United States Patent

Harker et al.

[15] **3,669,323**

[45] **June 13, 1972**

[54] ONE-WAY VALVE INSERT FOR COLLAPSIBLE DISPENSING CONTAINERS

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[73] Assignee: **American Can Company**, New York, N.Y.

[22] Filed: **Dec. 12, 1969**

[21] Appl. No.: **884,484**

[52] **U.S. Cl.** **222/490**

[51] **Int. Cl.** **B65g 35/38**

[58] **Field of Search** 222/541, 490, 564; 239/534, 239/521

[56] **References Cited**

UNITED STATES PATENTS

1,607,993	11/1926	Loewy	222/490
2,695,735	11/1954	Van Doornik	222/386
3,081,006	3/1963	Land	222/491 X

FOREIGN PATENTS OR APPLICATIONS

519,120	3/1955	Italy	222/490
1,046,518	10/1966	Great Britain	222/490

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Assistant Examiner—Norman L. Stack, Jr.
Attorney—Robert P. Auber, George P. Ziehmer, Leonard R. Kohan and Kenneth H. Murray

[57] **ABSTRACT**

A collapsible dispensing container tube having a thermoplastic headpiece united to a tubular body with a one-way valve insert positioned in the upper part of the tube to perform an anti-suck-back function by blocking the flow of air into the tubular body when manual pressure on the tubular body is released after the dispensing of a desired portion of product from the tube.

7 Claims, 12 Drawing Figures

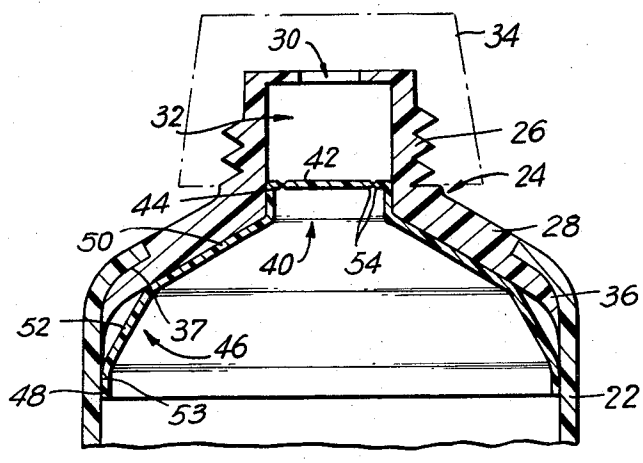


FIG. 3

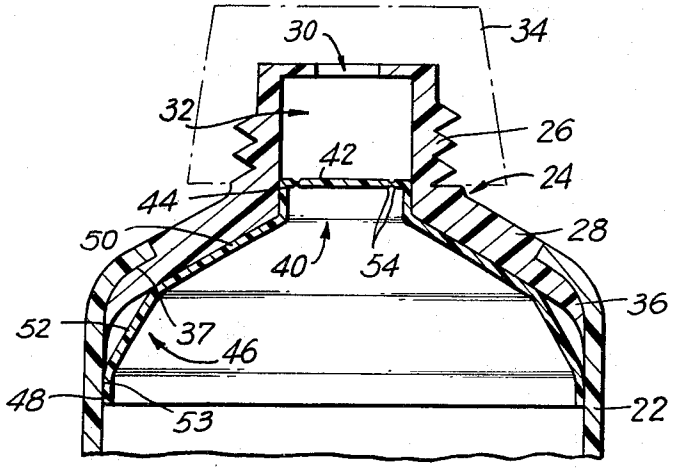


FIG. 1

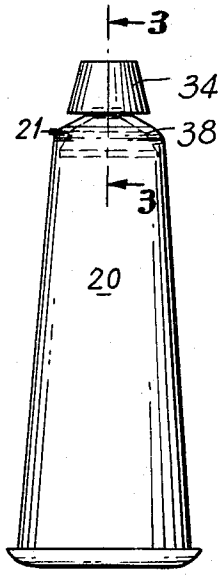


FIG. 5

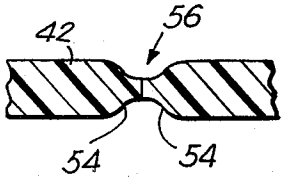


FIG. 4

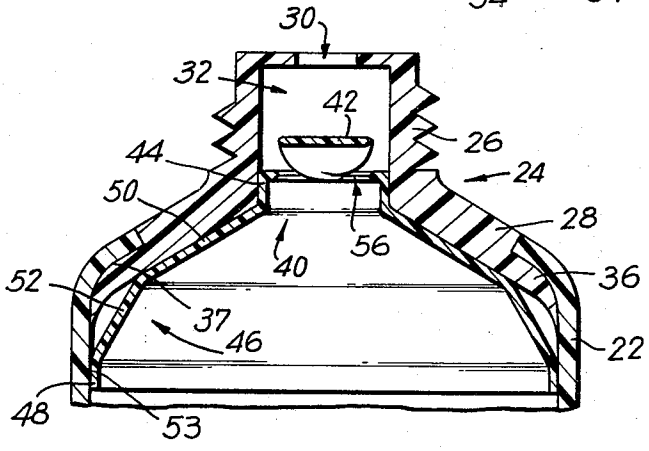


FIG. 2

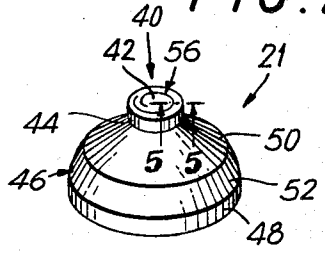


FIG. 6

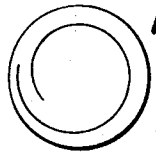


FIG. 7

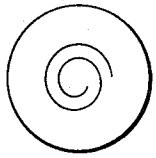


FIG. 8

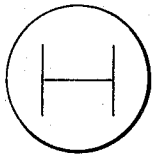


FIG. 9

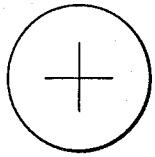


FIG. 10

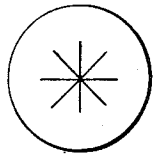


FIG. 11

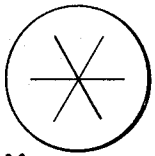
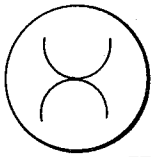


FIG. 12



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ONE-WAY VALVE INSERT FOR COLLAPSIBLE DISPENSING CONTAINERS

BACKGROUND OF THE INVENTION

The present invention relates broadly to collapsible dispensing containers, and is more particularly directed to a one-way valve insert capable of performing an anti-suck-back function, which is positioned inside and at the head end of the collapsible dispensing container.

The one-way valve insert comprising the present invention features new and improved means, forming an integral part thereof, for retaining the insert in its desired position in the collapsible dispensing container independent of the presence of product therein. Further, the portion of the insert forming the one-way valve has a new and improved opening fabricated therein providing an improved one-way opening and closing action of the valve. This improved one-way valve action allows product in the container to be easily and readily dispensed therethrough by squeezing the tube in a conventional manner. Then, when the squeezing pressure on the tube is released, this improved one-way valve action prevents air from being drawn into the tube, and, in addition, product contained in the container remains near the tube head for subsequent dispensing applications.

Conventional collapsible tubes, made of plastic or composite laminate capable of containing and protecting a product of a highly viscous or paste-like character, disadvantageously exhibit the characteristic of reverse product flow or "suck-back" by reason of the differential between atmospheric pressure and the internal pressure within the tube. In other words, when the user of the tube relaxes the pressure applied to the tube body, as when sufficient product has been dispensed, a suction effect takes place.

The plastic collapsible tube body, by virtue of its inherent residual resiliency, makes what may be regarded as a spontaneous residual recovery when the squeezing pressure is relaxed thereby causing residual or undispensed product in the tube neck and upper regions of the tube body to be drawn or sucked into the more distant regions of the container. The suck-back of residual product simultaneously causes air to be sucked into the tube body before the container closure can be replaced thereon.

This is unsatisfactory for several reasons, one being that the introduction of air into the tube body causes discoloration, flavor and scent loss, and chemical deterioration of certain products which contain oxygen-sensitive ingredients.

A second reason is that through inadvertence the container closure is often not replaced when dispensing is completed. Since by the suction effect above-described at least the tube neck passage is void of product, the product contents within the container body are exposed to the drying effect of atmosphere concomitant with the above-mentioned losses in the quality of the product.

A third detrimental effect is that air must be dispelled from the tube before dispensing the product on subsequent uses. Subsequent dispensing of a desired quantity of product, which, because of the above-described suction effect has receded some distance from the dispensing orifice, requires repeated squeezing of a kneading action to advance the product toward the dispensing orifice. This is laborious and time-consuming, and if the tube body is opaque, as is often the case, repeated squeezings frequently result in the expulsion of more product than desired.

One prior art approach to the suck-back problem has been the use of a cap with stand-up capabilities to permit the tube contents to drain back into the neck when the tube was not in use. However, this approach is unsatisfactory for the first two reasons stated above. Further, this expedient introduces packaging design problems if an exterior carton is desired, and also requires substantial distance between shelves for storage, as well as markedly increasing the cap costs.

Other prior art approaches proposed as solutions to the problem of exposing the product to the drying effect of atmosphere, a problem related to suck-back, are equipping the tube body or neck with a flapper valve, or as an alternative, surmounting the dispensing orifice with a conically shaped member having slits therein. Examples of these types of solutions are found in U.S. Pat. Nos. 1,122,868, 1,607,993 and 3,081,006.

U.S. Pat No. 1,122,868 to Davis proposes a one-way disk valve unsupported except by the product contained in the tube (called a "floating" disk). However, a disadvantage of this proposed solution is that the "floating" nature of the one-way disk valve contributes to its probable dislocation from its desired operative position after repeated dispensing of tube product by the effect of residual reverse product flow or suck-back occurring simultaneously with the release of squeezing pressure upon the tube.

U.S. Pat. No. 1,607,993 to Loewy proposes a one-way closure valve retained in the neck of a container tube by the pressure of product against its flanged bottom. However, the disadvantage of this proposed solution is the probability that, like the disk valve above-discussed, the closure valve would become dislocated from its desired operative position in the neck of the tube.

U.S. Pat. No. 3,081,006 to Land proposes an aperture disk valve unit permanently anchored to the tube. While the problem of probable dislocation of the valve unit is not present here, the complicated, slow and expensive process of assembling the parts makes this solution impractical.

In contrast to the unsatisfactory approaches above-discussed, the present invention provides a simple, unitary insert structure, capable of being snugly engaged with both the upper tube body and the lower tube neck, which is not susceptible to dislocation from its desired operative position and does not require a permanent anchoring arrangement to retain it therein.

The new and improved arrangement of structural elements comprising the one-way valve insert of the present invention will be hereafter described in more detail.

SUMMARY OF THE INVENTION

The one-way valve insert forming the present invention is a plastic unit, thermoformed or injection molded from a suitable thermoplastic material, with a die-cut opening of a desired configuration in the diaphragm portion of the unit. In fabricating the die-cut opening, a cutting die with a slightly radiused or blunted cutting edge may be used to produce a feather-edge cut which improves the one-way opening and closing action of the valve as compared to a clean cut produced by a sharp-edged die. Unlike the prior art above-discussed, the new and improved unit structure comprising the present invention is dimensioned to be anchored in its desired operative position in the tube, independent of the pressure provided by the presence of product contents therein, by a frictional fit of two separate annular areas of the unit respectively to two separate areas of the container tube. Thus, the present invention eliminates the need for additional anchoring or sealing-in features and the dependence upon the presence of product in the container tube.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a collapsible dispensing container tube embodying the new and improved concept of this invention as illustrated by the broken-line outline of the one-way valve insert positioned in the upper part of the container;

FIG. 2 is a perspective view of the one-way valve insert;

FIG. 3 is an enlarged partial sectional view taken substantially along the line 3—3 of FIG. 1, illustrating the valve portion of the insert in a closed position;

FIG. 4 is an enlarged partial sectional view similar to FIG. 3, illustrating the valve portion of the insert in an opened position;

FIG. 5 is an enlarged fragmentary sectional view taken substantially along the line 5—5 of FIG. 2, illustrating a feather-edged cut;

FIG. 6 is an enlarged partial top plan view of the insert, schematically illustrating the particular configuration of the cut in the diaphragm of the insert shown in FIG. 2; and

FIGS. 7–12 are enlarged partial top plan views of the insert similar to FIG. 6, schematically illustrating modified configurations of the cut in the diaphragm of the insert.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Illustrated in FIG. 1 is a collapsible dispensing container tube 20 embodying the new and improved concept of the present invention as illustrated by the broken-line outline of a one-way valve insert, generally designed 21 (see FIG. 2), positioned in the upper part of the tube.

Referring to FIGS. 3 and 4, there is illustrated the upper section of the collapsible dispensing tube 20 comprising a tubular body 22 connected at its upper end to a headpiece, generally designated 24. The tubular body 22 may be of any suitable material capable of containing and protecting the product contents of the tube, such as flexible, resilient plastic or composite laminate material for high viscosity or paste-like products, and also capable of thermally uniting with the headpiece 24.

The headpiece 24, of a readily moldable thermoplastic material such as polyethylene, includes a neck 26 surmounting a breast 28. In order for the tube to be capable of dispensing a product contained therein, the neck 26 has an orifice 30 leading from its upper end into a central bore 32 in the neck 26, the central bore 32 further communicating with the hollow interior of the collapsible tube 20. The neck 26 is externally screw threaded to receive a screw cap 34 for closing the orifice 30. The breast 28 of the headpiece 24 is thermally molded about its peripheral band area 36 to the upper interior wall 37 of the tubular body 22.

Shown in FIG. 2 is an illustrative embodiment of the one-way valve insert 21 thermoformed or injection molded from a suitable thermoplastic material. Basically, the insert structure includes a one-way valve 40 fabricated in a closure diaphragm 42 which is supported by a small annular head 44, the head 44 being further supported by a conical annular body, generally designated 46. The conical annular body 46 has a large annular base 48 and a conical annular shoulder 50, and, further, a trunk 52 which connects the base 48 with the shoulder 50.

The insert 21 in its desired operative position is illustrated in FIGS. 3 and 4. It can be seen therein that the exterior surface of the base 48 is contiguous with the interior surface 53 of the tubular body 22, and frictionally fit therewith. Also, as shown therein, the exterior surface of the head 44 is contiguous with the lower interior surface of the neck 26, and frictionally fit therewith. At these two contact areas, since the insert structure is frictionally fit to the container, the need for additional anchoring or sealing-in features is thereby eliminated. Additionally, as shown in FIGS. 3 and 4, the exterior surface of the shoulder 50 is contiguous with the interior surface of the breast 28.

The one-way valve 40 may be fabricated in the closure diaphragm 42 of the head 44 by the use of a cutting die. If desired the die may have a slightly radiused or blunted cutting edge to provide the closure diaphragm 42 with die-cut feather edges 54, defining an opening 56 of a certain specified configuration. The feather edges 54, illustrated in FIG. 5, have a reduced cross-sectional area of contact, as compared to that of sharp edges which are produced by a cutting die with a sharp cutting edge. This improves the one-way opening and closing action of the valve by reducing the area of frictional resistance between the edges. Consequently, the one-way valve 40 is more sensitive to application of squeezing pressure on the tubular body 22 during dispensing.

In operation, the container is uncapped and the product is easily and readily dispensed through the feather-edged die-cut opening 56 of the insert 21 by the application of squeezing pressure to the tubular body 22 in a conventional manner. As long as pressure is being applied by the movement of the product in the direction of the dispensing orifice 30, the inherent resilient bias of the one-way valve 40 to retain its original closed position transversely of the head 44 will be overcome and the one-way valve 40 will remain open. However, the instant the pressure is relaxed, the inherent resilient bias of the valve 40 causes it to return to its original closed position. Thus, the subsequent back pressure produced by the inherent residual resilience of the tubular body 22, which results in the suck-back of air, is prevented from occurring with the desired result that the one-way valve action prevents air from being drawn into the tubular body 22.

Referring to FIGS. 6–12, there is schematically illustrated the various feather-edged die-cut configurations which the one-way valve can take, all of which suitably perform to achieve the desired results of the present invention.

One configuration of the one-way valve opening is in the form of a spiral having a long increasing radius (FIGS. 2 and 6). Another configuration of the one-way valve opening is in the form of a spiral having a short increasing radius (FIG. 7). Yet another configuration of the one-way valve opening is in the form of a large H (FIG. 8). A further configuration of the one way valve opening is in the form of a cross (FIG. 9). Another configuration of the one-way valve opening is in the form of an eight-pronged star (FIG. 10). Still another configuration of the one-way valve opening is in the form of a six-pronged star (FIG. 11). A still further configuration of the one-way valve opening is in the form of two semi-circles, positioned tangentially at the midpoint of their circumferences (FIG. 12).

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. In a collapsible dispensing container tube comprising a flexibly, resilient tubular body and an annular headpiece having a centrally bored neck with a dispensing end opening and a conical breast with its lower end connected to said tubular body, the headpiece and tubular body forming a unitary tube structure capable of containing a product, a one-way valve insert comprising:

an annular base positioned contiguous with the interior surface of the tubular body, frictionally engaged therewith, and adjacent to the lower end of the conical breast of the headpiece;

a conical annular shoulder positioned contiguous with the interior surface of the conical breast of the headpiece;

a conical annular trunk connecting the upper end of the annular base of the lower end of the conical annular shoulder, said trunk being radially inwardly spaced from the annular location of connection between the lower end of the conical breast of the headpiece and the tubular body;

an annular head positioned contiguous with the lower interior surface of the neck of the headpiece, frictionally engaged therewith, said head connected at its lower end to the upper end of the conical annular shoulder; and

a closure diaphragm positioned transversely of the upper end of the annular head and connected thereto at the outer edge of said diaphragm, said diaphragm being spaced remote from the dispensing end opening of the container tube, said diaphragm having a die-cut opening therein such that a portion of said diaphragm forms a one-way valve so that upon compressing the tubular body to dispense a portion of the product therefrom said product pushes against the diaphragm causing the one-way valve to flex open towards the dispensing end opening of the

tube permitting the product to dispense therefrom, and, upon releasing the tubular body to cease dispensing the product therefrom, the product ceases to push the diaphragm, the resilience of the one-way valve causing said valve to close preventing air from being drawn into the interior of the tubular body.

2. A one-way valve insert, capable of being placed in a collapsible dispensing container having a flexibly resilient tubular body and an annular headpiece, said headpiece having a neck with a dispensing end opening and a breast with its lower end connected to said tubular body, comprising:

an annular base adapted to be positioned contiguous with the interior surface of the tubular body in frictional engagement therewith, adjacent to the lower end of the breast of the headpiece;

a conical annular shoulder adapted to be in contact with the interior surface of the breast of the headpiece;

a conical annular trunk connecting the upper end of the annular base to the lower end of the conical annular shoulder, said trunk adapted to be radially inwardly spaced from the annular location of connection between the lower end of the breast and the tubular body;

an annular head adapted to be positioned contiguous with the lower interior surface of the neck of the headpiece in frictional engagement therewith, said head connected at its lower end to the upper end of the conical annular shoulder; and

a closure diaphragm positioned transversely of the upper end of the annular head and connected thereto at the outer edge of said diaphragm, said diaphragm adapted to be spaced remote from the dispensing end opening of the container tube, said diaphragm having a die-cut opening therein such that a portion of said diaphragm forms a one-way valve capable of a flexing action above said diaphragm position.

3. A one-way valve insert according to claim 2 wherein a feather edge defines the die-cut opening in the diaphragm.

4. A one-way valve insert according to claim 2 wherein the configuration of the die-cut opening is in the form of a spiral.

5. A one-way valve insert according to claim 2 wherein the configuration of the die-cut opening is in the form of two semicircles, positioned tangentially at the midpoints of their circumferences.

6. A one-way valve insert according to claim 2 wherein the configuration of the die cut opening is in the form of two parallel lines with a line transverse thereto.

7. A one-way valve insert according to claim 2 wherein the configuration of the die-cut opening is in the form of a multi-pronged star.

* * * * *