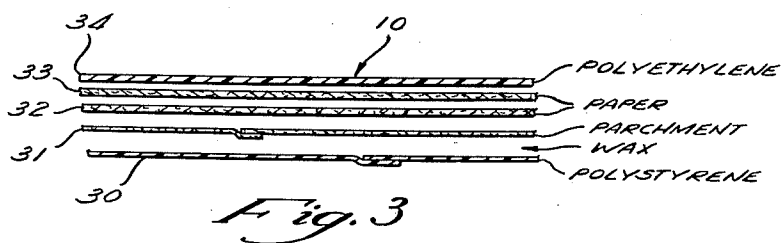
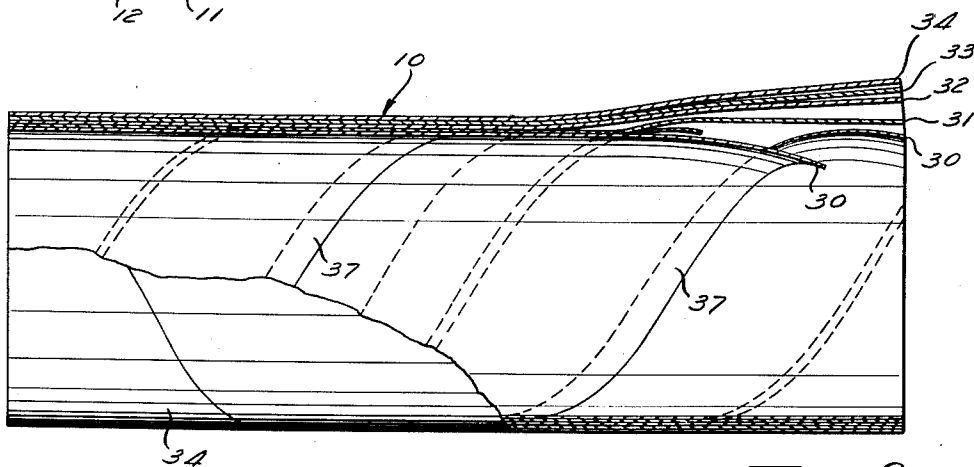
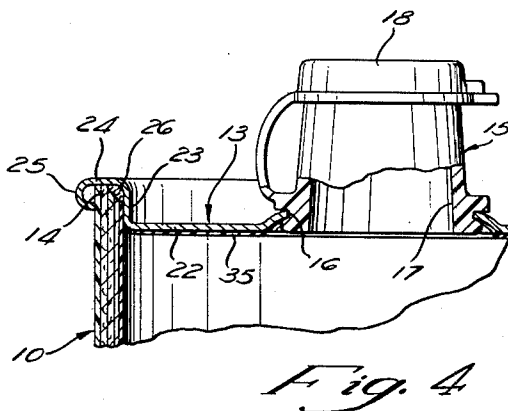
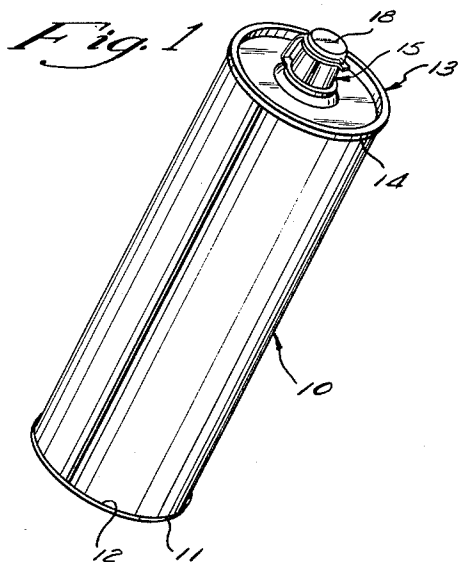


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FLUID CONTAINER

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1

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FLUID CONTAINER

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This invention pertains to fluid containers and more particularly to disposable fluid containers which are best suited for use in connection with the sale of liquids.

In present-day business, there are many liquids which are relatively difficult to package. Many liquids, such as household detergents, will chemically attack many materials which might be used in packaging. The result is that these materials are normally sold either in glass containers, which, of course, are relatively susceptible to breakage, metal containers, or plastic bottles, the latter two of which are relatively expensive.

The present invention seeks to overcome these disadvantages and to provide a light-weight, inexpensive, and simple-to-manufacture container which is suitable as a vessel for a wide variety of liquids.

With glass containers, it is, of course, necessary to glue a suitable paper label to the container. These labels are easily damaged and normally not exceptionally attractive. With plastic bottles polyethylene is the normal and accepted material. Present knowledge does not permit the bonding of paper labels to polyethylene. Accordingly, the most common result is that an identifying word message is painted or printed directly on the polyethylene bottle. This kind of labeling is, of course, quite expensive; and, in addition, it limits the variety and ingenuity that can be applied to making an attractive and inexpensive container.

The present invention, on the other hand, provides a very highly attractive container which includes an elongated tube which is closed at its ends by suitable closures. The tube is preferably generally cylindrical and has an outer label ply. The outer ply may be paper for some applications and in others it will include a layer of polyethylene and a metal foil or paper layer. Both paper and metal foil readily accept multi-color printing and accordingly it is possible to make an extremely attractive container of several colors in which the entire tube is printed and decorated. The entire tube then becomes an eye-catching display. It is a display which within the economic limitations imposed, nonetheless is, as indicated, multi-colored and covers the container as compared with the limitations to partial coverage and a limited number of colors with glass and polyethylene respectively.

Another of the features of the invention is that it readily lends itself to manufacture on existing paper tube manufacturing equipment. Further, the construction is such that it can be made without any specialized heat or forming equipment apart from the simple matter of suitably heated pots for the solvents and bonding agents employed.

The central tube of this container has as its inner ply a spirally wound and cold-bonded layer of polystyrene. In spirally winding this layer, the edges are overlapped and a suitable solvent is employed to make an endless spiral seam.

A ply of parchment with warm wax on its inner surface is spirally wound around the polystyrene to provide a moisture and vapor barrier surrounding, reinforcing, and stiffening the polystyrene. A plurality of paper layers, preferably two, of jute paper, are spirally wound around the parchment to provide strengthening paper plies which give rigidity and body to the tube. The label ply is wound around the paper ply. This ply, in addition

2

tion to presenting an attractive and eye-catching appearance, also serves as a strengthening ply and the polyethylene layer serves as a protective vapor barrier shielding the paper plies from attack from moisture.

The formed tube is cut to length and end closures are connected to the tubes. These closures are preferably drawn steel members which telescope into the ends of the tube and then crimp over the ends to provide a fluid tight crimped connection between the closures and the tubes. The top closure has a central pouring opening into which a pouring spout may be inserted.

A further and fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the drawings, in which:

FIGURE 1 is a perspective view of one of the new fluid containers;

FIGURE 2 is a sectional view of a tube incorporated in the container with parts separated at one end to show the internal construction of the tube and on an expanded scale with respect to FIGURE 1;

FIGURE 3 is an exploded foreshortened sectional view of the layers of the tube on an enlarged scale with respect to FIGURE 2; and,

FIGURE 4 is a fragmentary sectional view of the corner portion of one of the containers and on the scale of FIGURE 2.

Referring now to the drawings, the fluid vessel includes a central, elongated, and cylindrically contoured tube shown generally at 10. The tube 10 is a multi-ply structure formed in a manner and of materials that will be described in greater detail below.

A lower end closure 11 is fixed to the lower end 12 of the tube 10. The closure 11 is fixed to the tube 10 in a fluid tight relationship to form a bottom for the fluid vessel. An upper end closure 13 is fixed to upper end 14 of the tube 10 to form a top for the vessel. These end closures are metal members protected by a coating described below. The upper end closure 13 includes a plastic pouring spout 15 projecting through a central aperture 16. The spout 15 defines a through pouring passage 17. A cap 18 is carried by the pouring spout 15 for snap connection over the end to close the passage.

The connections between the upper and lower closures 13, 11 and the tube 10 are formed identically. Accordingly, the details of the connection shown in FIGURE 4 between the upper end closure and the tube 10 will be described, it being recognized that an identical connection is formed between the lower closure 11 and the tube 10. The upper closure 13 includes a central annular portion 22 extending transversely across the tube. A cylindrical axially extending portion 23 connects the central portion 22 and an annular rim portion 24. The annular rim portion 24 overlies the end 14 of the tube while the central portion 22 lies within the contour generated by the cylindrical tube 10. The closure includes an overlying annular flange 25 which is crimped inwardly to compress the tube between the cylindrical portion 23 and the flange 25. An annular quantity of a suitable sealing compound is provided at 26 between the tube and the closure. This material is an elastomeric compound that remains tacky. It is a rubber base compound with a hexane solvent. It is sold under the designation Darex 1101 UHS by Dewey and Almy Division of W. R. Grace. This compound prevents attack, at the end of the tube 10, by the liquid in the container. It also prevents a wicking action along the seams.

The details of the construction of the tube are best seen in FIGURES 2 and 3. The tube is a five-ply member especially formed of a specific combination of materials to provide a fluid impervious and substantially inert tube. This tube provides a laminated fiber structure that will withstand a wide range of fluids. It will with-

stand fluids of a pH of from 1 to 13. In short, the tube will withstand any fluid that the end closures are capable of retaining. It is a tube which will retain detergents, perfumes, vegetable oils, and many other fluids which have previously required either glass, metal or molded plastic containers, all of which are considerably more complex and expensive than the present invention.

The innermost of the five plies of the tube 10 is an inner ply 30 of biaxially oriented polystyrene, preferably .004 inch thick. By biaxial orientation what is meant is that a strip of polystyrene is stretched in at least two directions so that any internal stresses will be equalized. This aligns the molecules and makes a harder and more stable sheet. One suitable biaxially orientated polystyrene film is sold by Plax Corporation, jointly owned subsidiary of Monsanto Chemical Corporation and Emhart Manufacturing Company. This film is sold under the designation "100 grade Poly Flex." Other materials such as low melt index polyvinyl chloride film, are acceptable for the inner ply. One such polyvinyl chloride film is sold by The Dow Chemical Co. under the designation "No. 111." This inner ply 30 must be impervious to liquids, substantially inert, stable (at 140° F.) and acid proof. The polystyrene film is preferred because it has all of these characteristics and it is inexpensive, and readily available.

The inner ply 30 is circumscribed and surrounded by a fluid sealing ply. This ply, in the preferred embodiment, is a denser and sized ply of vegetable parchment 31. A fluid sealing layer of micro-crystalline wax forms a fluid impervious and bonding layer between the polystyrene and the parchment.

The parchment layer must be a flexible paper which is dense enough to prevent the penetration of wax. Other papers are suitable for this purpose but parchment is preferred because of its low porosity. One suitable parchment is Lard Pak sold by Rhinelander Paper Co. of Wisconsin.

The wax layer is formed from a hot melt refined micro-crystalline wax with resins and butadiene rubber in small quantities mixed with the wax to make it tacky. One suitable wax is sold by Boler Wax Company of Ardmore, Pennsylvania, under the designation WP1. This wax layer serves several purposes. It is a moisture vapor barrier to seal the inner plastic ply which is poor in this characteristic. The wax layer stiffens the entire tube, giving strength and rigidity. The wax also serves as a lubricant for knives used to cut a formed tube to desired lengths.

The parchment ply 31 is circumscribed by inner and outer spirally convoluted plies of jute board 32, 33. These jute plies are each about 0.019 inches in thickness. Alternately, these plies of jute may be other strong and tough paper plies such as Kraft paper, but jute is preferred.

A label ply surrounds and reinforces the paper plies 32, 33. For some applications a paper label ply will suffice. However, in the preferred form of the invention, for reasons which will be discussed below, the label ply is a laminate. The label ply 34 in addition to bearing a printed message supplies a strong reinforcing ply and, in addition in the preferred form, a vapor barrier protecting the paper plies and assisting in maintaining the fluids within the containers. This preferred label ply is a laminate of a polyethylene layer and a printed layer of either metal foil or paper. The polyethylene is used as a bond to seal the metal to the paper plies when foil is used. When paper is used it is preferably 60-75 pound printed stalk paper glued to the paper plies and protected by an outer polyethylene layer.

The same polyethylene film may be used whether accompanied by a layer of aluminum foil or paper. One suitable source of this polyethylene film is Dupont Alathon #16.

Since the limiting factor on the kinds of fluids that can be contained in these containers will be the end closures, and since they are preferably made of metal which may

be subject to attack by fluids within the container, a protective coating is applied to the inner surface of the end closures 11, 13. This protective layer on the end closures is shown in exaggerated thickness in FIGURE 4 at 35. One suitable end closure is formed by using chemically treated black plate obtainable from The Bethlehem Steel Corporation. This so-called black plate is steel treated with chromium phosphate in accordance with a process developed by the H. J. Heinz Corporation and known as the Hinc Process. The inner treated surface of the closure is covered by an epoxy resin coating over which a layer of vinyl varnish is applied. The epoxy and varnish may both be purchased from Stoner Mudge Division of American-Marietta Corporation. This division is located in Pittsburgh, Pennsylvania. The epoxy and varnish are sold respectively under the designations S-5061-C and S-6204-BL. Tin plate with a pigmented coating and high-impact styrene, also make a suitable end closure.

Method of Tube Manufacture

The tubes 10 are manufactured on an elongated cylindrically contoured mandrel. The various plies are wound simultaneously and continuously in the usual spiral tube forming technique. An elongated strip of polystyrene is spirally wound around the mandrel to form the inner layer 30. This polystyrene is wound such that the edges overlap to provide an elongated and continuous spiral seam 37. This spiral seam in the finished product extends from one end closure to the other. The customary disposable slip sheet may be interposed between the polystyrene ply and the mandrel for lubrication.

The polystyrene is bonded to itself along this spiral seam through the application of a suitable solvent. It is a cold bonding operation which requires no heat. This solvent may be a mixture of 10 parts methyl ethyl ketone and 90 parts methyl isobutyl ketone with 5 to 10 parts plasticizer. The plasticizer is added to provide slow evaporation and prevent the formation of a brittle seam. The solvent is applied and the spiral seam is formed with a lap groove roller which follows the seam spirally as the strip of polystyrene is wound on the mandrel.

The wax layer is applied to the inner surface of a strip of parchment. The wax emulsion is applied hot, at about 200° F. The parchment is spirally wound around the polystyrene, while the wax is still hot, in order that the wax will bond to the polystyrene.

The two paper plies are wound over the parchment ply. In each case, a suitable glue is applied to the paper and the paper is wound spirally with the edges abutting but preferably not overlapping in the usual paper tube technique. Again, in the usual paper tube technique, the spiral seams of each paper layer are offset so that the paper of one layer overlaps the seam of the other.

The outer label ply 34 is applied over the label plies. Preferably, this ply is also spirally wrapped and it may be overlapped in the fashion of the polystyrene and parchment plies to provide a strengthening and protective barrier.

The finished tube is cut into lengths suitable for handling and subsequently cut to can length. Finally, the end closures 11, 12 are crimp connected to the tube.

While the invention has been described with a great deal of detail it is believed that it essentially comprises a vessel container including a central tube having a plurality of plies with the inner ply being a liquid impervious substantially inert plastic layer and end closures secured to the ends of the tube in a fluid tight manner to form a liquid tight seal.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted

to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In a fluid container having an elongated cylindrical contoured tube and end closures fixed to the ends of the tube in fluid tight relationship, the combination of a first inner polystyrene ply, a second ply of parchment surrounding the inner ply, a cylindrically contoured tube of wax interposed between and bonding the first and second plies and providing a stiffening layer and a moisture and vapor barrier, a third ply of paper surrounding and glued to the parchment, a fourth ply of paper surrounding and glued to the third ply, a fifth ply of a laminate of polyethylene and a material selected from the group consisting of metal foil and paper surrounding and bonded to the fourth ply, said plies each being spirally wound, said first, second and fifth plies each having overlapped edges bonded together in a continuous spiral seam extending from one end of the tube to the other, said third and fourth plies each having their side edges in substantial abutment to form a continuous spiral seam extending from one tube end to the other and said third and fourth ply seams being offset axially.

2. A fluid container comprising, a central tube member, first and second end closures disposed across the ends of the tube and secured to the tubes in fluid tight connections to provide a container, said tube having an inner spirally wound ply of polystyrene having overlapped edges bonded together in fluid-tight relationship, said bonded-together edges defining a spiral seam extending continuously from one end closure to the other, a spirally wound ply of parchment surrounding said polystyrene ply, and layer of wax interposed between the parchment and polystyrene plies and forming a fluid impervious and continuous bonding layer between the two mentioned plies, and a plurality of paper plies wound around the parchment ply.

3. The device of claim 2 wherein each of said end closures includes a metal disc having an annular recess near the perimeter thereof and wherein the ends of the tube are disposed in the recess and the metal closure is crimp connected to the tubes.

4. The device of claim 2 wherein a label ply of polyethylene is spirally wound around the paper plies.

5. The device of claim 2 wherein there are two paper plies of jute paper.

6. In a fluid container having an elongated cylindrically contoured tube and end closures fixed to the ends of the tube in fluid tight relationship, the combination of a first inner inert, stable, flexible, plastic ply, a second ply of dense wax impervious paper surrounding the inner ply, a cylindrically contoured tube of wax interposed between and bonding the first and second plies and providing a stiffening layer and a moisture and vapor barrier, a third ply of paper surrounding and glued to the parchment, a fourth ply of paper surrounding and glued to the third ply, a fifth ply of a laminate of polyethylene and a material carrying a printed message on its outer face and selected from the group consisting of metal foil and paper surrounding and bonded to the fourth ply,

said plies each being spirally wound, said first, second and fifth plies each having overlapped edges bonded together in a continuous spiral seam extending from one end of the tube to the other, said third and fourth plies each having their side edges in substantial abutment to form a continuous spiral seam extending from one tube end to the other and said third and fourth ply seams being offset axially.

7. The container of claim 6 wherein the fifth ply is a laminate of metal foil and polyethylene bonding the foil to the fourth ply.

8. The container of claim 6 wherein the fifth ply is a laminate of paper and polyethylene bonded to and protecting the outer face and the laminate glued to the fourth ply.

9. A fluid container comprising, a central tube member, first and second end closures disposed across the ends of the tube and secured to the tubes in fluid tight connections to provide a container, said tube having an inner spirally wound ply of flexible plastic material having overlapped edges bonded together in fluid-tight relationship, said bonded-together edges defining a spiral seam extending continuously from one end closure to the other, a spirally wound fluid sealing ply surrounding said plastic ply, and a mass of fluid-impervious sealing material interposed between the sealing and plastic plies and forming a fluid impervious and continuous bonding layer extending from one end of the tube to the other between the two mentioned plies, and at least one paper ply wound around the sealing ply.

10. The device of claim 9 wherein first and second annular rings of elastomeric compound are interposed respectively between the upper and lower end closures and the ends of the tube and in sealing engagement with the ends of the tube.

11. The device of claim 9 wherein the mass of fluid impervious sealing material is wax.

12. A fluid container comprising a tube having an inner flexible plastic ply, and at least one paper reinforcement ply around the inner ply, first and second end closures fixed to the ends of the tube, and first and second annular rings of elastomeric sealant between the first and second closures and the ends of the tube respectively and sealing the ends of the tube.

13. The device of claim 12 wherein a sealant layer of wax surrounds the inner plastic ply and is within the reinforcing ply.

14. The device of claim 13 wherein a parchment sealing layer surrounds the wax and the reinforcing ply surrounds the parchment.

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