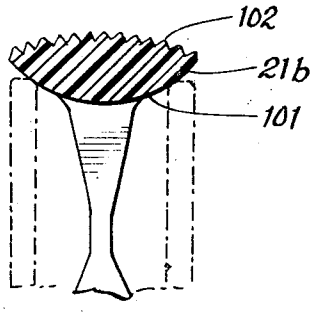


FIG. 12



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CLOSURE CAP HAVING RESILIENT RETAINING MEANS

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7 Claims. (Cl. 222—517)

ABSTRACT OF THE DISCLOSURE

Dispensing closure including a base portion for securement to a nozzle providing exit of the fluent contents of a receptacle and a cap portion swingable between closed and open positions. The cap portion is permanently secured to the base portion through a pair of flexible straps desirably weakened intermediate their ends whereby movement of the cap portion may be accomplished digitally with minimum effort and lowered incidence of fatigue failure.

This invention relates to a dispensing closure adapted to be secured to a receptacle as a permanent feature thereof and capable of movement between "on" and "off" positions with respect to the opening through which the contents of the receptacle are dispensed.

Among the objects of the invention is the provision of a closure for the stated purpose which may be readily molded in one piece, which may be reliably secured to the neck or other means defining the exit of the receptacle by automatic machinery, which is capable of repeated operation, which seals reliably, which may be manipulated with one hand and which need not be held digitally in open position during dispensing.

Other advantages and objects of the invention will become apparent from the ensuing description which, taken with the accompanying drawings, discloses certain forms in which the principles of the invention may be embodied in practice.

In these drawings:

FIG. 1 is a side elevation, partly in cross section, of one form of closure in accordance with the invention, in closed position;

FIG. 2 is a view similar to FIG. 1, but in open position;

FIG. 3 is a perspective view of an alternative form of device similar to that of FIG. 1;

FIG. 4 is a perspective view of another embodiment;

FIG. 5 is a fragmentary perspective view to illustrate a further modification;

FIG. 6 is a view similar to FIG. 1 showing another alternative;

FIG. 7 is a view of the device of FIG. 6 taken in plane 90° displaced therefrom;

FIG. 8 is a cross section taken on the line 8—8 of FIG. 7;

FIG. 9 is a side view of yet another modification;

FIG. 10 is a view of the device of FIG. 9 taken in a plane 90° displaced therefrom;

FIG. 11 is a top plan view of the device shown in FIG. 9; and

FIG. 12 is a partial view of still another modification.

Broadly regarded, the invention comprehends a dispensing closure fabricated from a resilient, plastic composition such as polyethylene, comprising a base part to be secured to the means defining the exit of a receptacle containing a fluent substance. In the case of a conventional neck the mode of securement may be a screw-threaded connection, a bead and groove engagement or any other expedient well-known in this art. In the case of an opening in a wall of the container which may be a clean,

punched hole or a punched hole having a circumferential flange, the base part will have a male portion to intromit such hole and be so constructed as to remain a permanent, tight fit therein. If desired the device may be molded as an integral part of a container, e.g. a squeeze bottle of polyethylene, or it may be attached to the receptacle by cement. Upstanding from the base portion or formed as part of means assembled therewith, is a pair of oppositely-disposed flexible straps, the upper ends of which are continued into a closure portion adapted to obturate an opening in a nozzle portion forming a continuation of the means defining the exit from the receptacle. This cap portion is preferrably of inverted cup-like form and is adapted to be moved digitally between "on" and "off" positions with respect to said opening, or the cap portion may be of shallow plug-like form to intromit partially and to obturate, the dispensing receptacle opening. The entire device is molded of some suitable resilient plastic composition in order, one, whereby to conveniently connect the base part to the means defining the exit of receptacle by moderate stretching and consequent constriction, or by compression and consequent expansion and, two, whereby to enable the closure portion to be shifted between its two principal positions by flexing of the straps. The dimensions and proportions of the foregoing several elements will be so chosen that the straps are under moderate tension when the device is installed on the receptacle. Thus, the closure portion is biased into reliable fluid-tight relation with the margin of the exit opening. In order to realize comparatively effortless digital actuation and to lower the incidence of fatigue failure the straps are desirably weakened by reduction in transverse cross section at some predetermined zone intermediate the ends thereof. Additionally the closure portion, when of inverted cup-shape, is desirably interiorly formed as a part of a substantially spherical surface and the curvature thereof is selected to be essentially congruent with a corresponding curvature of the marginal area of the exit opening. In this case the straps will be so constructed that the common axis on which bending occurs passes essentially through the polar axis of the substantially spherical surface, i.e., swinging movement of the closure portion is about said axis as an imaginary pivot. Alternatively the closure portion may be configured interiorly as part of a cylindrical surface and the marginal area of the exit opening then correspondingly contoured. The device is so shaped as to facilitate molding without the substantial expense of retractible cores as well as to enable the rapid assembly thereof with the receptacle by automatic machinery.

Reverting then to the drawings there is shown, by way of example and somewhat enlarged (FIGS. 1 and 2), a collapsible tube **10**, e.g., as commonly used for toothpaste, including a nozzle **11** of some rigid material, as is conventional. The nozzle **11** carries threads **13** with which a correspondingly threaded interior **12** of the base portion **14** of the device is engaged. Although the terminal **17** of the nozzle is shown as a hemispherical surface **32** this portion of the nozzle may be of flat-ended, conventional form. The device comprises a cap **21** essentially of inverted cup-shape form, the interior **31** of which has a spherical curvature congruent with the curvature **32** in order that a fluid-tight joint may be realized when the device is in closed position and to facilitate digital shifting when the same is to be moved to open position. FIG. 1 shows the device "closed" and FIG. 2, "open." The curvature **31** may be other than spherical only so long as the same has a zone which will bear reliably on the contiguous end of the nozzle in an area peripherally of the exit thereof.

The cap portion **21** is joined to the base portion **14** by

a pair of oppositely disposed straps **22—22**, the ends **23** and **24** of which are desirably flared as shown and the intermediate portion **26** made sufficiently narrow to permit flexing as the cap portion is shifted from one principal position to the other. Moreover, it is preferred to locate the narrow portion **26** at an elevation such that its maximum flexure provides shifting of the cap portion with minimum effort. However, better to insure that the cap will remain in open position by engagement at one side of the nozzle as indicated at A (FIG. 2), pending return to closed position, the narrow portion **26** is desirably displaced downwardly, as illustrated. The exit from the nozzle is indicated at **34**. Obviously the relationship of the cap portion to this opening will be such as to provide adequate overlap thereof in order to achieve reliable, fluid-tight sealing.

It will be evident from the drawings that the diameter across the crest of the threads **12** is greater or equal to the largest diameter of the cap **21**, and that the straps **22—22** will extend between the base portion **14** and cap **21** in such manner that a conventional two-part mold may be employed and the use of retractible cores avoided, for example, the configuration of FIG. 3.

To facilitate digital manipulation the cap **21** may be provided with serrations **41** (FIG. 3), knurling **42** (FIG. 4) or a handle **43** (FIG. 5), or any equivalent means.

Turning to the modification of FIG. 4, the cap portion **46** may comprise an upper part **47** continuing into partial skirts **48—48** which define U-shaped slots **51—51**. The width of these slots, measured circumferentially, is made less than the diameter of the adjacent portion of the nozzle **11**. Accordingly, when the device is moved in either direction to open position the margin of one slot will be momentarily distended and then allowed to constrict on the other side of the nozzle, whereby to retain the device in open position.

It will be understood that the device, whether of the form of FIG. 1 or that of FIG. 4, can be actuated in either direction from closed to open position, that is, by movement away from, or toward the user.

FIGS. 6, 7 and 8 illustrate an alternative embodiment. In this case the base portion **53** is shown as adapted for a bead and groove type of fitment. The nozzle **55** is provided with a bead **56** to engage a groove **58** on the interior of the base portion. In this embodiment the straps **59—59** are shown as of uniform transverse cross section and are united at the lower end to the base portion **53** and at the upper end to the cap portion **61**. In this modification the lower face **62** is a portion of a cylindrical surface, and the contiguous face **64** of the nozzle is congruent therewith. Operation of this embodiment is believed to be obvious in view of the description of FIGS. 1 and 2. Closed position is indicated in full lines and open position by broken lines.

In order to insure registry of the surfaces **62** and **64** the device must be properly oriented about the longitudinal axis of the nozzle. This objective may be attained, for example, by providing flat portions **66—66** at the bead **56** or elsewhere together with mating flat portions **68—68** in the groove **58**.

FIGS. 9, 10, and 11 illustrate another form of the invention in which the nozzle and closure device are fabricated as a complete assembly for attachment to the receptacle. In this form the nozzle portion **71** is provided with a groove **72** and there is another part **73** including a flange **76** engageable therewith. The transverse cross section of at least the flange **76** is preferably trapezoidal with an interior face inclined inwardly and upwardly to constitute a frusto-conical surface **78**. A similar frusto-conical surface **79** is provided on the nozzle portion **71**. Thus, upon initial assembly the two frusto-conical surfaces are caused to slide upon one another, the collar including the flange **76** meanwhile being momentarily distended whereafter the flange **76** "snaps" into the groove **72**. By providing an upper face **80** on the flange **76** and a companion face **81** in the groove **72** which are horizontal, reliable interlock is effected. The bottom **83** of the part **71** may be formed as desired for attachment to the neck portion of the container, viz., in the form of a skirt to fit over said portion, or the same may be of plug form for insertion through a punched aperture in the top of a tin container or the like. The cap **21*a*** and straps **22*a*—22*a*** are similar to those described in connection with FIGS. 1 to 8.

FIG. 12 illustrates an embodiment in which a head portion **21*b*** has its lower face **101** of spherical curvature in order that the head may partially enter the neck or nozzle of the receptacle with a male type of engagement as contrasted with the female type of engagement of that form of the invention shown in FIG. 1. Alternately the surface **101** may be a portion of a cylindrical surface provided, of course, that the margin of the exit opening is correspondingly shaped. The reference numeral **102** represents serrations on the upper surface of the head **21*b*** to provide friction.

While we have shown particular embodiments of our invention, it will be understood, of course, that we do not wish to be limited thereto since many modifications may be made and we, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of our invention.

We claim:

1. In combination, a container for a fluent substance, said container having a nozzle extending therefrom having an exit opening at its distal end, a closure device of resilient, generally shape-retaining material adapted to be moved between two positions representing open and closed conditions of the opening respectively, said device having a base portion and said nozzle and base portion having mutually-interengageable means to attach the device to the nozzle, said device having a cap portion adapted to slide with respect to said nozzle end between said two positions, a pair of oppositely-disposed, flexible straps joining the cap and base portions, said cap having a skirt which, in the obturating position, extends downwardly over the nozzle, said skirt being peripherally interrupted at diametrically opposite sides thereof, the peripheral extent of each interruption being less than the diameter of the nozzle within the skirt whereby, during actuation of the device toward open position, the skirt will be distended by the nozzle and, when the device is in open position the skirt will resume its normal shape to maintain the cap portion in the open position.

2. In combination, a container for fluent material having means defining an exit opening and a dispensing closure to be incorporated with said means, said closure comprising a first part having a base portion to be secured to said container and said first part having a nozzle in fluid communication with the exit opening, the distal end surface of the nozzle having a substantially hemi-spherical configuration, the bore of the nozzle exiting in said surface, a second part comprising a cap portion adapted to be moved between two positions respectively obturating and exposing said bore, the interior surface of said cap portion being substantially congruent with said distal end surface to seal the margin of said bore in overlapping relation therewith when the cap portion is in obturating position, said second part having a collar, said first part and collar having mutually-engaging male and female means for attachment of the first part to the second part, and a pair of resilient straps joining said cap portion to said collar whereby movement of said cap portion between its said two positions flexes said straps, at least said second part comprising resilient, relatively shape-retaining material.

3. The combination in accordance with claim **2** further characterized in that each said strap has a weakened portion intermediate its ends at which principal flexure thereof may occur.

4. The combination in accordance with claim **2** wherein said mutually-engaging means comprises a groove pe-

ripherally exteriorly of the first part and a tongue peripherally interiorly of the collar received in said groove.

5. The combination in accordance with claim 4 in which the floor of the groove is inclined upwardly and inwardly as a frusto-conical surface and a portion of the nozzle adjacent the groove is frusto-conical whereby the tongue may be initially engaged in the groove by momentary deformation of the collar by said nozzle frusto-conical portion but disengagement is substantially precluded by abutment of the top face of the tongue with the corresponding face of the groove, said last two faces being in a common plane transverse to the central axis of the nozzle.

6. In combination, a container for fluent material having a nozzle extending therefrom, said nozzle having a curved end conforming substantially to a segment of a cylindrical surface and an exit opening in said surface, and a one-piece closure device comprising resilient, generally shape-retaining material, said device having a base portion, mutually-engageable means on said base portion and nozzle to secure said device to the nozzle, said device having a cap adapted to be moved between positions respectively obturating and exposing said exit opening, a pair of oppositely-disposed flexible straps joining said cap to said base portion, the transverse cross-sectional area of the straps being less at an intermediate point thereof than at the ends, the interior face of said cap being conformed to the cylindrical curvature of said

nozzle end surface to seal the margin of the opening when the cap is in obturating position, said mutually engageable means incorporating spline means to orient the device in a predetermined angular position with respect to the longitudinal axis of the nozzle to maintain congruency of the respective curved surfaces of the nozzle end and cap.

7. The combination in accordance with claim 6 wherein said spline means comprises at least one flat surface on the base portion and nozzle respectively, said surfaces being contiguous.

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