Jan. 8, 1963 M. M. JUNAID 3,072,304

AUTOMATIC VALVE CAP FOR COLLAPSIBLE TUBES

Filed Nov. 15, 1960

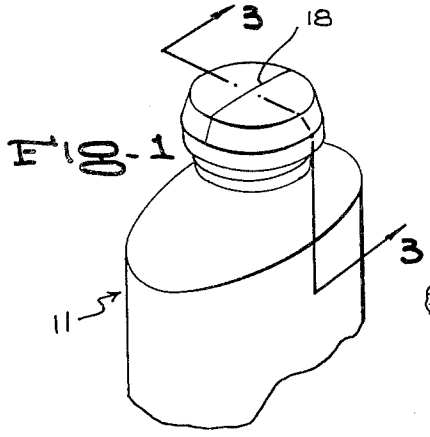


FIG-1

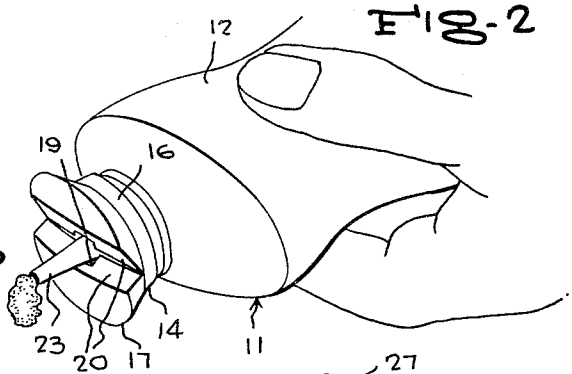


FIG-2

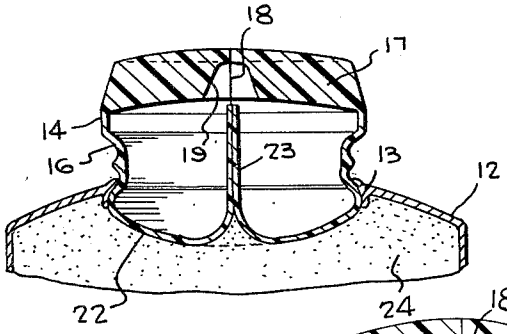


FIG-3

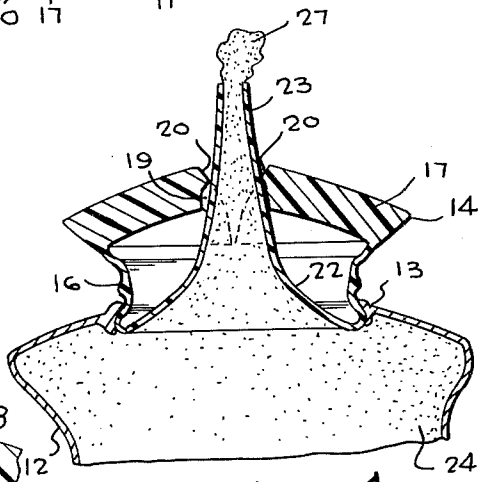


FIG-4

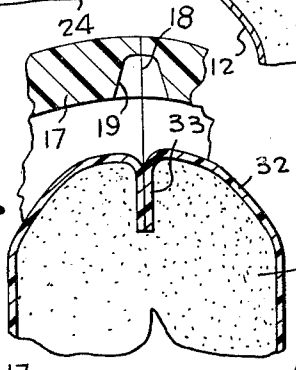


FIG-6

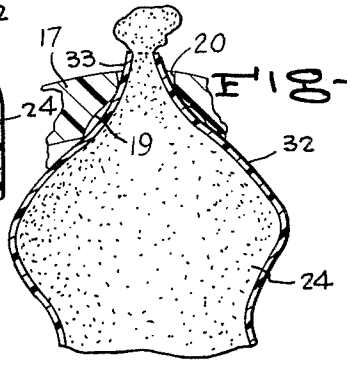


FIG-7

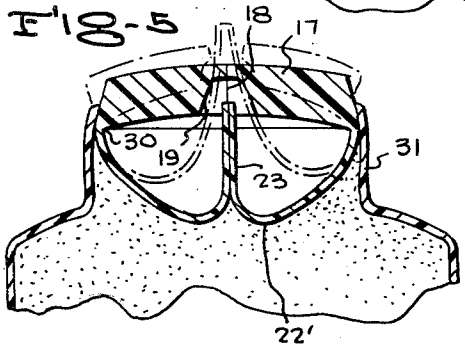


FIG-5

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AUTOMATIC VALVE CAP FOR COLLAPSIBLE TUBES

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This invention relates to dispenser closure devices, and more particularly to a self-closing cap assembly for a collapsible tube of the type containing paste-like material.

A main object of the invention is to provide a novel and improved self-closing cap and spout assembly for a collapsible tube, the assembly involving very simple components, being neat in appearance, and involving no detachable parts.

A further object of the inventoin is to provide an improved self-closing cap and spout assembly for a collapsible tube containing paste-like material, said assembly being inexpensive to fabricate, being durable in construction, allowing the paste-like material in the tube to be dispensed automatically responsive to squeezing pressure on the tube, and closing automatically when the squeezing pressure is released.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIGURE 1 is a perspective view of the upper portion of a collapsible tube containing paste-like material and provided with an improved self-closing cap and spout assembly constructed in accordance with the present invention.

FIGURE 2 is a perspective view showing the manner in which the cap is distended to open position and the dispensing tube of the assembly is extended responsive to squeezing pressure applied to the tube illustrated in FIGURE 1.

FIGURE 3 is an enlarged vertical cross sectional view taken substantially on the line 3—3 of FIGURE 1.

FIGURE 4 is a vertical cross sectional view, similar to FIGURE 3, but showing the positions of the parts when squeezing pressure is applied to the collapsible tube in the manner illustrated in FIGURE 2.

FIGURE 5 is a fragmentary vertical cross sectional view taken through a modified form of self-closing cap assembly according to the present invention, the spout portion being shown in its normal closed position.

FIGURE 6 is a fragmentary vertical cross-sectional view taken through the spout portion of a further modified form of self-closing cap assembly according to the present invention, the spout portion being shown in its normal closed position.

FIGURE 7 is a vertical cross sectional view of the spout element of FIGURE 6, shown in dispensing position, namely, in an upwardly distended position assumed in response to the pressure developed by the paste material when squeezing pressure is applied to the tube.

Referring to the drawings, 11 generally designates a collapsible tube containing paste material, such as toothpaste, shaving cream, or the like, the tube comprising a main body 12 of relatively malleable thin metal, such as metal foil, or the like, and being formed with a neck portion 13 at its top end. Secured in the generally annular neck portion 13 is a cap assembly, designated generally at 14, the assembly 14 being integrally formed of flexible resilient material, such as flexible resilient plastic material of polyethylene or material having similar physical characteristics. The cap member 14 is permanently secured inside the generally annular neck portion 13, by suitable cement, or any other suitable fastening means.

The cap member 14 comprises the generally annular main body 16 which is integrally formed at its top end with a thickened closure disc 17, the closure disc being formed with a diametral slit 18 and being further formed beneath said slit with an upwardly converging recess 19. As will be presently explained, when the two segments of the relatively thick disc element 17 spread apart, due to distension of the spout portion of the cap member, the walls 20, 20 of the slit 18 separate in the manner illustrated in FIGURES 2 and 4, and the recess 19 opens to define a passage through which the dispensing spout portion of the cap assembly may project.

The bottom portion of the cap assembly 14 comprises a flexible diaphragm 22 which is formed with the central spout portion 23, the spout portion comprising a conduit which is normally disposed immediately subjacent the recess 19, extending upwardly from the main body of the diaphragm 22, as shown in FIGURE 3, the diaphragm 22 and the spout portion 23, integral therewith, being relatively thin and being readily yieldable upwardly to pressure exerted in the paste-like contents 24 of the tube 11 when squeezing pressure is applied to the tube, as will be presently described.

As shown in FIGURE 3, the walls of the conduit 23 normally closely engage each other, the conduit being thus in a flattened condition under normal conditions, and the conduit is supported immediately below the recess 19, the conduit sealing the container 11 so that the paste-like contents 24 thereof are sealed from the atmosphere. As shown in FIGURE 3, the diaphragm 22 is normally downwardly convex in contour.

When squeezing pressure is applied to the thin malleable main body of the metal collapsible tube 11, as shown in FIGURE 2, pressure is developed in the past-like contents 24 of the tube, said pressure being transmitted to the diaphragm 22 and causing paste-like material to be forced upwardly into the conduit 23, expanding the conduit and forcing the conduit upwardly into the recess 19, causing the disc member 17 to be distended upwardly in the manner shown in FIGURE 4, the expanded upwardly tapering conduit 23 being forced through the opening defined by the spread-apart walls of the recess 19 in the manner illustrated in FIGURE 4. The conduit 23 is of sufficient length so that a substantial portion thereof will project upwardly between the spread-apart segments of the distended disc element 17, and paste-like material will be forced out of the conduit 23 in the manner shown at 27 in FIGURE 4. When the squeezing pressure is released, the pressure in the paste-like material 24 is accordingly reduced, and the walls of the upper portions of the slit 18 come together, the upper wall portions of said slit adjacent the recess 19 engaging the spout 23 and exerting inward force thereon to cut off any further discharge of the paste-like material from the spout member, while at the same time the spout member is retracted downwardly and tends to resume its normal collapsed position, shown in FIGURE 3. Thus, the paste-like material remaining in the upper portion of the spout member 23 is forced out of the spout member, while at the same time the collapsed spout member is retracted downwardly between the walls of the slit 18 adjacent the recess 19 and ultimately is drawn downwardly below the disc member 17, resuming the normal position thereof shown in FIGURE 3. In said normal position, the spout member 23 is in sealing collapsed position, whereby the interior of the collapsible tube 11 is sealed with respect to the atmosphere.

As will be readily apparent, the relatively thick top cover disc member 17 defines a protective closure for the assembly, protecting the relatively fragile spout member 23 against mechanical damage, and also covering the spout member so that it will not normally be contami-

nated. Thus, the spout member 23 is exposed only when squeezing pressure is applied to the body 12 of the collapsible tube, namely, will be exposed only when paste material is being dispensed from the tube.

In the form of the invention shown in FIGURE 5, the flexible diaphragm, shown at 22' is integrally connected to the periphery of the closure disc 17 at 30, said periphery being secured to the top portion of the neck 31 of the paste tube container. With this arrangement, when squeezing pressure is applied to the paste tube container, the pressure of the paste material forces the diaphragm upwardly toward the dotted view position thereof, and the distortion of the diaphragm develops tension in the disc member 17 tending to pull the respective segments on opposite sides of the slit 18 apart. The slit therefore opens before the top end of the spout portion 23 engages the interior surface of the recess 19, so that there is no possibility of the interior of the recess becoming smeared with the paste material. The spout passes upwardly through the open slit substantially to the dotted view position thereof in FIGURE 5. When the squeezing pressure is released, the spout portion 23 tends to flatten, pinching away the paste material exterior thereto, and closes, cutting off further discharge. The spout retracts into the space below disc member 17, and the release of tension in the disc member closes the slit 18. Thus, the slit 18 may open and close without the spout portion 23 ever coming into contact with the wall surfaces of the slit or of the recess 19.

FIGURES 6 and 7 illustrate a modified form of diaphragm and spout structure which may be employed in place of the diaphragm 22 and spout 23 of FIGURES 1 to 4. In the modified form of the invention illustrated in FIGURES 6 and 7, the diaphragm, shown at 32, normally has an upwardly convex configuration, and the spout member, shown at 33, normally extends downwardly into the paste-like material 24. When squeezing pressure is applied to the container, the pressure is transmitted to the diaphragm 22, forcing the spout member 33 upwardly to the upwardly directed position shown in FIGURE 7, simultaneously expanding the spout member 33 and forcing the spout member into the recess 19 of the cap 17, forcing the segments of the cap apart and allowing the spout member 33 to project upwardly through the opening defined by the spread-apart segments of recess 19 and the portions of the walls of the slit 20 immediately above the recess, in a manner generally similar to that illustrated in FIGURE 4. Thus, the operation of the dispensing tube with the diaphragm structure of FIGURES 6 and 7 is generally the same as the operation described in connection with the embodiment of the invention illustrated in FIGURES 1 to 4, except that the configuration of the diaphragm 32 and spout 33 are different from the configuration of the diaphragm 22 and spout 23 in the first-described form of the invention.

While certain specific embodiments of an improved dispensing enclosure cap assembly for a collapsible tube have been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. In combination, a collapsible tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly, a flexible diaphragm secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and to project the discharge spout through said opening when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed to the atmosphere through said opening when said discharge spout is projected through the opening.

2. In combination, a collapsible tube containing paste-like material, said tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly, a flexible diaphragm secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and to project the discharge spout through said opening under the pressure developed in said paste-like material when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed to the atmosphere through said opening when said discharge spout is projected through the opening.

3. In combination, a collapsible tube containing paste-like material, said tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly, a flexible diaphragm of relatively thin flexible material secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and to project the discharge spout through said opening under the pressure developed in said paste-like material when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed to the atmosphere through said opening when said discharge spout is projected through the opening.

4. In combination, a collapsible tube containing paste-like material, said tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly, a flexible diaphragm of relatively thin flexible material secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and to project the discharge spout through said opening under the pressure developed in said paste-like material when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed to the atmosphere through said opening when said discharge spout is projected through the opening, said discharge spout being normally in a substantially flattened condition but expanding to a substantially tubular shape under the pressure of the paste-like material.

5. In combination, a collapsible tube containing paste-like material, said tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly, a flexible diaphragm of relatively thin flexible material secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and to project the discharge spout through said opening under the pressure developed in said paste-like material when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed to the atmosphere through said opening

when said discharge spout is projected through the opening, said discharge spout being normally in a substantially flattened condition but expanding to a substantially tubular shape under the pressure of the paste-like material, the discharge spout resuming its normal substantially flattened condition to cut off flow of paste-like material therethrough when the squeezing pressure on the tube is released.

6. In combination, a collapsible tube containing paste-like material, said tube having a neck portion, a cap member of flexible resilient material permanently secured to said neck portion, said cap member being formed with a slit located to define an opening when the cap member is distended outwardly and formed with an upwardly convergent recess adjacent said slit, a flexible diaphragm of relatively thin flexible material secured in said neck portion, and a normally closed discharge spout integrally formed in said diaphragm, said discharge spout being normally disposed below the slit and said diaphragm and discharge spout being sufficiently yieldable to distend upwardly and elevate the discharge spout and to project the discharge spout through said opening under the pressure developed in said paste-like material when squeezing pressure is applied to the collapsible tube, the space in the cap member around the discharge spout being exposed

to the atmosphere through said opening when said discharge spout is projected through the opening, said discharge spout being normally in a substantially flattened condition but expanding to a substantially tubular shape under the pressure of the paste-like material, the discharge spout resuming its substantially flattened condition to cut off flow of paste-like material therethrough when squeezing pressure on the tube is released.

7. In a device of the character described, a collapsible container provided with an extensible spout which extends responsive to squeezing pressure applied to the container and which retracts when the squeezing pressure is released, means defining a normally closed chamber receiving the spout in its retracted condition, said spout including means opening said chamber and exposing the space around the spout to the atmosphere responsive to said squeezing pressure to allow extension of the spout, and means embodied in the spout to control discharge therethrough in accordance with said squeezing pressure.

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