March 9, 1954 J. W. KNOBLOCK 2,671,579

COLLAPSIBLE TUBE AND PROTECTIVE JACKET THEREFOR

Filed Aug. 30, 1948

2 Sheets-Sheet 1

Fig. 1

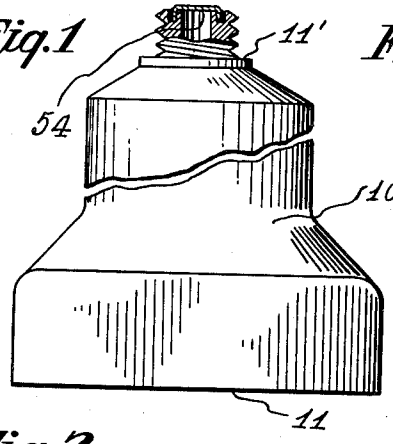


Fig. 2

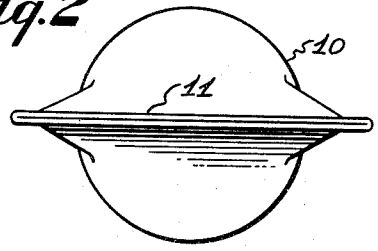


Fig. 3

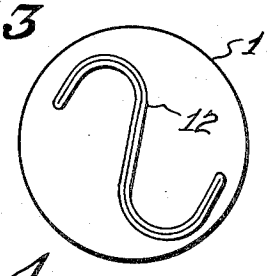


Fig. 4

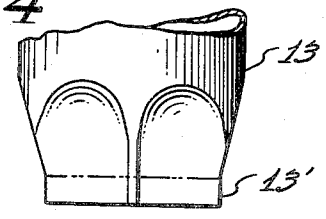


Fig. 5

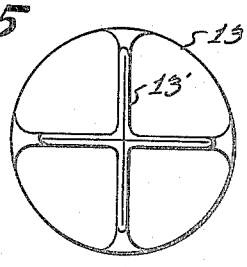


Fig. 6

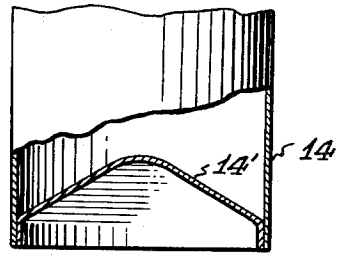
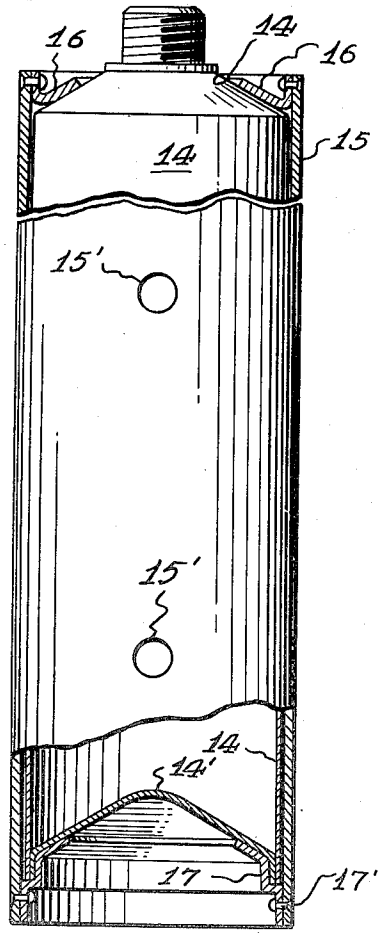


Fig. 7



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COLLAPSIBLE TUBE AND PROTECTIVE JACKET THEREFOR

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Fig. 8

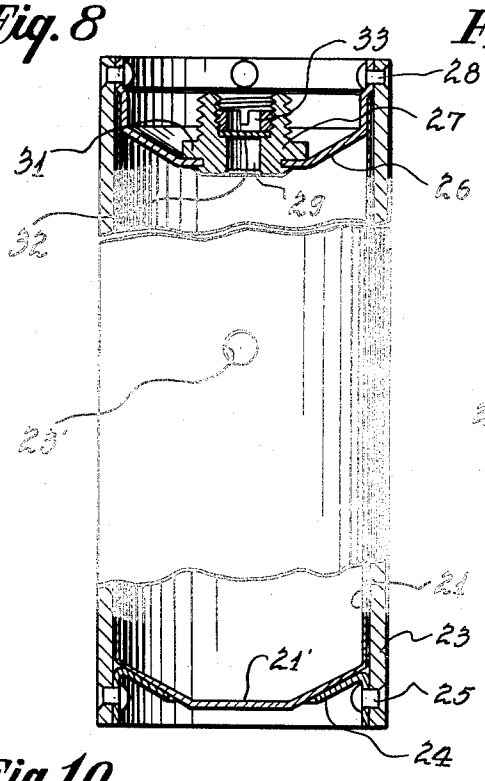


Fig. 9

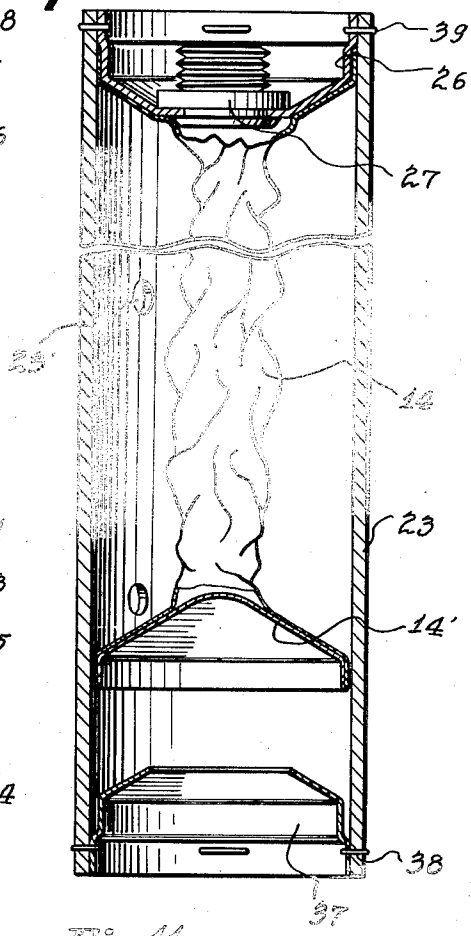


Fig. 10

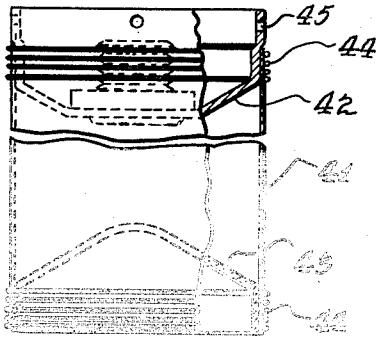


Fig. 11

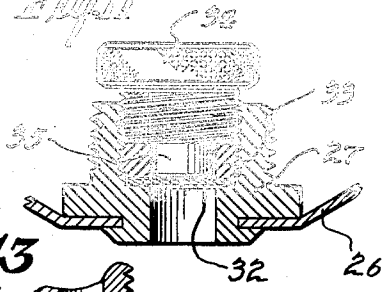


Fig. 12

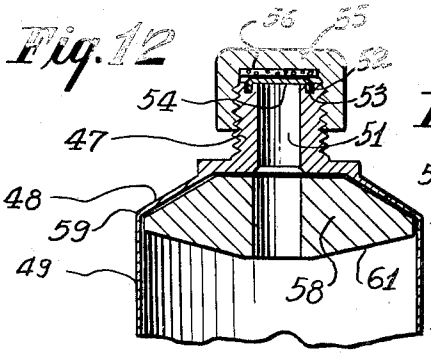
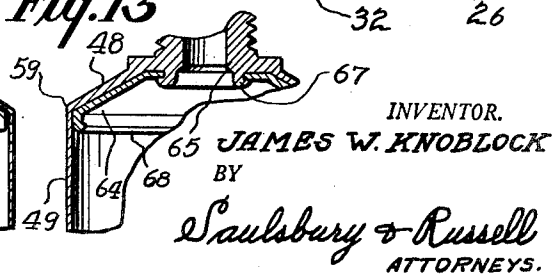


Fig. 13



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UNITED STATES PATENT OFFICE

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COLLAPSIBLE TUBE AND PROTECTIVE JACKET THEREFOR

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Application August 30, 1948, Serial No. 46,762

4 Claims. (Cl. 222—105)

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This invention relates to collapsible tubes and to a surrounding container structure or protective jacket therefor.

This application is a continuation in part of my application on a collapsible tube and protective jacket therefor, Serial No. 22,625, and filed April 22, 1948, now Patent No. 2,557,121, issued June 19, 1951, the protective jacket being to prevent distortion in the tube while being handled or shipped.

It is the principal object of the present invention to provide a collapsible tube for liquids or other fluids in which the sealed end of the tube is within the diametrical width of the tube whereby the same may be received by a cylindrical container or jacket of equal diameter throughout its length.

It is another object of the present invention to provide a protective jacket for a collapsible tube which will permit its collapse when disposed in a discharging device, either by manual means, air or gas pressure, or by mechanical means.

It is another object of the invention to provide a protective jacket for collapsible tubes to prevent its distortion when being filled, shipped or handled.

It is another object of the invention to provide a collapsible tube with an internal reinforcing member at its outlet end whereby to protect the top peripheral seam of the tube and its separation upon the tube being collapsed by air or gas pressure and at the same time to provide a convex surface onto which the intermediate portion of the tube can be pressed upon being collapsed whereby to give a complete discharge of the contents of the tube at the outlet end.

It is another object of the present invention to provide a frangible closure element on the threaded neck portion and a safety plug or cap for preventing the fracture of the element while the tube and its protective jacket are removed from the fire extinguisher casing.

Other objects of the present invention are to provide a collapsible tube adapted to receive a protective jacket which is of simple construction, easy to fit within the jacket, provide a tube and jacket assembly which is of simple construction, consumes little space, and efficient in operation.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a fragmentary side elevational view

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of a collapsible tube having the frangible closure element of the present invention and with the bottom end formed with a wide flattened formation and before it has been crimped to lie within the diameter of the tube.

Fig. 2 is a bottom plan view of the tube as shown in Fig. 1.

Fig. 3 is a bottom plan view of a collapsible tube after the crimp of the flattened formation has been made and formed into S-shape to keep it within the size of the tube diameter.

Fig. 4 is an elevational view of the lower end of a collapsible tube having a bottom closure made by contracting the wall to the center in a number of places, to form a closure with a plurality of seams which radiate from the tube center.

Fig. 5 is a bottom plan view of a modified tube shown in Fig. 4.

Fig. 6 is a fragmentary elevational view of a still further form of tube which has a concave-convex bottom fitted in the bottom end of the tube and secured thereto.

Fig. 7 is an elevational view, partly broken away, of a protecting jacket housing the collapsible tube shown in Fig. 6.

Fig. 8 is a fragmentary elevational view of a still further form of tube which has a convex-concave top secured to the tube wall in a tight fitted manner and to the jacket by rivets and an integral bottom end also fitted within the jacket and free to move upwardly when the tube is collapsed.

Fig. 9 is a sectional view in elevation of a collapsible tube having its bottom end conforming to the form of the invention shown in Fig. 6, and collapsed upon a concave-convex upper end of the type shown in Fig. 8 and stapled to the jacket, the side walls of the tube upon being collapsed having been brought tight upon the concave-convex end structures of the tube.

Fig. 10 is a fragmentary and elevational view of a collapsible tube having concave-convex top and bottom end structures which are connected to the tube wall and made secure therewith by a wire or cord.

Fig. 11 is an enlarged sectional view of a tube outlet end structure with a frangible disc secured in the outlet and protected by a threaded plug.

Fig. 12 is a fragmentary sectional view of a tube having a shouldered member within its outlet end whereby to protect and prevent the outlet end of the tube from separating when pressure is applied to discharge the contents of the tube and having a still further form of frangible

disc and a cap for retaining such disc on the threaded outlet.

Fig. 13 is a fragmentary sectional view of a tube with another supporting member for the interior of the outlet end of the tube.

Referring now particularly to Figs. 1, 2 and 3, 10 represents a flexible wall forming a collapsible tube having top and bottom portions and which is formed at first with a wide flattened bottom end 11 and then crimped into S shape as shown at 12 in Fig. 3, whereby to bring the bottom end within or not greater than the diameter of the tube and to make possible its easy insertion and confinement within a protective jacket 15 having a straight cylindrical wall. The seam formed by the closing of the end of the tube is made tight by cement after being formed or it may be fused or soldered.

In Figs. 4 and 5, there is shown a collapsible tube 13 that has a bottom closure 13' that is formed with a spider template of thin metal disposed within the tube end and onto which the tube wall is pressed. Thereafter, the template is removed and the seams fully closed and cemented or soldered. The seam ends are irregular when formed and are trimmed to appear level on their bottom as shown in Fig. 4.

In Fig. 6, a collapsible tube 14 has a concave-convex cup tight fitted in the bottom end. This cup is indicated at 14' and is preferably thicker than the tube wall. It is arched to aid in the supporting of the tube contents and also facilitate the collapsing of the tube by air pressure and to make possible the maximum discharge of its contents. Experience has shown that these concave-convex end structures for collapsible tubes aid the collapsing of the tube with good results. The bottom 14' is preferably secured by fusing or soldering. After sealing any of the foregoing types of tubes, any distortion in the shape of the tube may be rectified by placing the tube within a cylinder, formed to fit, and blowing the wall outward by a slight air pressure injected into the outlet end of the tube.

In Fig. 7, the protective jacket or retainer 15 has the collapsible tube 14 fitted therein. This tube is shown with the jacket merely for illustration. It will be understood that any of the other tubes which are formed to have a bottom end structure within the diameter of the tube may likewise be surrounded by a cylindrically shaped jacket. The bottom structure 14' is supported on a supporting ring 17 riveted as indicated at 17' to the jacket wall and extending radially inwardly thereof to support the bottom portion of the tube against axial movement upwardly therebeyond from the jacket while providing for free collapse of the tube toward the top end of the jacket upon application of pressure thereto. With the tube 14 in place within the jacket 15, a ring or segments of a ring forming a ring-like member 16 of an outer diameter not greater than the jacket are similarly riveted to the jacket wall 15 as indicated at 16', such member 16 having a central aperture therein through which the outlet neck of the tube extends and by means of which it is supported in proper operative position within the upper end of the jacket. Accordingly, the collapsible tube 14 is retained within the jacket against axial displacement therefrom and will be protected on its ends as well as at its side against distortion or rupture. The riveting of the member 16 to the jacket 15 prevents outward movement of the tube from the jacket while providing for free discharge of the contents of the tube through the neck upon the collapse of the tube.

The jacket 15 is made of solid material such as paper, fibre, plastic or metal, or of suitable meshed material. The jacket and the tube are adapted to fit a spray discharging device, in which the tube 14 can be collapsed by air or gas pressure released within the discharge casing and admitted to the jacket through side holes 15'. The tube 14, when alone, is soft and easily distorted, but when secured within the jacket 15, the combined unit is sturdy and will withstand rough handling and shipment and may be easily inserted into the spray discharge casing.

As shown in Fig. 8, a collapsible tube 21 may be formed with an integral bottom 21' and supported within a jacket 23 by a radially inwardly extending ring 24 fixed to the jacket 23 by rivets 25 to support the bottom portion of the tube against axial movement outwardly therebeyond from the jacket while providing for free collapse of the tube toward the top end of the jacket upon application of pressure thereto. In the upper end of the tube 21, there is tightly fitted an outlet end ring-like member 26 of rigid material and of convex-concave shape and of an outer diameter not greater than the jacket, depending into the tube 21. Such member 26 has a central aperture therein through which the outlet neck extends and by means of which it is supported in proper operative position within the upper end of the jacket so that the neck portion, as indicated at 27, will lie within the jacket 23. This end structure 26 also serves for the attachment of the tube with the jacket 23 as by rivets 26 and prevents outward movement of the tube from the jacket while providing for discharge of the contents of the tube through the outward neck upon collapse of the tube. The neck portion 27 has an outlet hole 29 and a gasket shoulder 31 adapted for the seating of the tube with its jacket within the spray discharge device.

The neck portion 27 contains a frangible element 32, Fig. 11, which can be easily ruptured by the application of pressure upon the tube 21 to discharge its contents. This disc 32 is retained by an externally threaded ring 33 screw-threaded into the neck portion. To protect the frangible element in shipment and handling, a threaded plug 34 is fitted into the neck portion so that its projection 35 may be located adjacent the outer face of the disc 32 and prevent its distortion. The plug 34 is discarded when the tube is to be used in the fire extinguisher casing. When air under pressure is released within the fire extinguisher, it will enter holes 23' of the jacket 23 to exert pressure upon the tube 21. As illustrated in Fig. 9, the lower end of the tube will be elevated as the tube wall collapses and by the provision of concave-convex end structures, a more thorough discharge of the contents of the tube is effected. The tube wall will be drawn against the inner faces of the concave-convex end structures. The jacket 23, as shown in Fig. 9, has a bottom support 37 which is made secure to the jacket by staples 38. The upper end structure 26 is similarly secured to the jacket by staples 39. As viewed in Fig. 9, the tube 14 is shown in a collapsed state and ready to be replaced with its jacket with a full tube and another jacket. The bottom end structure 14' of the tube 14 shown in Fig. 6 is used with tube 14 in jacket 23, Fig. 9.

In Fig. 10, there is shown a tube which is formed without welding or soldering. A cylin-

drical tube wall 41 is secured to top and bottom end structures 42 and 43 by wire cord, tape or pressed rings 44. The end structures, if desired, may be grooved and treated with plastic resins, cement, or other sealing compound in order to prevent leakage between the tube 41 and the end structure. The top end structure 42 has holes 45 through which rivets can be extended to secure the upper end of the tube to the protective jacket.

In Fig. 12, there is shown a modified form of the frangible element. A neck portion 47 is integral with a top portion 48 of a tube 49. This neck portion has an outlet opening 51. The upper end face of the neck portion has an annular groove 52 into which a depending flange 53 of a frangible disc 54 is extended and secured by solder or other suitable means. To protect the disc 54 while in shipment or in handling, a cap 55 is threaded upon the neck portion 47 so that an inner soft gasket 56 engages the top face of the frangible element 54 and restrains it against displacement and rupture. When the tube is adapted for use, the cap 55 is removed and may be discarded to expose the frangible element 54 in the manner as shown in Fig. 1 so that it may be easily and readily ruptured to start the flow of contents of the tube. This flow of the contents is constant thereafter and even as a result of the release of the air pressure upon the tube.

In order to prevent the breakage of the upper end of a tube having an integral top portion, as shown in Figs. 1, 7 and 12, and to provide for a convex face against which the tube wall may be brought to bear upon the same being collapsed, there has been provided a plate 58. This plate 58 will reinforce the peripheral edge 59 which readily may otherwise fracture. The convex surface is provided at 61.

In Fig. 13, there is shown within the top portion 48 of the tube 49, another type of reinforcing member as indicated at 64 which is fixed to a neck portion 65 having a depending projection 67 peened over the internal periphery of the member 64. This member 64 is thin but shaped to fit within the edge 59 to reinforce it. The outer periphery of the member is flared inwardly as indicated at 68 to provide a surface onto which the side wall of the tube can be pressed when the tube is collapsed.

It should now be apparent that when alone, the collapsible tube is soft and easily distorted, but when secured within the jacket, the combined unit is sturdy and will withstand rough handling and shipment.

This unit also has the advantage that when the tube is to be collapsed by pressure, either mechanical or by air or gas, as in spray discharge devices, it is strong enough to be tightly fitted into the spray discharge device with which it is to be used. This tight fitting connection will reduce the ill effects of vibration on the tube, and will also reduce the open space in the discharge device. Open space in the discharge device increases the amount of air required to pressure collapse the tube.

It should now be apparent that there has been provided a collapsible tube with concave-convex end structures, at the opposite ends, which aids the discharge of the contents of the tube and which provides a tube which will not readily fracture as the contents of the tube are being discharged from the outlet opening. It should be further apparent that there has been provided a tube outlet structure which can be disposed within the jacket and protected thereby and also serve as the means for the connection of the tube to the top of the jacket and wherein while the top of the tube is being restrained within the jacket, the bottom of the tube may be elevated to permit the free collapsing of the tube wall. It should be further apparent that there has been provided means for protecting the frangible elements in the outlet openings of the tubes while being shipped or handled.

While various changes may be made in the detailed construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

I claim:

1. In a collapsible tube and protective jacket assembly, a collapsible tube having a flexible wall and a top portion including a neck with an outlet opening therethrough, said tube having a bottom portion of a diameter not greater than the diameter of its flexible wall, a protective jacket adapted to receive the tube and having a straight cylindrical outer wall, a radially inwardly extending support on the bottom end of the jacket extending axially into the end thereof for receiving and supporting the bottom end of the tube, an annular support separate from said tube and adapted to engage the top portion thereof while receiving said neck therethrough, said annular support extending radially inwardly of the upper end of said jacket and lying entirely within said jacket, and means securing said annular support to said jacket.

2. A collapsible tube and protective jacket assembly for use in a discharging device adapted to apply collapsing pressure thereto, comprising a flexible wall forming a collapsible tube having top and bottom portions, means forming a discharge outlet neck at the top end of said tube, means forming a bottom end for said tube of a diameter not greater than the diameter of said flexible wall, a protective jacket adapted to receive said tube therein and having a straight cylindrical wall, a radially inwardly extending support at the bottom end of said jacket for supporting said bottom portion of said tube against axial movement outwardly therebeyond from said jacket while providing for free collapse of said tube toward the top end of said jacket upon application of pressure thereto, a ring-like member within the top end of said jacket of an outer diameter not greater than the diameter of said jacket, said ring-like member having a central aperture therein through which said outlet neck extends and by means of which it is supported in proper operative position within the upper end of said jacket, and means securing said ring-like member to said jacket to prevent outward movement of said tube from said jacket while providing for discharge of the contents of said tube through said outward neck upon collapse of said tube.

3. A collapsible tube and protective jacket assembly as defined in claim 2 wherein said ring-like member forms a structural part of said tube directly connecting said top portion of said tube with said outlet neck.

4. A collapsible tube and protective jacket assembly as defined in claim 2 wherein said ring-like member includes an annular shoulder connecting said neck with said top portion of said wall to complete the top end of said tube.

JAMES W. KNOBLOCK.

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