

Feb. 25, 1930.

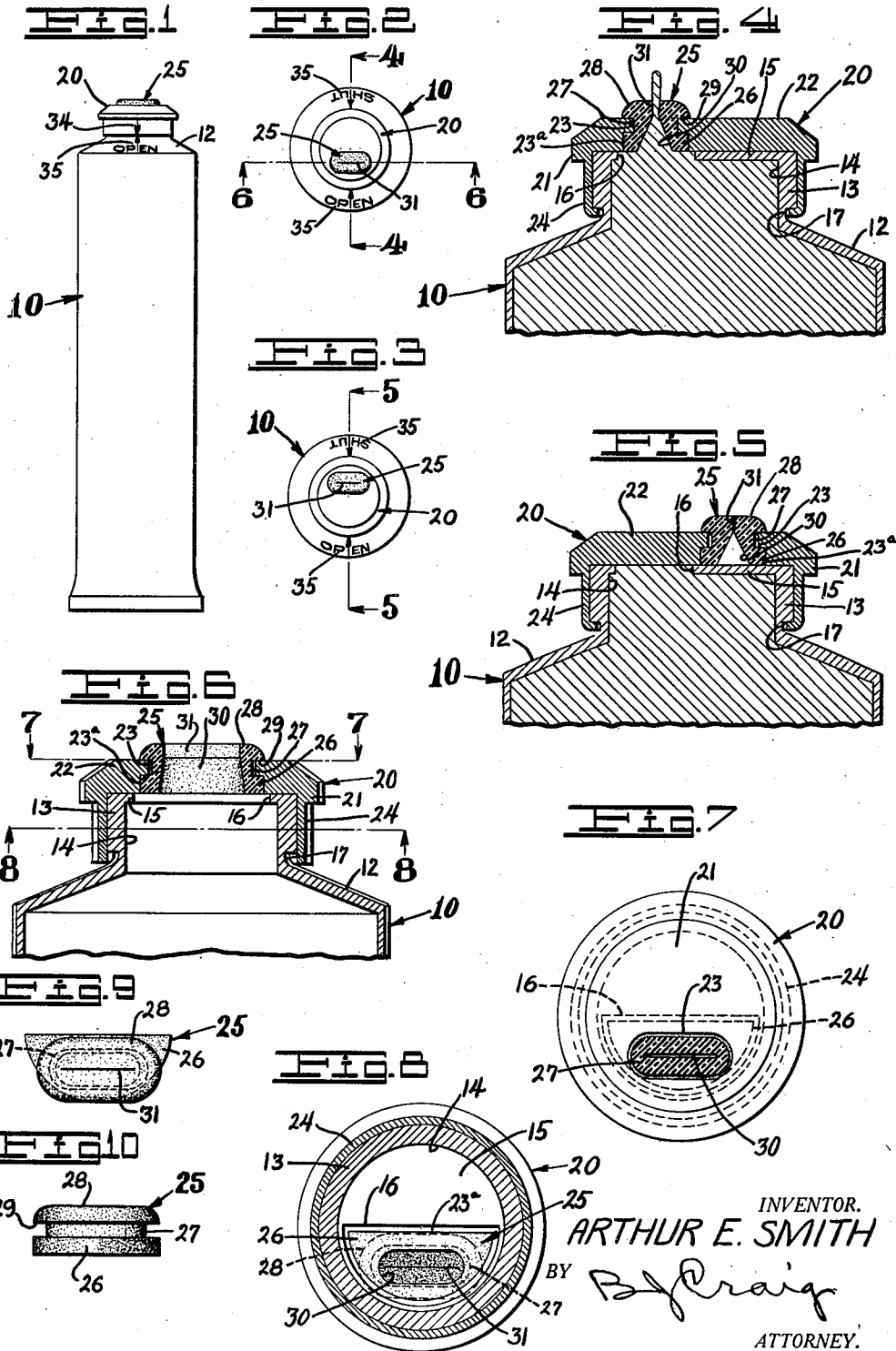
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1,748,682

AUTOMATIC VALVE FOR CLOSURES

Filed May 28, 1928

2 Sheets-Sheet 1



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AUTOMATIC VALVE FOR CLOSURES

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2 Sheets-Sheet 2

Fig. 11

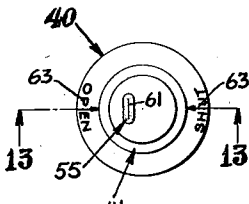


Fig. 12

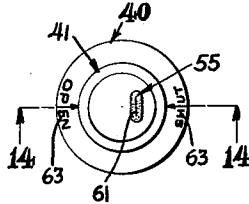


Fig. 13

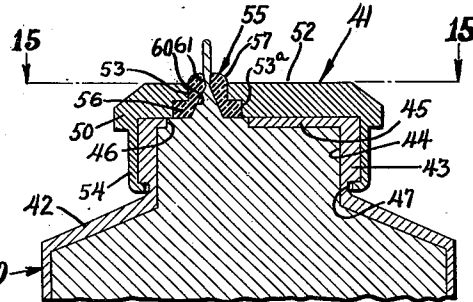


Fig. 15

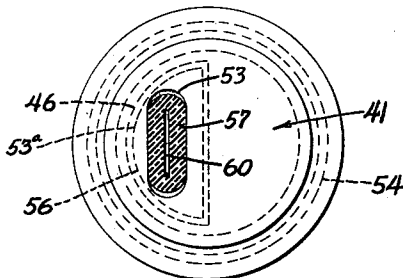


Fig. 14

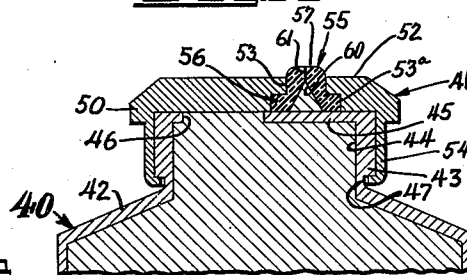


Fig. 16

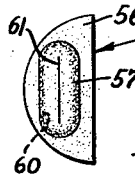


Fig. 17

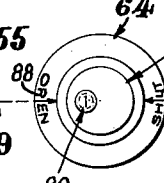


Fig. 18

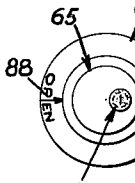


Fig. 19

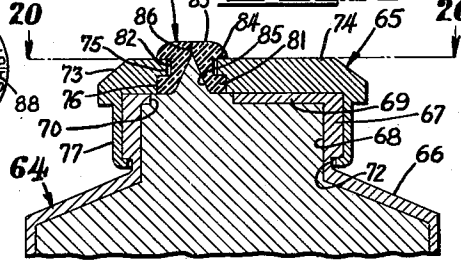


Fig. 22

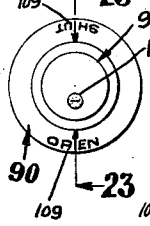


Fig. 24

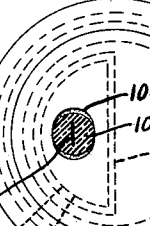


Fig. 21



Fig. 20

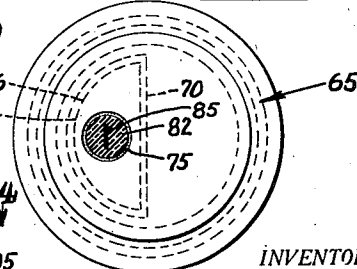


Fig. 25

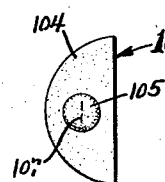


Fig. 23

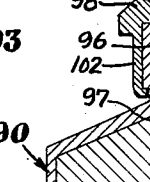


Fig. 26



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AUTOMATIC VALVE FOR CLOSURES

Application filed May 28, 1928. Serial No. 281,131.

This invention relates to improvements in closures for receptacles.

The general object of this invention is to provide an improved closure for a collapsible tube wherein the closure includes an automatic valve.

Another object of the invention is to provide a rotatable collapsible tube cap having an automatic discharge valve therein.

A further object of the invention is to provide novel means for retaining an automatic valve on the closure cap.

Another object of the invention is to provide a closure including an automatic discharge valve, the perimeter of which is less than the perimeter of the discharge opening in the tube.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is an elevation of a collapsible tube embodying the features of my invention.

Fig. 2 is a top plan view of the tube of Fig. 1, showing the cap turned to a position wherein the tube contents may be discharged.

Fig. 3 is a view similar to Fig. 2 showing the cap turned to a closed position.

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 2, showing the valve opened by pressure of the tube contents.

Fig. 5 is a section taken on line 5—5 of Fig. 3.

Fig. 6 is a section taken on line 6—6 of Fig. 2, showing the cap before it is fastened to the tube neck.

Fig. 7 is a section taken on line 7—7 of Fig. 6.

Fig. 8 is a section taken on line 8—8 of Fig. 6.

Fig. 9 is a detail side elevation of the automatic valve shown in Figs. 1 to 8 inclusive.

Fig. 10 is a top plan view of the valve of Fig. 9.

Fig. 11 is a top plan view of a slightly modified form showing the cap turned to a position wherein the tube contents may be discharged.

Fig. 12 is a view similar to Fig. 2 showing the cap turned to a closed position.

Fig. 13 is an enlarged section taken on line 13—13 of Fig. 11 showing the valve opened by pressure of the tube contents.

Fig. 14 is a section taken on line 14—14 of Fig. 12.

Fig. 15 is a section taken on line 15—15 of Fig. 13.

Fig. 16 is a detail top plan view of the automatic valve shown in Figs. 11 to 15 inclusive.

Fig. 17 is a top plan view of another slightly modified form showing the cap turned to an open position.

Fig. 18 is a view similar to Fig. 17 showing the cap turned to a closed position.

Fig. 19 is an enlarged section taken on line 19—19 of Fig. 17.

Fig. 20 is a section taken on line 20—20 of Fig. 19.

Fig. 21 is a detail top plan view of the automatic valve shown in Figs. 17 to 20 inclusive.

Fig. 22 is a top plan view of still another modification showing the cap turned to an open position.

Fig. 23 is an enlarged section taken on line 23—23 of Fig. 22.

Fig. 24 is a section taken on line 24—24 of Fig. 23, and

Fig. 25 is a detail top plan view of the automatic valve shown in Figs. 22 to 24 inclusive.

Referring to the drawings by reference characters I have shown my invention in connection with a collapsible metallic tube indicated generally at 10. In the following description I will describe my invention as used in connection with tubes of this character which are particularly adapted for the purpose of dispensing material such as dental creams and pastes, although it will be understood that the invention is not limited to this particular use, but may be used for dispensing other plastic or semi-viscous substances which flow more or less freely.

As shown in the accompanying drawings, the collapsible tube 10 is provided with a conical end portion 12 having a cylindrical neck 13 integral therewith. The neck 13 includes a cylindrical recess 14 which commu-

nicates at one end with the interior of the tube 10 and is provided at the other end with a transverse partition 15 having an eccentrically located aperture 16 therethrough. Adjacent the juncture of the conical end portion 12 and the neck 13 I provide an external groove 17.

A metallic cap indicated generally at 20 is adapted to be positioned on the neck 13 and is shown as including a body portion 21, a top 22 having an eccentrically located aperture 23 therein which communicates with a recess 23^a in the body 21 and a skirt portion 24. The recesses 16 and 23^a are preferably similar in shape, being semi-circular. The cap 20 includes an automatic valve indicated generally at 25, which is preferably made of a good grade of rubber vulcanized to the desired elasticity.

As clearly shown in Figs. 9 and 10 the automatic valve 25 includes a semi-cylindrical body portion 26 having a centrally located substantially elliptical neck 27 thereon on which is provided an enlarged substantially elliptical head 28 which includes an overhanging peripheral flange 29. A recess 30 is provided in the body portion 26 and the neck 27 and a slit 31 in the head communicates with the recess 30.

The automatic valve 25 is adapted to be positioned in the recess 23^a of the cap 20 so that the valve neck 27 is positioned in the cap aperture 23 and the valve head 28 protrudes beyond the top 21 of the cap while the valve head flange 29 overlaps the cap aperture 23 as clearly shown in the drawings.

In the form now being described the area of the valve body 26 is preferably less than the area of the tube flange aperture 16 as shown in Fig. 8, and the area of the valve neck 27 is preferably less than the area of the cap aperture 23 as shown in Fig. 7. The distance between the top of the valve body 26 and the underside of the head flange 29 (i. e. the length of the neck 27) is preferably less than the thickness of the side walls of the cap aperture 23. Thus when the valve 25 is positioned in the cap 20 the side wall of the cap aperture 23 distorts the valve head 28 and exerts a pressure thereon which tends to retain the valve discharge slit 31 closed. The amount of pressure exerted on the valve head to retain the slit closed may be regulated by varying the relative breadth of the cap aperture and the length of the neck 27.

Either before or after the valve 25 has been positioned in the cap 20 the latter is placed on the neck 13 of the tube and the ends of the cap skirt 24 are spun into the neck groove 17 as shown in Figs. 4 and 5.

When the cap is operatively positioned on the tube the recess 30 of the valve 25 is adapted to register with the aperture 16 of the neck partition 15 as shown in Figs. 4 and 8. When the cap is in this position it is

only necessary to apply pressure to the tube 10 to force the contents thereof out through the valve slit 31 which opens as clearly shown in Fig. 4. The difference in the circumference of the valve neck 27 and the cap aperture 23 allows the valve neck to expand when the tube contents is being discharged. After the pressure on the tube has been removed the elasticity of the valve forces the slit 31 closed again.

When the cap 20 is turned to the position shown in Figs. 3 and 5 so that the valve recess 30 does not register with the tube aperture 16, pressure on the tube will not force the tube contents out.

An indicator 34 may be provided on the cap 20 which is adapted to coact with indicia matter on the tube such as indicated at 35 to show the open and closed positions of the valve.

In Figs. 11 to 16 inclusive I have shown a collapsible tube 40 having a metallic cap 41 thereon which includes a modified form of automatic discharge valve. The tube 40 is provided with a conical end portion 42 having a cylindrical neck 43 integral therewith. The neck 42 includes a cylindrical recess 44 which communicates at one end with the interior of the tube 40 and is provided at the other end with a transverse partition 45 having an eccentrically located semi-circular aperture 46 therethrough (see Fig. 15).

Adjacent the juncture of the conical end portion 42 and the neck 43 I provide an external groove 47. The cap 41 is adapted to be positioned on the neck 43 and is shown as including a body portion 50, a top 52 having an eccentrically located substantially elliptical aperture 53 therein which communicates with a semi-circular recess 53^a in the body 50, and a skirt portion 54. The cap 41 includes an automatic valve indicated generally at 55 which is preferably made of a good grade of rubber vulcanized to the desired elasticity.

As shown the automatic valve 55 includes a semi-circular body portion 56 having an eccentrically located substantially elliptical neck 57 thereon. A recess 60 is provided in the body portion 56 and the neck 57 and a slit 61 in the head communicates with the recess 60.

The automatic valve 55 is adapted to be positioned in the recess 53^a of the cap 41 so that the valve neck 57 is positioned in the cap aperture 53. The length of the valve neck 57 is preferably less than the length of the cap aperture 53 as shown in Fig. 15 and the width of the neck 57 is preferably slightly greater than the width of the cap aperture 53.

Thus when the valve 55 is positioned in the cap 41 the side walls of the cap aperture 53 distort the valve neck 57 and exert a pres-

sure thereon which tends to retain the valve discharge slit 61 closed. The amount of pressure exerted on the valve head to retain the slit closed may be regulated by varying the relative proportion of the width of the cap aperture to the width of the valve neck.

After the valve 55 has been positioned in the cap 41 the cap is placed on the neck 43 of the tube and the ends of the cap skirt 44 are spun into the neck groove 47.

When the cap is operatively positioned on the tube the recess 60 of the valve 55 is adapted to register with the aperture 46 of the neck partition 45 as shown in Figs. 13 and 15. When the cap is in this position it is only necessary to apply pressure to the tube 40 to force the contents thereof out through the valve slit 61 which opens as shown in Fig. 13. The difference in the length of the valve neck 57 and the cap aperture 53 allows the valve neck to expand when the tube contents is being discharged. After the pressure on the tube has been removed the elasticity of the valve forces the slit 61 closed again.

When the cap 41 is turned to the position shown in Figs. 12 and 14 so that the valve recess 60 does not register with the tube aperture 46 pressure on the tube will not force the tube contents out.

Indicia matter such as indicated at 63 may be provided on the tube 40 and is adapted to coact with an indicator on the cap 41 to show the open and closed positions of the valve.

In Figs. 17 to 21 inclusive I have shown a collapsible tube 64 having a cap 65 thereon which includes another modified form of discharge valve. The collapsible tube 64 is provided with a conical end portion 66 having a cylindrical neck 67 integral therewith. The neck 67 includes a cylindrical recess 68 which communicates at one end with the interior of the tube 65 and is provided at the other end with a transverse partition 69 having an eccentrically located semi-circular aperture 70 therethrough. Adjacent the juncture of the conical end portion 66 and the neck 67 I provide an external groove 72.

The cap 65 is adapted to be positioned on the neck 67 and is shown as including a body portion 73, a top 74 having an eccentrically located annular aperture 75 and a counter-sunk recess 76 in the body 73 and a skirt portion 77. The cap 65 includes an automatic valve indicated generally at 80 which is preferably made of a good grade of rubber vulcanized to the desired elasticity.

As shown, the automatic valve 80 includes a semi-circular body portion 81 having a centrally located annular neck 82 thereon on which is provided an enlarged annular head 83 which includes an overhanging peripheral flange 84. A recess 85 is provided in the body portion 81 and extends into the neck 82. A slit 86 in the head communicates with the recess 85.

The automatic valve 80 is adapted to be positioned in the recess 76 of the cap 65 so that the valve neck 82 is positioned in the cap aperture 75 and the valve head 83 protrudes beyond the top 74 of the cap and the valve head flange 84 overlaps the aperture 75.

The circumference of the valve neck 82 is preferably less than the circumference of the cap aperture 75 as shown in Fig. 20, and the length of the valve neck is preferably less than the thickness of the side walls of the cap aperture 75.

Thus when the valve 80 is positioned in the cap 65 the side wall of the cap aperture 75 distorts the valve head 83 and exerts a pressure thereon which tends to retain the valve discharge slit 86 closed. The amount of pressure exerted on the valve head to retain the slit closed may be regulated by varying the relative proportion of thickness of the cap aperture to the distance between the top of the valve body and the underside of the valve head as previously stated.

After the valve 80 has been positioned in the cap 65 the cap is placed on the neck 67 of the tube and the ends of the cap skirt 77 are spun into the neck groove 72 as shown.

When the cap is operatively positioned on the tube the recess 85 of the valve 80 is adapted to register with the aperture 70 of the neck partition 69 as shown in Figs. 19 and 20. When the cap is in this position it is only necessary to apply pressure to the tube 64 to force the contents thereof out through the valve slit 86 which opens. The difference in the circumference of the valve neck 82 and the cap aperture 75 allows the valve neck to expand when the tube contents are being discharged. After the pressure on the tube has been removed the elasticity of the valve forces the slit 86 closed again.

When the cap 65 is turned to the position shown in Fig. 18 the valve recess 85 does not register with the tube aperture 70 and the pressure on the tube will not force the tube contents out.

Indicia matter such as indicated at 88 may be provided on the tube 64 and adapted to coact with an indicator on the cap 65 to show the open and closed positions of the valve.

In Figs. 22 to 25 inclusive I have shown a collapsible tube 90 having a cap 91 thereon which includes a further modified form of discharge valve. The collapsible tube 90 is provided with a conical end portion 92 having a cylindrical neck 93 integral therewith. The neck 93 includes a cylindrical recess which communicates at one end with the interior of the tube 90 and is provided at the other end with a transverse partition 95 having an eccentrically located aperture 96 therethrough. Adjacent the juncture of the conical end portion 92 and the neck 93 I provide an external groove 97.

The cap 91 is adapted to be positioned on

the neck 93 and is shown as including a body portion 98, a top 99 having an eccentrically located substantially elliptical aperture 100 and a countersunk recess 101 in the body 98, and a skirt portion 102. The cap 91 includes an automatic valve indicated generally at 103 which is preferably made of a good grade of rubber vulcanized to the desired elasticity.

As shown the automatic valve 103 includes a semi-circular body portion 104 having a centrally located annular neck 105 thereon. A recess 106 is provided in the body portion 104 and the neck 105 and a slit 107 in the neck communicates with the recess 106.

The automatic valve 103 is adapted to be positioned in the recess 101 of the cap 91 so that the valve neck 105 is positioned in the cap aperture 100 and protrudes beyond the top 99 of the cap.

The circumference of the valve neck 105 is preferably less than the width of the cap aperture 101 as shown in Fig. 24, and the length of the cap aperture 101 is preferably greater than the circumference of the valve neck 105.

Thus when the valve 103 is positioned in the cap 91 the side walls of the cap aperture 100 distort the valve neck 105 and exerts a pressure thereon which tends to retain the valve discharge slit 107 closed. The amount of pressure exerted on the valve head to retain the slit closed may be regulated by varying the width of the cap aperture relative to the width of the valve neck.

After the valve 103 has been positioned in the cap 91 the cap is placed on the neck 93 of the tube and the ends of the cap skirt 102 are spun into the neck groove 97 as shown.

When the cap is operatively positioned on the tube the recess of the valve 106 is adapted to register with the aperture 96 of the neck partition 95 as shown in Figs. 23 and 24. When the cap is in this position it is only necessary to apply pressure to the tube 90 to force the contents thereof out through the valve slit 107 which opens as shown in Fig. 23. The difference in the circumference of the valve neck 105 and the cap aperture 100 allows the valve neck to expand when the tube contents is being discharged. After the pressure on the tube has been removed the elasticity of the valve forces the slit 107 closed again.

Indicia matter such as indicated at 109 may be provided on the tube 90 and adapted to contact with an indicator on the cap 91 to show the open and closed positions of the valve.

Although in the foregoing description I have referred to my invention as embodied in collapsible tubes I wish it to be understood that it may be used for other purposes if desired.

From the foregoing description it will be apparent that I have provided an improved closure for tubes containing plastic, semi-viscous or freely flowing materials, which clo-

sure can be economically manufactured, is highly efficient in use, and which satisfies the conditions necessary to produce a sanitary device.

Having described my invention, I claim:

1. In combination with a receptacle having a discharge aperture, a cap rotatably mounted on said receptacle, said cap having an eccentric aperture in the top wall, said cap aperture being adapted in one position of said cap to register with said discharge aperture, a valve carried by said cap, said valve being formed of flexible material, said valve including a neck fitting said cap aperture, said valve body portion being of less area than the area of said receptacle discharge aperture.

2. In combination with a collapsible tube having a discharge aperture, a cap rotatably mounted on said tube, said cap having an aperture, a valve carried by said cap, said valve being formed of flexible material and having a portion fitting said cap aperture and of substantially the same transverse sectional area as the area of the cap aperture, said valve being of less area than the area of said discharge aperture, said valve being of less width than said cap aperture, said valve having a discharge slit therein.

3. A receptacle having a discharge aperture, a cap, said cap including a body portion and a top wall, said cap top wall having an aperture therein, a valve carried by said cap, said valve being of less area than the area of the discharge aperture and being formed of flexible material, said valve having a neck fitting said cap aperture and being of substantially the same transverse sectional area as the area of the cap aperture, said valve neck being of greater length than the length of the wall of the cap aperture.

4. In combination with a collapsible tube having a relatively stiff neck thereon, a transverse partition adjacent the end of said neck, an aperture in said partition, a cap fitted over said neck, said cap including a body portion and a top wall, the top wall of said cap having an aperture, a valve carried by said cap, said valve being formed of flexible material, said valve comprising a body portion and an annular neck, said valve body being of substantially the same transverse sectional area as the area of the cap aperture and of less area than the area of said partition aperture, said valve being positioned in said aperture of said cap top wall.

5. The combination of a collapsible tube having a discharge opening, and a cap rotatably mounted on said collapsible tube, said cap having an aperture alignable with said tube aperture and an automatic flexible, separately formed valve in said cap aperture.

6. In combination with a collapsible tube having a relatively stiff neck thereon, a transverse partition adjacent the end of said neck,

said partition having an aperture at one side of the center of said partition, a cap fitted over said neck, said cap including a body portion, a top wall, and a side wall, said cap being rotatable on said neck, a substantially elliptical aperture in said top wall of said cap and a semi-cylindrical recess in said body portion, said aperture being adapted in one position of said cap to register with said aperture in said partition, a valve carried by said cap, said valve being formed of flexible material, said valve comprising a semi-cylindrical body portion and an annular neck, said valve body being less in area than the area of said tube partition aperture, said valve body portion being positioned in said cap recess, said valve neck being positioned in said aperture of said cap top wall, said valve neck being greater in circumference than the width of said cap top wall aperture and said aperture being of greater length than said neck, said valve having a discharge aperture therein.

7. In combination with a collapsible tube having a relatively stiff neck thereon, an eccentric discharge aperture in said neck, a cap rotatably mounted on said neck, an eccentric recess and an eccentric aperture in the top wall of said cap, said aperture being adapted in one position of said cap to register with said discharge aperture in said neck, a valve carried by said cap, said valve being formed of flexible material, said valve comprising a body portion and a neck, the area of said valve body portion being less than the area of said neck discharge aperture, said valve body portion being positioned in said cap recess and said valve neck being positioned in said aperture of said cap top wall, said valve neck being of greater width than said cap top wall aperture and the wall of said aperture being greater in length than said neck, the side wall of said neck being under tension when operatively positioned on said cap, a recess in said valve body portion and said neck and a slit extending from said recess through said neck, said slit being adapted to be normally closed by the tension of said neck and adapted to be forced open by the contents of said collapsible tube when said cap aperture is moved to register with said discharge aperture.

In testimony whereof, I hereunto affix my signature.

ARTHUR E. SMITH.