April 8, 1930. F. L. FOX 1,753,239

CAP STRUCTURE FOR COLLAPSIBLE TUBES

Filed May 3, 1926

Fig. 8.

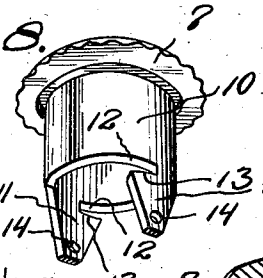


Fig. 1.

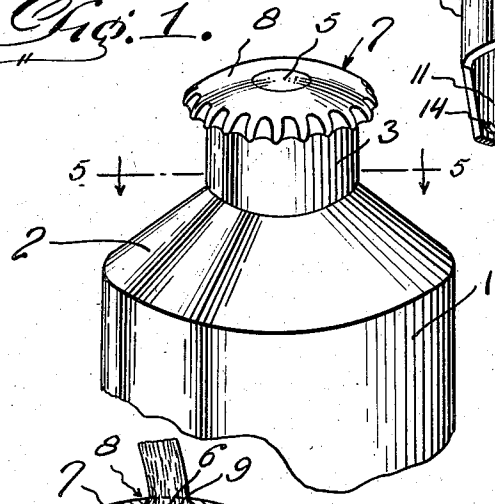
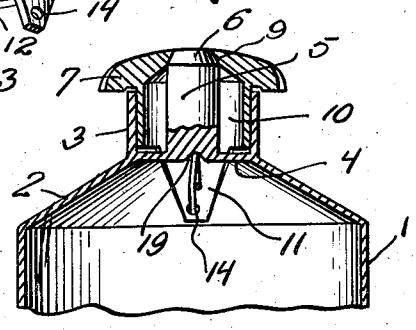


Fig. 2.



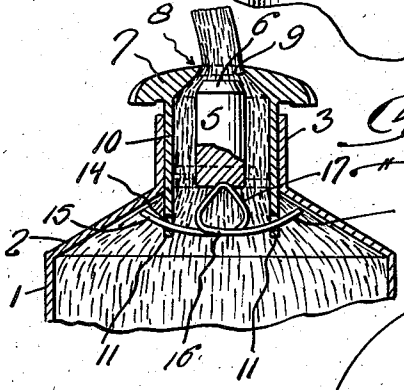


Fig. 7.

Fig. 3.

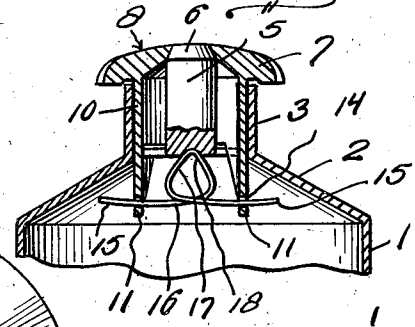
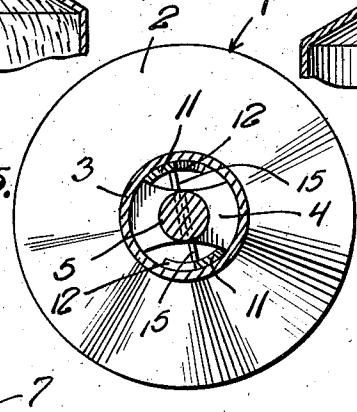


Fig. 5.



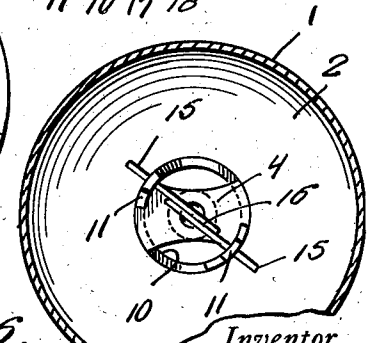


Fig. 4.

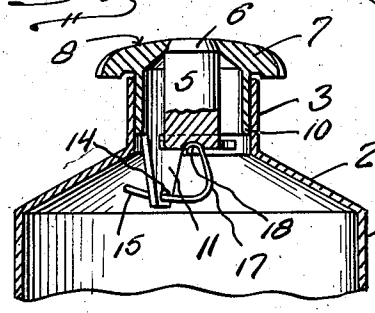


Fig. 6.

Inventor
Frederick L. Fox,

By

Attorney

Patented Apr. 8, 1930 1,753,239

UNITED STATES PATENT OFFICE

FREDERICK L. FOX, OF WASHINGTON, DISTRICT OF COLUMBIA

CAP STRUCTURE FOR COLLAPSIBLE TUBES

Application filed May 3, 1926. Serial No. 106,345.

This invention relates to improvements in the construction of collapsible tubes such as used for shaving cream, tooth paste, etc., and particularly to a cap structure for such tubes, provided with parts adapted to cooperate to automatically close the discharge opening of the cap.

It has been heretofore contemplated to provide automatically closing valves or discharge openings in collapsible tubes as shown by numerous prior patents and constructions made in the art which are all subject to substantially the same disadvantages in construction and operation, as a result of which a satisfactory operating structure for automatically closing the discharge opening or neck of a tube of this character as provided.

These difficulties arise from the fact that the structures of the prior art after the discharge of the desired amount of material from a tube require further displacement of the material which must be forced back into the tube to expand the tube structure or provide a second and supplemental discharge which is not desired. In other cases, the devices as developed in the prior art use valve mechanisms normally closed by spring pressure which are mounted within the tubes and which in addition to being subject to the above disadvantages, further seldom move to closed position in view of the great amount of pressure required to displace the material back into the tube after the valve has partially seated, and in order to move into fully seated position.

In these cases, attention is called to the fact that this inefficient seating of the valve permits the air to contact with the material in the tube which causes it to dry and harden as a result of which, the valve mechanism of the discharge will not subsequently operate as the pressure required is so great that it will in most cases split the body of the tube rather than operate the valve. Where the tube structures are subject to the after discharge, it is usually necessary to wipe this extra material off which is seldom used and which results in a substantial waste unnecessarily. Where it is necessary to displace the material back into the tube by the controlling element in engaging its seat, this requires the expansion of the tube and enlargement thereof toward its original size and requires such spring pressure to seat the controlling element in view of the plasticity of the material in the tube that the normal discharge operation is rendered entirely unsatisfactory.

This invention is therefore designed to overcome these disadvantages experienced by the devices of the prior art in providing a construction which will automatically operate to close the discharge nozzle or opening in a collapsible tube, and which does not have an after discharge or require the displacement of material back into the tube and the reformation of the same in order to seat and effect the closing operation.

It is therefore an object of this invention to provide an automatically operating closure for collapsible tubes which will effectively seal the discharge opening in the neck of the tube after the discharge of a desired quantity of the material therefrom upon the release of pressure on the tube in effecting the discharge and effectively seal the material within the tube from contact with the air.

A further object of the invention resides in providing an automatically operating closure device for collapsible tubes which is responsive to the pressure created on the exterior of the tube to permit the discharge of the plastic material therefrom and which upon release of this pressure will immediately operate to separate the discharge material from that within the tube and effectively seal the discharge opening.

The invention further comprehends the provision of a structure wherein the closure members for the tube automatically operate to provide a smooth exterior surface on which the material from within the tube is discharged so that it may be readily and conveniently removed for application in a well known manner or the ends of the tube used as an applicator to apply the discharged material after the removal of which the surface will remain substantially clean, due to the particular formation of the parts, and air will be prevented from contacting with the material contained in the tube so that

it cannot harden and prevent the operation of the closure mechanism. A spring construction is further provided which is of special design to insure the efficient operation of the closure mechanism and which is adapted to be contained within the tube in such a manner that the plastic material contained therein will in no way interfere with the efficient operation of this especially designed spring construction, which further acts as an assembly means for the parts of the closure mechanism and the tube in order to retain the same in this assembled relation at all times.

The invention also comprehends the provision of such a construction that the invention is embodied in its finished construction with relatively few parts of simple structure which may be readily molded and machined in apparatus at present used in the art without requiring the construction and design of special machinery for the purpose of manufacturing the tubes of this invention.

Numerous other objects and advantages residing in this invention are more particularly pointed out in the following detailed description and in the claims directed to the preferred construction of the device, it being understood however that various changes in the size, shape and arrangement of the parts may be made for carrying out the principle of operation and assemblage without departing from the spirit and scope of the invention as herein set forth.

In the drawings forming part of this application:—

Figure 1 is a perspective of the discharge end of a collapsible tube construction in accordance with this invention.

Fig. 2 is a vertical sectional view through this discharge end, with the parts shown in closed position.

Fig. 3 is a vertical sectional view similar to Fig. 2, taken at right angles to the section in Fig. 2 and showing the parts in closed position.

Fig. 4 is a view similar to Fig. 3, in which the section is taken at an acute angle from the section of Fig. 3 to illustrate the locking lug and spring construction in its assembled relation in the tube structure.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a sectional view similar to Fig. 5 showing the parts in locked position to prevent automatic operation of the cap.

Fig. 7 is a vertical sectional view similar to Fig. 3, showing the position of the parts when pressure is exerted to discharge material from the tube.

Fig. 8 is a perspective of the cap member.

1 indicates a collapsible tube of the type now well known in the art and used as a collapsible container for tooth paste, shaving cream and similar substances which at one end is provided with a substantially non-collapsible conical head 2 from which the cylindrical neck 3 extends. In the usual construction of these tubes, the exterior surface of the neck 3 is usually threaded to receive the interiorly threaded cap. In the present invention, however, the neck is constructed of plane cylindrical form interiorly and exteriorly and at the juncture between the neck and the conical head 2 the end of the neck of the tube is formed with a transversely extending strip 4 arranged substantially diametrical in the neck and formed with the substantially cylindrical projection 5 extending axially within the neck 3 and in concentric relation therein. The end of this projection 5 is formed with a frusto-conical surface 6 for a purpose which will presently appear.

The provision of this neck structure in the tube forms an annular or ring-shaped discharge passage for the material in flowing outwardly upon collapsing the body portion of the tube indicated at 1.

The terms "neck" or "neck structure" as used in the claims is to be interpreted to include not only the portion 3 but also the strip 4 provided with projection 5, in view of the fact that it is by this composite structure that the discharge passage is formed in the neck so that it may cooperate with the cap for controlling discharge of material from the tube. The terms "stationary part" and "movable part" as used in the claims refer to the neck structure above set forth and to the cap structure, respectively as fully illustrated and described herein.

A cap or closure member is indicated at 7 which includes a slightly rounded face 8 forming a receiving surface and applying surface for the material discharged from the tube through the neck. The cap is formed with a central opening 9 of substantially the same conical formation as the surface 6 on projection 5 for seating cooperation therewith in the manner as illustrated in Fig. 2 to effectively seal the annular discharge passage in the neck against discharge of material from the tube and to prevent access of air thereto.

This cap 7 is provided with a cylindrical sleeve-like extension 10, the exterior diameter of which is constructed for a sliding fit within the neck 3 and is of a length substantially equal to the length of the neck as may be seen by comparison of Figs. 2 and 3. The free end of this sleeve extension 10 is formed at diametrically opposite points with arms 11 extending in parallel relation as shown in Fig. 3, beyond the end of the sleeve and normally positioned within the head portion of the tube. These arms are formed with slots adjacent the end of the sleeve 10 as indicated at 12 in Fig. 8, which in the closed position of the cap on the neck 3 are adapt-

ed to receive the strip 4 formed in the neck and provide locking cooperation therewith to effectively lock the cap against the movement axially in the neck.

These recesses are formed so that the edges 13 are slightly tapered so as to produce a binding action for drawing the cap onto the neck in effectively sealing the opening 9 through the cooperation of the plug extension 5 seating in said opening.

The ends of the projections 11 of the cap member are formed with openings 14 in the end portions thereof to slidably receive the free ends 15 of the spring member 16 which is formed with a looped central portion as indicated at 17 in which the portion 18 is of V-shape to provide a pivot and support for the center of the spring member in the socket 19 formed in the web 4. The ends 15 of this spring member 16 are freely slidable thru the openings 14 of the cap member, and these ends due to the resiliency of the spring member normally tend to move the cap into closed position as shown in Fig. 3.

This spring member embodies the special feature of this invention in view of the fact that it efficiently balances the cap in its operation to open and closed position to permit the discharge of material from the tube and does not become fouled in any manner from its location in the material within the tube so as to interfere with its efficient operation to close the cap and prevent discharge of the material from the tube. This spring construction further permits the ready assembly of the parts and serves to normally prevent the detachment of the cap from the tube, and in this sense forms an assembling and locking member for locking the cap to the tube.

With the tube construction above described, it has been found in practice that the annular passage in the discharge neck and the opening in the cap are adapted to control the flow of material from the tube providing a structure in which a relatively weak resilient member may be used to constantly maintain the cap in closed position except when pressure is exerted manually on the exterior of the tube for expelling a portion of the contents thereof.

The cap is immediately operative to permit the expulsion of material from the tube which is always deposited upon the surface of the cap and immediately upon the release of pressure or upon the termination of the compressing action for collapsing the tube, the cap is moved to closed position for effectively sealing the contents and separating it from the expelled portion of material at the release or termination of the collapsing action on the tube, and while the same is still in the hand in the usual manner.

The surface of the cap provides a convenient application member for applying shaving cream to the face in the event the collapsible tube contains shaving cream or for permitting the application of the contents of the tube expelled onto the surface in any suitable manner for which the material may be used. This considerably improves the construction of tubes of this character in this connection in addition to providing the automatic closure for cutting off the expelled material from the contained material of the tube and preventing access of the air to the contained material.

It has been found from continued experiment, that the material within the tube and surrounding the co-operating portions of the cap and the neck will not harden under the action of the air in view of the efficiency in the sealing of this contained material, and that it will be immediately operative at all times until the entire amount of material is fully expelled from the tube.

A further feature of the invention is the locking provisions of the extensions on the cap structure which will effectively lock the cap in closed position on the tube so that in shipping the tube or in carrying a tube of this character in a suit case or the like, should it accidentally have pressure applied thereto, the cap will be prevented from opening. A quick and slight turn of the cap will immediately unlock the same and permit the ready operation thereof in the manner as above set forth.

A further feature of the invention is in the spring structure which effectively assembles the cap on the tube, as it will be noted from the drawings that the ends of the spring members prevent the disassembly of the cap from the neck of the tube under all conditions and efficiently serves to maintain the cap in closed position on the tube.

Having thus described my invention, what I claim as new is:—

1. In combination, a collapsible tube for containing fluent material having a neck formed with a ring-shaped discharge opening, a closure cap slidably carried by said neck and having a discharge opening in concentric relation to said ring-shaped discharge opening in the neck, and means for seating the closure cap on the neck, to close said ring-shaped discharge opening against communication with the opening in said cap.

2. In combination, a collapsible tube for containing fluent material having a neck formed with a ring-shaped discharge opening, a closure cap slidably carried by said neck having a discharge opening in concentric relation to the discharge opening in the neck, and means for normally seating the closure cap on the neck, said neck and closure cap being formed for cooperation to close said ring-shaped discharge opening, and means for filling the discharge opening in said cap terminating flush with the outer

surface thereof in the seated position of said cap on the neck.

3. A closure for collapsible tubes and the like, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, and a resilient member extending diametrically of said neck, and engaging said neck and cap at spaced points to yieldingly retain the cap in its normal position.

4. A closure for collapsible tubes and the like, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, a resilient member extending transversely to said neck and engaged with the neck and cap at spaced intervals to yieldingly retain the cap in its normal position, and means for permanently retaining the cap on the neck.

5. A closure for collapsible tubes and the like, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, a resilient member extending transversely to said neck and engaged with the neck and cap at spaced intervals to yieldingly retain the cap in its normal position, said cap being rotatable relative to said neck, and means for locking the cap against movement from said normal position in one rotated position of the cap on the neck.

6. A closure for collapsible tubes and the like, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, a resilient member extending transversely to said neck and engaged with the neck and cap at spaced intervals to yieldingly retain the cap in its normal position, said cap being rotatable relative to said neck, and means having positive engagement with the cap and neck for locking said cap in normal position.

7. A closure for collapsible tubes comprising in combination with the collapsible tube, a cylindrical neck, a body mounted in the neck extending axially therein and forming a ring-shaped discharge passage in the neck, a cap reciprocably mounted on the neck having a discharge opening closed by said body, and means for normally holding said cap in closed position.

8. A closure for collapsible tubes, comprising in combination with the collapsible tube, a cylindrical neck, a body mounted in the neck extending axially therein and having a surrounding discharge passage, a cap reciprocably mounted on said neck and normally closing said passage by engagement with said body, and a resilient member engaging the cap and the body for normally retaining said cap in closed position.

9. A closure for collapsible tubes, comprising in combination with the collapsible tube, a cylindrical neck, a body mounted in the neck extending axially therein and having a surrounding discharge passage, a cap reciprocably mounted on said neck and normally closing said passage by engagement with said body, and a resilient member extending diametrically of said neck and engaging the cap and body at spaced points to yieldingly retain the cap in closed position.

10. A closure for collapsible tubes, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, and a resilient member having a laterally extending portion engaged with a part of said neck, and another portion engaged with said cap to yieldingly retain the cap in its closed position.

11. A closure for collapsible tubes, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, and a resilient member having a laterally extending portion intermediate the ends engaged with a part of said neck, and having the end portions engaging said cap to yieldingly retain said cap in closed position.

12. A closure for collapsible tubes, comprising in combination with the collapsible tube, a neck having an outlet passage, a cap reciprocably mounted on said neck and normally closing said passage, said cap having limited rotative movement and provided for direct locking cooperation with the neck in one position, and a resilient member having an intermediate offset portion rotatably engaged with a part on the neck, and having the ends engaged with and normally retaining said cap in normal position on said neck.

13. A device of the class described having a stationary part and a movable part thereon, in combination with a resilient member having the central portion laterally offset and pivotally engaging said stationary part, and having the ends extending in opposite directions in substantial alignment, said ends engaging said movable part to normally actuate it in one direction on said stationary part.

In testimony whereof I affix my signature.

FREDERICK L. FOX.