April 8, 1930. W. V. ROOS 1,753,665

COLLAPSIBLE TUBE

Filed Nov 24, 1928

Fig. 1.

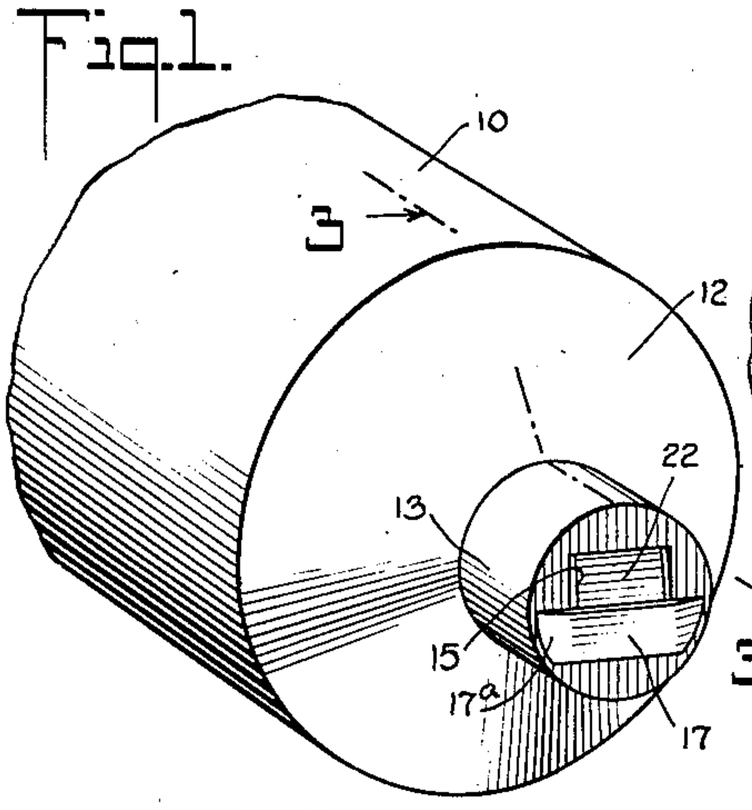


Fig. 2.

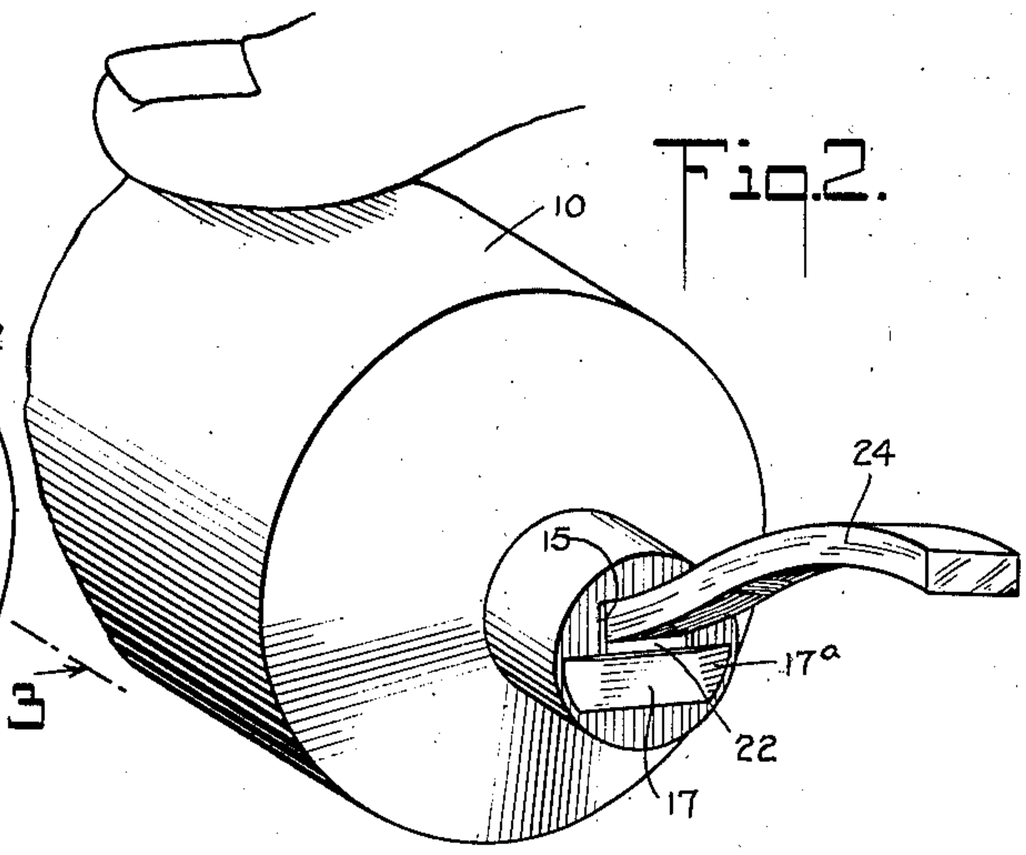


Fig. 3.

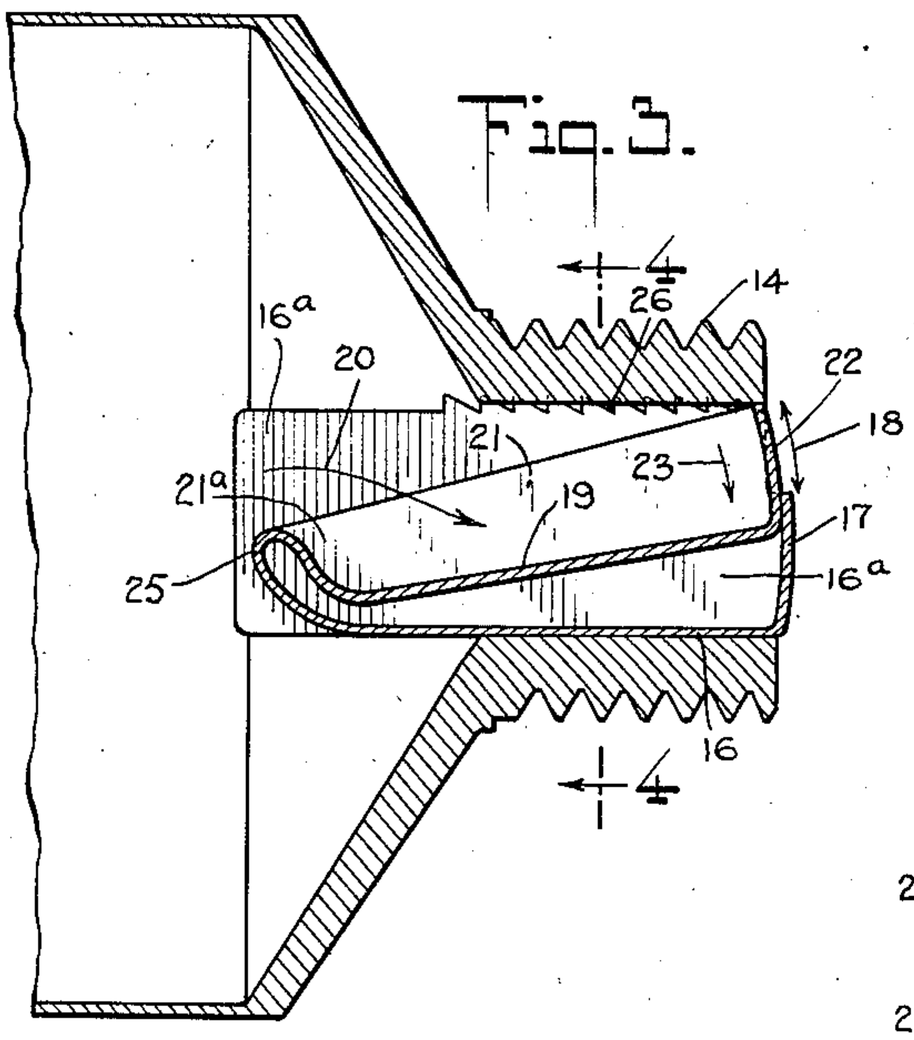


Fig. 4.

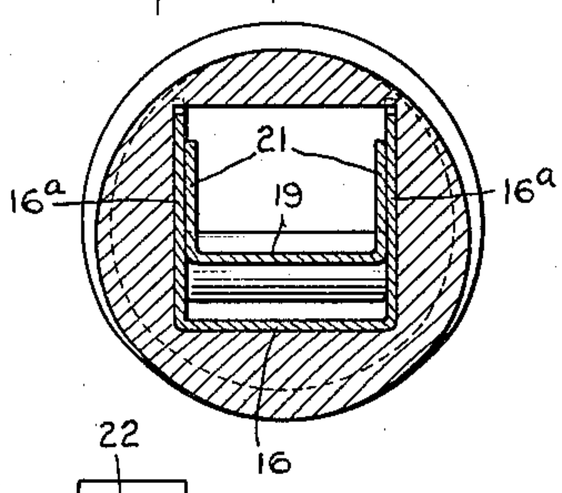


Fig. 5.

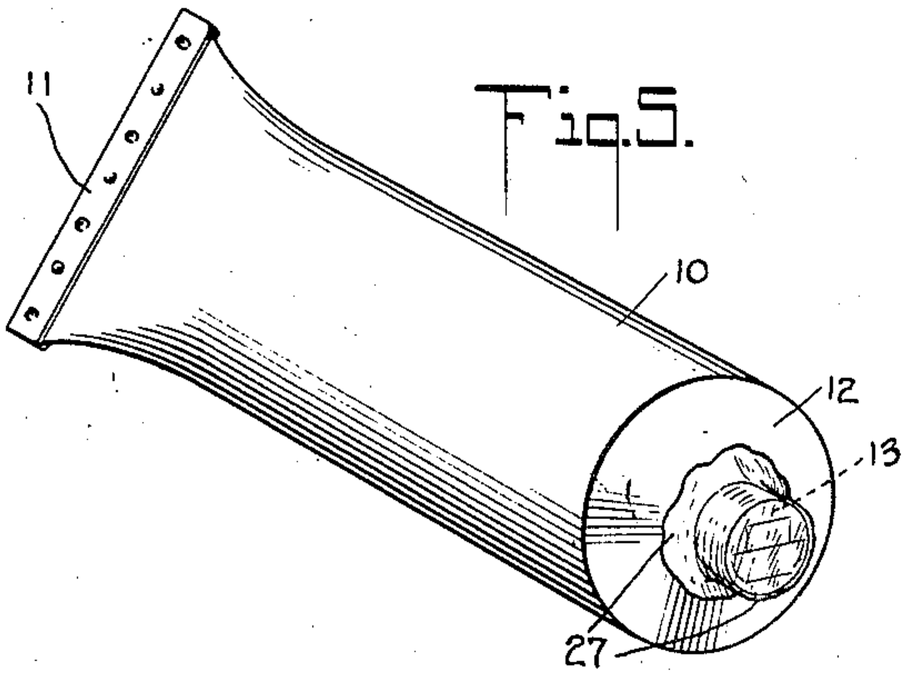
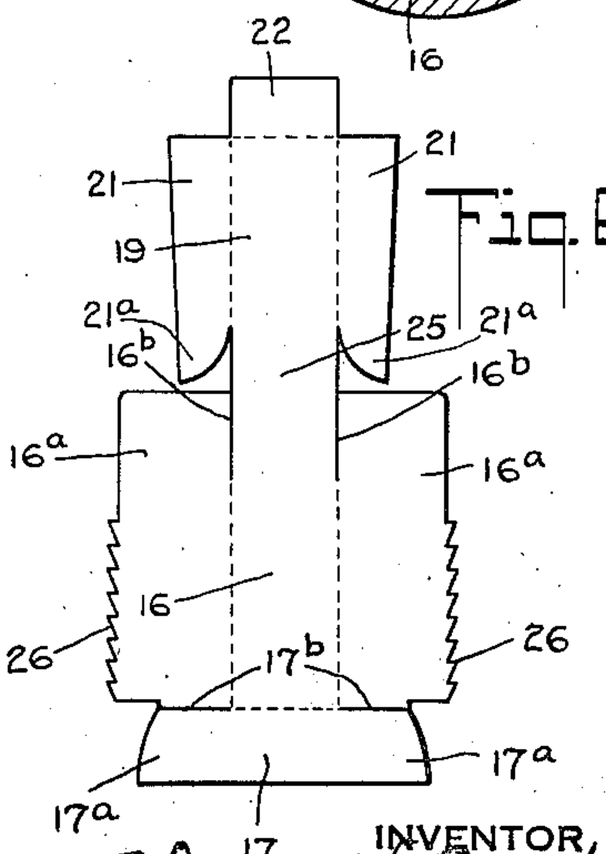


Fig. 6.



INVENTOR,
Wendell V. Roos,
BY
Henry J. Lucke,
ATTORNEY

Patented Apr. 8, 1930 1,753,665

UNITED STATES PATENT OFFICE

WENDEL V. ROOS, OF NEW YORK, N. Y.

COLLAPSIBLE TUBE

Application filed November 24, 1928. Serial No. 321,679.

This invention relates to automatic opening and closing devices for collapsible tubes and the like.

Pursuant to my invention, the automatic closure device for a collapsible tube or the like comprises a member formed or inserted within the discharge orifice of the collapsible tube consisting essentially of a relatively fixed element having a terminal flange portion thereof disposed at or adjacent the terminus of the discharge orifice and extending over a substantial portion of the opening of the orifice of a relatively movable element having a body portion extending transversely to the direction of discharge flow of the medium contained within the collapsible tube, said relatively movable element further comprising a terminal flange portion coacting when in its closed position with said fixed flange portion to effectually fully close the opening of the discharge orifice and upon the flow of the medium is displaced to provide for the discharge of the medium.

In most preferred forms of my invention, the member comprising the above stated two elements is formed from a unitary blank of a suitable contour whereby upon folding the portions of the blank the above stated two elements are provided. My invention is particularly applicable for collapsible tubes having a square or rectangular discharge orifice and the member as a unit is inserted and retained in position against the pressure exerted by the medium during discharge by a serrated or other sharp edge peripheral portion serving as retaining means.

Further features and objects of my invention will be more fully understood from the following detail description and the accompanying drawings, in which:

Fig. 1 is a perspective view of a collapsible tube having its discharge nipple provided with my invention; this view shows my closure device in its closed position;

Fig. 2 is a perspective view similar to Fig. 1 and showing a medium of viscous nature at a stage of discharge;

Fig. 3 is a sectional elevation on line 3—3 of Fig. 1;

Fig. 4 is a sectional elevation on line 4—4 of Fig. 3;

Fig. 5 is a perspective view similar to Fig. 1 showing the use of a temporary outer coating of closure material; and

Fig. 6 is a plan view of a blank from which my closure member may be formed.

The collapsible tube 10 is of any standard or other suitable type, and comprises essentially a cylindrical portion closed at its bottom by means of the usual clip 11 or the like. The top 12 of the tube is usually frusto-conical to which the discharge nipple 13 is attached. The discharge nipple may be provided with threading 14, see Fig. 3, or bayonet joint or other suitable form of connecting means for a cap (not shown), or may be substantially smooth for use with or without a cap, as appears more fully hereinafter. The orifice 15 of the discharge nipple is shown of substantially square outline.

The device embodying my invention comprises essentially the element 16, the body portion of which is bent at its two right-angled corners to lie adjacent three of the four sides of the orifice 15. Its forward terminal portion 17 is bent upwardly, as viewed in Figs. 1, 2 and 3, to form a terminal fixed flange and of a width to completely close the orifice at three sides but of reduced height to provide for the clearance 18, indicated by a double arrowed line, serving as the effective discharge opening for the tube.

My closure device further comprises the relatively movable element 19 having its body portion extending transversely to the direction of flow, indicated by the arrow 20 see Fig. 3, of the medium contained within the collapsible tube when the collapsible tube is manually or otherwise compressed for discharging the same.

The opposite side flanges 21, 21, see Figs. 3 and 4, are of reduced height relative to the sides 16^a, 16^a of the element 16. The front flange 22 of the relatively movable element 19, when in its closed position, serves to effectually close the clearance 18.

Upon compression of the collapsible tube, the contained medium is subjected to pressure, effective upon the body portion 19 of

the relatively movable member, causing the latter to be displaced in the direction of the arrow 23, and thereby displacing the movable flange 22 in the region of the clearance 18, thus providing for an extent of discharge opening dependent upon the degree of pressure applied. With the use of a highly viscose medium, the discharge indicated at 24, see Fig. 2, has the general outline of the discharge opening, the movable flange 22 being displaced to more or less extent relative to the fixed closure flange 17.

Upon release of the pressure, the movable body portion 19 and its movable closure flange 22 are returned to fully closed position automatically, usually by the resiliency of the material of the body portion 19.

Preferably, the parts of my closure member are of unitary construction and of any suitable resilient material such as Monel metal, tempered soft steel or the like formed of a blank of suitable configuration, see Fig. 6, affording the formation of the respective parts of my closure device by suitable blanking, cutting and folding of the respective portions of the material. In such construction, a flexing pivot is provided at the location indicated at 25, see Figs. 3 and 6, affording a linear pivot point for resiliently returning the relatively movable portion 19 upon release of pressure.

Pursuant to the most preferred form of my invention, the location of flexing of the material at the line of bend 25, serving as the pivot for the relatively movable element 19, is disposed substantially at the radial center relative to the fixed flange portion 17, and for this purpose the material adjacent the location 25 is upturned curvedly as is indicated in Fig. 3. Also, the opposite side walls 16^a, 16^a of the fixed portion 16 extend to a location posteriorly of the location 25 of flexing and are pressed to make a close fit with the abutting edges of the pivot portion 25, to avoid any substantial clearance between the material 25 and the side walls 16^a, 16^a, and thus prevent any substantial accumulation of the medium in the space between the fixed element 16 and the relatively movable element 19.

Furthermore, I prefer to provide the fixed flanged portion 17 with extensions or apron portions 17^a, 17^a, serving to abut the outer face of the discharge opening and thus limit the extent of insertion of my closure device within the discharge orifice of the collapsible tube.

As a simple and convenient method of retaining my closure device within the discharge orifice I provide the serrations 26 or other angular cuts at one or both of the side portions 16^a, 16^a, of the fixed element 16, thus enabling the closure device as a unit to be inserted under pressure within the discharge orifice and firmly held in position by the serrations 26 or equivalent.

As indicated above, a cap may or may not be employed, and when a cap is employed the same may be secured in position by screw threading 14, bayonet joint or other desired form of disconnectable connection. A cap may be employed during the period of shipment and display by being suitably dimensioned for a friction fit between the cap and the nipple of the tube.

I prefer not to employ a cap and to apply by dipping or otherwise a temporary closure material such as nitrocellulose or other form of so-called "soluble cotton", gelatine, paraffin or the like, as indicated at 27 in Fig. 5; such closure material may be readily removed by means of a knife or the like or by other procedure.

My invention will be understood from the foregoing particulars. It will also be appreciated that the approved steps of manufacture of present day collapsible tubes may be adhered to in the adaptation of my invention, as well as the approved present day procedure of automatic and other filling of the desired media within the tubes. My closure device is preferably inserted in position within the discharge orifice of the tube during the process of manufacture of the tube.

A preferred form of my invention as formed of a unitary blank is illustrated in Fig. 6. The body portion 16, positioned in Fig. 3 at the bottom, is substantially central of the corresponding portion of the blank and the body portion 19 extends substantially in alignment with said body portion 16. The fixed flange 17 is formed with the preferred opposite extensions 17^a, 17^a, by providing the slits 17^b and giving the desired contour and folding along indicated dotted lines. The portions 16^a, 16^a of the body portion 16 are formed of suitable contour and by the provision of the slits 16^b and folding along the indicated dotted lines. The side portions 21, 21 of the body portion 19 of the movable element of my closure device are formed by providing the desired contour with wings 21^a and folding along the indicated dotted lines. The movable flange 22 is formed by folding along its indicated dotted lines.

It is convenient in the use of steel to blank out the blank indicated in Fig. 6, then form the respective parts of my closure device as above described, and thereafter to be tempered in accordance with the characteristics of the material and the special requirements of the manufacturer.

It will be observed that the hereinabove described forms of my closure device are inserted within the discharge orifice of the tube by the application of pressure, in which operation the serrations 26 or equivalent function to retain the closure device against outward displacement upon application of

pressure to the tube for discharging the contained medium, and the extent of insertion of the closure device is limited by the extensions 17ª, 17ª engaging the outer face of the discharge orifice.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. The combination of a collapsible tube, a unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion extending in one dimension less than the corresponding dimension of the orifice to provide a clearance thereat and a relatively movable element having a body portion normally disposed obliquely to the direction of discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally extending to close said clearance, said body portion being arranged to be displaced upon application of pressure to the medium within the body of the tube and thereby displace its terminal flange portion to provide a discharge opening through said clearance and to return to normal position upon release of such pressure.

2. The combination of a collapsible tube, unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally extending to close said clearance and resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance.

3. The combination of a collapsible tube, unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally tending to close said clearance, resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance and to provide a discharge opening through said clearance and means for frictionally retaining said fixed body portion within the discharge orifice of the tube.

4. The combination of a collapsible tube, unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally tending to close said clearance, resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance and stop means for limiting the extent of insertion of said closure device within the discharge orifice.

5. The combination of a collapsible tube, unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally tending to close said clearance, resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance and stop means extending to the front face of said discharge orifice for limiting the extent of in-

sertion of said closure device within the discharge orifice.

6. A closure device for the discharge orifice of a collapsible tube comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally extending to close said clearance, resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance and stop means extending to the front face of said discharge orifice for limiting the extent of insertion of said closure device within the discharge orifice.

7. A closure device for the discharge orifice of a collapsible tube comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally extending to close said clearance and resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance, said fixed element further having oppositely disposed portions extending laterally of said resilient means for excluding the medium from the region of free movement of said movable element.

8. The combination of a collapsible tube, unitary closure device disposed within the discharge orifice of said tube, said closure device comprising a relatively fixed element having an outer flange portion disposed adjacent the outer terminal of the discharge orifice, said flange portion having a dimension less than the corresponding dimension of the orifice to provide a clearance thereat, a relatively movable element having a body portion normally disposed obliquely to the direction of the discharge flow of the medium within the tube, said relatively movable element further having a terminal flange portion normally extending to close said clearance and resilient means normally tending to position said movable flange portion within said clearance, said resilient means being adapted to yield to the flow of the medium upon application of pressure to thereby displace said movable flange portion to provide a discharge opening through said clearance, said fixed element further having oppositely disposed portions extending laterally of said resilient means for excluding the medium from the region of free movement of said movable element.

In testimony whereof I have signed this specification this 21st day of Nov. 1928.

WENDEL V. ROOS.