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E. L. WINDERS

3,178,082

DISPENSING CAP

Filed May 9, 1963

FIG. 1

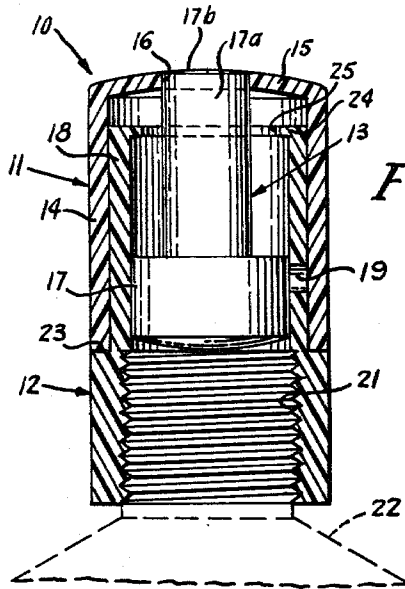
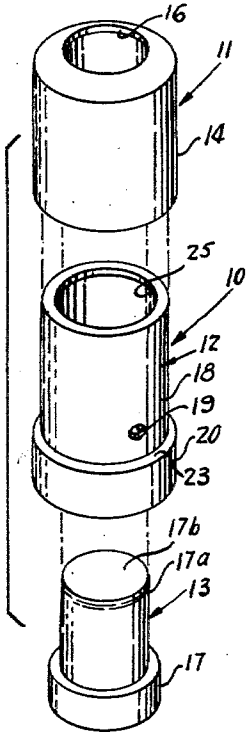


FIG. 2A

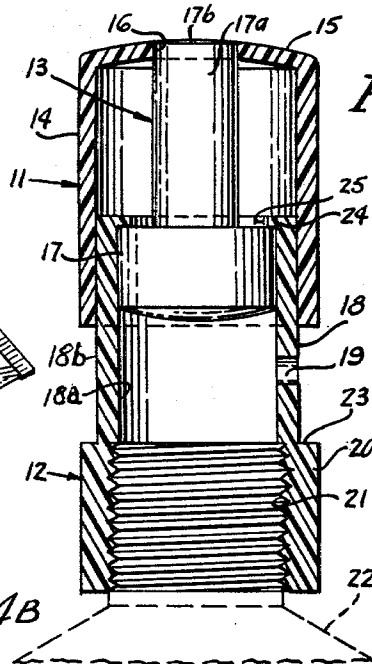


FIG. 2B

FIG. 3

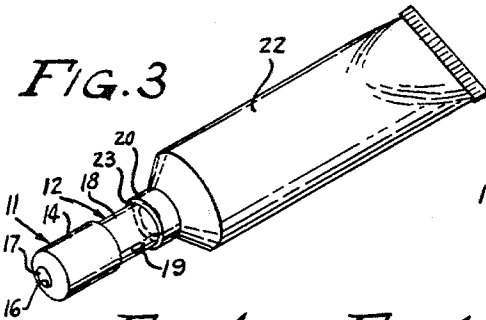
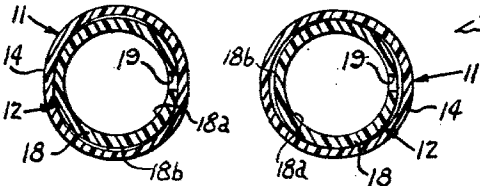


FIG. 4A

FIG. 4B



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3,178,082

DISPENSING CAP

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5 Claims. (Cl. 222-496)

This invention relates to a dispensing cap and more particularly to a cap for collapsible tubes or the like, such as are employed in dispensing tooth paste and similar semi-solid or fluid substances.

A primary object of this invention is the provision of an improved cap which is substantially permanently affixed to the tube and which may be opened or closed without removing the same from the tube, thus reducing the possibility of loss to a minimum.

An additional object of the invention is the provision of a tube of this character which may be opened substantially automatically by pressure on the collapsible tube, the extrusion of the contents of the tube into the cap normally opening the same.

A further object of the invention is the provision of a cap which may be readily and expeditiously sealed by a partial turn of the external components thereof to effect a relatively tight seal against accidental extrusion of the contents of the tube.

A further object of the invention is the provision of a device of this character which may be re-utilized, if desired, by removing the same from an exhausted tube and threading the same on a new tube in place of the conventional closure cap.

A further object of the invention is the provision of a device of this character which may be readily and inexpensively manufactured, which is sturdy and durable in construction, reliable and efficient in operation, and which may be operated with a minimum of time and effort.

Still other objects reside in the combinations of elements, arrangements of parts, and features of construction, all as will be more fully pointed out hereinafter and disclosed in the accompanying drawing wherein there is shown a preferred embodiment of this inventive concept.

In the drawing:

FIGURE 1 is an exploded perspective view showing one form of cap constructed in accordance with the instant invention.

FIGURE 2A is a vertical sectional view taken substantially through the center line of the cap showing the same applied to a collapsible tube, in closed position.

FIGURE 2B is a view similar to FIGURE 2A but showing the parts in open position.

FIGURE 3 is a perspective view of the cap applied to a collapsible tube shown in open position.

FIGURE 4A is a transverse sectional view taken through the outer components of the cap in one position of adjustment, the central plunger being omitted; and

FIGURE 4B is a view similar to FIGURE 4A showing a different position of adjustment.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Having reference now to the drawings in detail, one form of dispensing cap constructed in accordance with the instant invention is generally indicated at 10, and comprises essentially three components; a floating cap generally indicated at 11, a transmission tube generally indicated at 12, and a plunger generally indicated at 13. The outer or floating cap comprises a tubular sleeve 14, having a top closure 15 with a central opening 16 therein. The plunger 13 includes a cylindrical head 17 with a spherical bottom face, and a smaller diameter stem 17a, the upper end 17b of the stem being permanently sealed in the opening 16, the sealing being effectuated after assembly, and therefore from the exterior of the assembled

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cap, in a manner to be more fully described hereinafter. The transmission tube 12 includes a sleeve-like portion 18 having a circular inside diameter 18a in cross-section corresponding substantially (that is, with working clearance) to the outside diameter of the head 17 of the plunger 13, the sleeve 18 being thickened in peripheral parts to provide a cam surface such as an oval outside surface 18b for a purpose to be described further hereinafter. The sleeve 18 has an opening 19 in the side thereof at a median location, and the sleeve has a lower portion 20 which is internally threaded as at 21 and adapted to engage the outer threads of a conventional collapsible tube schematically indicated at 22 in FIGURES 2A and 2B and disclosed in FIGURE 3. The lower sleeve portion 20 provides a stop shoulder 23 which is of a radial width approximately equal to the wall of sleeve 14, so that when in assembled relation the sleeve 14 in the closed position of FIGURE 2A will seat on the shoulder 23 and the bottom curved surface of head 17 is slightly spaced above (see FIG. 2B) the horizontal plane of the bottom of sleeve 14, and above the horizontal plane at the top of the internal threads 21 (see FIG. 2A).

The upper portion of transmission tube 12 is provided with a narrow inwardly extending flange 24 of slightly less inside diameter than the diameter of the plunger head 17, thus defining a large central opening 25. The stem of the plunger extends with an annular clearance therearound through the opening 25, and the flange 24 serves as an upper limit stop for the plunger head 17.

As best shown in FIGURES 4A and 4B, the floating cap 11 may have cam surfaces which are illustrated as substantially oval in cross-section, as is also the outside surface 18b of the inner sleeve 18 of the transmission tube 12; each oval being provided with long and short axes which are but slightly different in magnitude.

Both the cap and the tube are constructed of flexible semi-resilient material permitting some deformation of parts upon relative angular rotation of cap 11 relative to sleeve 18. Thus when the long axis of the outer sleeve 14 coincides with the long axis of the outside surface 18b of the inner sleeve 18 (FIG. 4B) relatively free longitudinal movement of the cap relative to the sleeve portion 18 of the tube 12 may be effected.

However, when the cap 11 is given a quarter turn with respect to the stationary sleeve 18 (to the position of FIGURE 4A) so that the normal long axis of the outside surface 18b of the inner sleeve 18 coincides with the short axis of the sleeve 14 of cap 11, a relatively tight binding action is effectuated, which prevents longitudinal movement of the cap 11 relative to the sleeve 18, under the exertion of normal pressure.

In the assembly of the device the plunger 13 is first positioned in the transmission tube 12 with the stem 17a extending upwardly with clearance through the opening 25. The long axis of the sleeve 14 of cap 11 is then aligned with the long axis of the outside diameter 18b of the sleeve 18, with the end 17b of the stem 17a extending into the opening 16 and being flush with top 15. The opening is then sealed from the outside, about the end of the stem in any desired manner, as by heat sealing or other suitable process, so that in effect the plunger and cap become an integral unit. When so assembled the bottom curved surface of head 17 is slightly spaced above the plane of the shoulder 23 above the top of the threads 21, and above the plane of the bottom of sleeve 14.

In the use and operation of the device the conventional cap is removed from any collapsible tube 22 and the threaded interior 21 of collar 20 is threadably engaged with the threaded end of the tube.

When it is desired to seal the device, cap 11 is rotated until its short cross-sectional axis coincides with the long cross-sectional axis of the outside surface 18b of sleeve 18

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of transmission tube 12, at which time a frictional binding is effectuated, and the parts will remain frictionally held in position shown in a desired longitudinal relationship including the closed FIGURES 2A and 4A. When it is desired to extrude the contents of the tube 22, cap 11 is given a partial left or right rotation until its long cross-sectional axis is substantially aligned with the long cross-sectional axis of the sleeve 18 of the transmission tube 12, as shown in FIGURE 4B. At this time freely slidable linear movement of cap 11 along tube 12 may be readily effectuated. The tube 22 is squeezed, and the impingement of its contents against the lower face of the plunger 17 forces the plunger 17 upwardly to the position shown in FIGURE 2B until its upward movement is stopped by flange 24. The opening 19 is so positioned relative to the thickness of plunger head 17 as to be fully exposed when the plunger reaches its upper limit, so that the contents of the tube may be extruded through opening 19, as, for example, onto a toothbrush.

After a sufficient quantity of the contents has been extruded longitudinal pressure towards the tube is exerted on the top 15 of the floating cap. This forces the plunger 17 downwardly, the sleeve 14 effectually sealing the opening 19, and the plunger 17 being positioned adjacent the threaded top of tube 22. A partial turn of cap 11 then realigns its short longitudinal axis with the long longitudinal axis of the sleeve 18 as shown in FIGURE 4A and an effective clamping action is produced precluding accidental longitudinal travel of either the plunger or its associated outer cap.

When the device is removed from a partially filled tube by unscrewing internally threaded sleeve 20 from the male threads of the tube, there remains, projecting beyond the tube, due to the vertical clearance between the curved bottom of the head 17 and the top of the tube threads, a small amount of the tube contents. This small amount of contents may be severed from the remaining tube contents by moving a sterile straight blade across the top of the threads of the tube (viz. by planar cleavage). Then a clean conventional closure cap may be threaded on the tube, and the partial contents kept in an uncontaminated condition.

This anti contamination feature is inherent with the disclosed structure, and it is a considerable advance as compared to the known prior art wherein the bottom of a plunger in use is either coplanar with the top of the threads of the tube, or wherein the bottom of the plunger projects into the delivery mouth of the tube.

From the foregoing it will now be seen that there is herein provided an improved dispensing cap or control which accomplishes all the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative, and not in a limiting sense.

I claim:

1. As an article of manufacture, a dispensing cap for a collapsible tube, comprising
 - an open ended transmission tube having one internally threaded end portion adapted to be engaged with the externally threaded mouth of the tube, and a side opening thru a median portion of the wall of the transmission tube,
 - a floating cap mounted about said transmission tube and longitudinally movable thereover, and including a tubular sleeve and a top closure,
 - a plunger including a head and a stem, said head being of a diameter to move freely within said transmission tube, the longitudinal thickness of said head being such that the head clears said side opening when it is adjacent the top of said transmission tube, and obstructs said side opening when it is adjacent

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said internal thread, said stem extending axially upward from said head and attached to said top closure, a flange on the inner side of the remaining open end of said transmission tube directed towards said stem, said flange forming a stop for said plunger head and floating cap against longitudinal movement away from said internal threads and said side opening of said transmission tube,

the one internally threaded end of said transmission tube is of greater external diameter than the remainder thereof, to provide a shoulder stop against which the end of the tubular sleeve of said cap rests when in closed position,

and the longitudinal position of said latter stop, the longitudinal extent of said floating cap and the longitudinal extent of said plunger is such that a longitudinal clearance is provided between the bottom of said plunger head and the closer end of said internal threads, even when the floating cap is in closed position contacting said latter shoulder,

whereby upon unscrewing the transmission tube from a partially filled collapsible tube, there remains, because of said clearance and projecting beyond thread of the collapsible tube, a small amount of collapsible tube contents, which small amount may be completely removed from the remaining contents within the collapsible tube, by planar cleavage across the end of the externally threaded end of the tube, leaving such remaining contents free of contamination due to contact with any of the structural elements of the dispensing cap.

2. As an article of manufacture, a dispensing cap for a collapsible tube, comprising

an open ended transmission tube of semi-resilient flexible material having one internally threaded end portion adapted to be engaged with the externally threaded mouth of the tube, and a side opening thru a median portion of the wall of the transmission tube, a floating cap of semi-resilient flexible material mounted about said transmission tube and longitudinally movable thereover, and including a tubular sleeve and a top closure with a central opening,

a monolithic plunger including a head and a stem, said head being of a diameter to move freely with a working clearance only within said transmission tube, the longitudinal thickness of said head being less than the distance between said side opening and the top of said transmission tube and more than the distance between said side opening and the closer end of said internal thread, said stem being of smaller diameter than said head and extending axially from said head through said central opening of said floating cap, said stem being sealed to said floating cap at an exterior part of said central opening,

an inwardly extending flange of small radial extent on the inner side of the remaining open end of said transmission tube, said flange directed towards but stopping short of the periphery of said stem, thus providing an annular clearance between the innermost portion of said flange and said stem, said flange forming a stop for said plunger head and floating cap against longitudinal movement away from said internal threads and said side opening of said transmission tube,

whereby initial longitudinal movement of said cap and plunger head away from the collapsible tube, exposes said opening to permit extrusion of the contents of the collapsible tube therethrough, and longitudinal movement of said cap and plunger head in an opposite direction then closes said opening and positions said plunger head adjacent said internally threaded end of said transmission tube.

3. The structure of claim 2 wherein, the longitudinal lengths of said stem and head are such as to provide at all times a clearance between the

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bottom of the head and the more adjacent end of the internal threads of said transmission tube.

4. The structure of claim 2 wherein,

the exterior surface of said transmission tube with the exception of said internally threaded portion, and all the interior surface of said tubular sleeve of said floating cap, are similar in geometrical cross-section shape, and deviate from circular formation by the presence of cam surfaces which are so shaped that in one rotational relationship of sleeve and cap, free relative longitudinal movement may be effected therebetween, but in another rotational relationship of sleeve and cap a binding action is effected therebetween,

whereby the floating cap may be fixedly positioned at any desired longitudinal portion of the transmission tube.

5. The structure of claim 2 wherein,

the adjacent surfaces of said transmission tube and said tubular sleeve of said floating cap are oval in cross-section, with such a small clearance therebetween

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that when the long axes of each oval are substantially aligned, a free relative longitudinal movement of said sleeve and cap is allowed, but when the long axis of one oval is substantially aligned with a short axis of the other oval, a binding action is effected to restrict relative longitudinal movement between said sleeve and cap,

whereby upon approximately 90° angular rotation of said cap in either direction with respect to said transmission tube, the two elements may be released for relative longitudinal movement, or locked against such movement.

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