June 5, 1951 J. A. HORN 2,555,490

AXIALLY SLIDABLE AND AXIALLY DISCHARGING OUTLET ELEMENT OPERATED BY PRESSURE OF CONTENTS

Filed Sept. 9, 1947

Fig. 1.

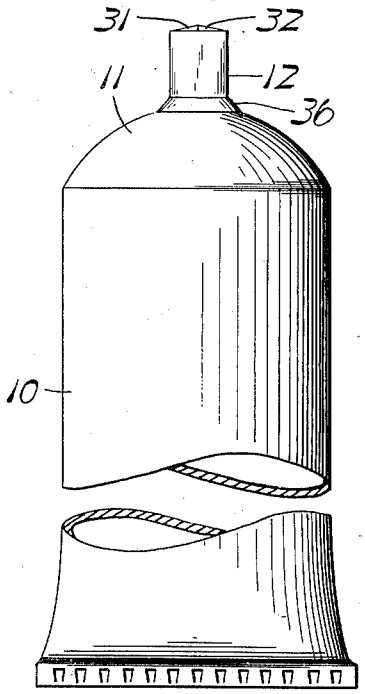


Fig. 6.

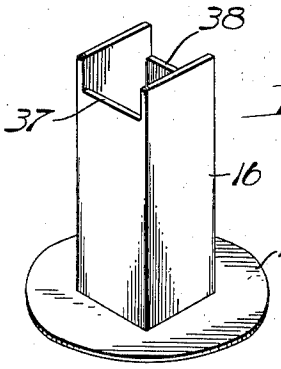


Fig. 7.

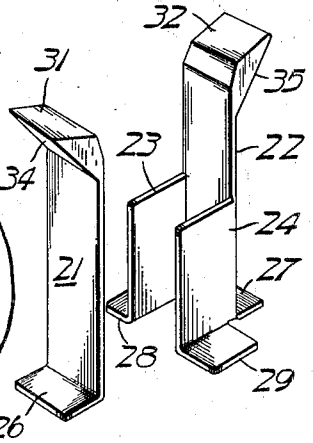


Fig. 5.

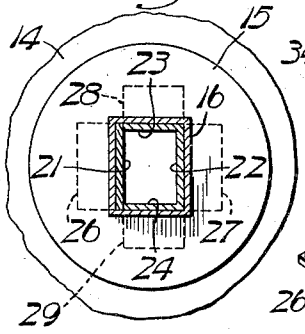


Fig. 2.

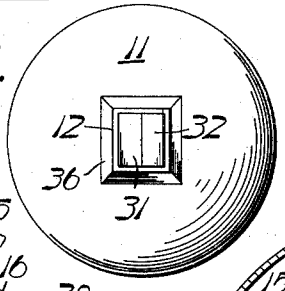


Fig. 4.

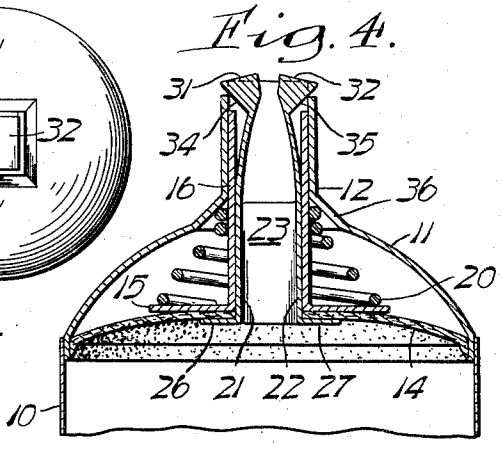
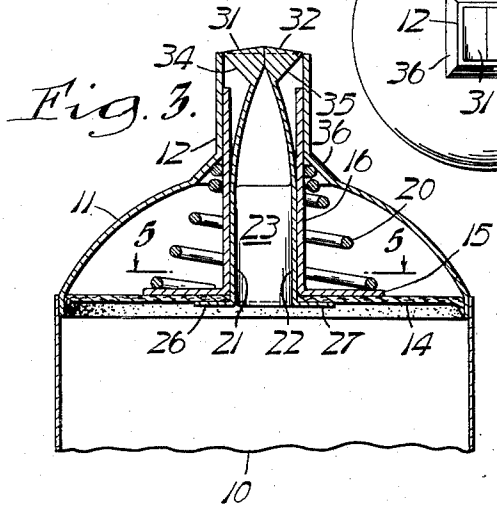


Fig. 3.



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2,555,490

AXIALLY SLIDABLE AND AXIALLY DISCHARGING OUTLET ELEMENT OPERATED BY PRESSURE OF CONTENTS

Joseph A. Horn, Buffalo, N. Y.

Application September 9, 1947, Serial No. 772,907

1 Claim. (Cl. 222—493)

1

This invention relates to dispensing closures for collapsible tubes and particularly to a self-opening closure for such tubes.

It has been variously proposed in the prior art to provide collapsible tube closures which are adapted to open automatically when the tube is squeezed in the usual way to expel its contents. Such devices have in the past not been practical or feasible to produce commercially.

According to the present invention a tube closure is provided which opens readily and automatically upon only the usual moderate squeezing of the tube and closes securely when squeezing pressure is removed. This practical and satisfactory operation is due in general to the overall design of my device and in large measure to the fact that the squeezing pressure is arranged to act against a diaphragm whose extent is equal to the full cross-sectional area of the tube, whereby a very substantial force is available for effecting the closure opening operation.

Conversely, the substantial opening force thus made available permits the employment of spring means of sufficient force to positively close the tube opening when squeezing pressure is terminated.

While a fully detailed embodiment of my invention is illustrated in the accompanying drawing and described in the following specification, it is to be understood that such embodiment is by way of example only, the scope of my invention being limited only as defined in the appended claim.

In the drawings:

Fig. 1 is a general elevational view of a collapsible tube having one form of the closure of my invention, portions of the tube being broken away to permit illustration on an enlarged scale;

Fig. 2 is a top plan view thereof;

Fig. 3 is a central vertical cross sectional view of the upper end of the collapsible tube of Figs. 1 and 2;

Fig. 4 is a view similar to Fig. 3 but with the closure and its operating elements in open position;

Fig. 5 is a fragmentary cross-sectional view on the line 5—5 of Fig. 3;

Fig. 6 is a perspective view of one of the elements of the closure assembly; and

Fig. 7 is a disassembled perspective view of two other elements of the closure assembly.

Throughout the several figures of the drawing like characters of reference denote like parts and the numeral 10 designates the usual main body portion of a collapsible tube having a head or

2

crown portion 11, generally of stiffer construction, and a throat 12 which, in the illustrated embodiment is of square or rectangular cross-section.

Fitted within the upper end of tube at about the point where the tube body 10 and crown 11 meet is a diaphragm 14 whose area coincides with the cross sectional extent and configuration of the tube body itself. The marginal edges of diaphragm 14 are feathered as shown in Fig. 3 and are prevented from moving upwardly to any substantial degree by the rapidly reducing diameter of the crown 11.

The diaphragm 14 may be of rubber or fabric, synthetic or natural, or of any other pliable and readily flexible material. The diaphragm has a square or rectangular central opening over which seats a base flange 15 of a square or rectangular tubular member 16, shown in detail in Fig. 6. Tubular member 16 extends slidably into throat 12 of the tube proper and serves at all times to close off the space within crown 11 from the interior of the tube body 10 which contains the material for which the tube is provided, such as tooth paste, shaving cream, or the like.

This free space within crown 11 comprises a spring chamber and, as appears clearly from Fig. 3, a frusto-conical compression coil spring 20 acts between the upper interior portion of crown 11 and the upper surface of base flange 15 to normally urge the tubular member 16 and the diaphragm 14 to the position illustrated in Fig. 3, wherein, as will presently appear, the tube is in closed condition.

A pair of resilient up-standing plate elements 21 and 22 comprise the closure proper and are illustrated in detail in Fig. 7. The element 22 has a pair of side flanges 23 and 24 which abut plate element 21 when the elements are in assembled position in tubular member 16 as appears from Figs. 3 and 5, particularly the latter. It will be noted that flanges 23 and 24 of plate element 22 are at the lower part thereof so that the parts of both plate elements 21 and 22 above flanges 23 and 24 may be flexed toward each other from the free positions shown in Fig. 7.

A base flange 26 is formed at the bottom of plate element 21 and base flanges 27, 28 and 29 are provided at the bottom of plate element 22. When the plate elements 21 and 22 are assembled upwardly through the central opening in diaphragm 14 and through tubular member 16 the base flanges 26, 27, 28 and 29 seat against the under side of the diaphragm. The flange 15 and flanges 26 through 29 may be held in engagement

with diaphragm 14 by the opposing pressures of spring 20 and the contents of the tube or they may be fastened by extraneous means if desired.

At their upper ends plate elements 21 and 22 are provided with head portions 31 and 32, respectively, which cooperate to close the throat of the tube as illustrated in Fig. 3. The parts are normally held in this position by the downward force of spring 20 against base flange 15. The heads 31 and 32 have cam surfaces 34 and 35, respectively, which engage the upper inside edges of throat 12 to retain the heads in the throat-closing position of Fig. 3.

At the junction of crown 11 and throat 12 there is a tapered portion 36 which facilitates assembly of the plate elements 21 and 22 by camming the head portions 31 and 32 toward each other as they are moved upwardly toward throat 12 during assembly.

However, when squeezing pressure is exerted against the tube body, diaphragm 14 is forced upwardly to the position of Fig. 4 against the resistance of spring 20. This moves plate elements 21 and 22 and tubular member 16 upwardly and cam surfaces 34 and 35 permit the heads to spread because of the natural tendency of elements 21 and 22 to straighten. This spring tendency is augmented by the pressure of the contents of the tube passing upwardly between plate elements 21 and 22. It will be noted from Fig. 6 that two of the upper edges of tubular members are recessed as at 37 and 38 to permit the spreading movement of heads 31 and 32. When squeezing pressure on the tube is stopped spring 20 returns the parts from the position of Fig. 4 to the position of Fig. 3.

What is claimed is:

A dispensing closure for a collapsible tube having a collapsible body portion, a head at one end

and a reduced throat leading from said head, said closure including a flexible diaphragm extending across the interior of said body portion at its juncture with said head, a rigid tubular member extending from said diaphragm to said throat and slidable in the latter upon movement of the diaphragm, an opening in said diaphragm establishing communication between the interior of the body portion and the interior of the throat by way of said tubular member, a pair of closure elements having closure heads which cooperate to close the outer end of said throat when in closed position and a vertical resilient plate element supporting each closure head from said diaphragm, said plate elements being biased to move apart and said heads having inclined lateral cam surfaces for engagement against the outer end of said throat whereby upward movement of said diaphragm due to squeezing pressure on the tube body causes the closure heads to move outwardly from said throat and separate by reason of the bias of the plate elements, a compression coil spring acting between said diaphragm and the inner surface of said head for returning the closure heads to throat closing position when squeezing pressure on the tube body is terminated.

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