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Szatkowski

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[54] **CONVOLUTE WOUND FIBRE DRUM WITH THERMOPLASTIC ADHESIVE**

[75] Inventor: **Richard R. Szatkowski**, Western Springs, Ill.

[73] Assignee: **Continental Can Company, Inc.**, New York, N.Y.

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[52] **U.S. Cl.** ..... **229/4.5**; 93/36 PC; 93/36.5 R; 93/94 R; 229/3.5 R; 229/5.7

[51] **Int. Cl.**[2] **B65D 3/04**; B65D 3/22

[58] **Field of Search** ..... 229/4.5, 5.5, 5.6, 5.7, 229/5.8, 3.5 R; 93/36 PC, 36.5 R, 39.1 R, 36.8, 94 R; 156/69; 138/144

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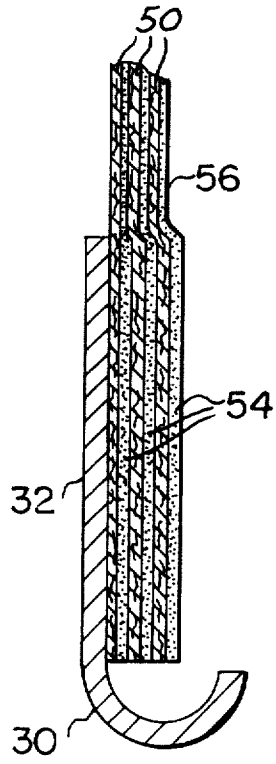
Primary Examiner—William I. Price
Assistant Examiner—Stephen P. Garbo
Attorney, Agent, or Firm—Diller, Brown, Ramik & Wight

[57] **ABSTRACT**

A convolute wound fibre drum comprising several plies of convolutely wound container board for forming a tubular member, the plies being adhesively secured to one another by a layer of thermoplastic material. The tubular member has a metal chime attached at each end by an indentation of a portion of said chime and said tubular member. The thermoplastic material between the plies and adjacent said indentations has a greater elasticity than the thermoplastic intermediate said indentations so as to preclude the rupture of the fibres upon forming said indentation.

5 Claims, 6 Drawing Figures



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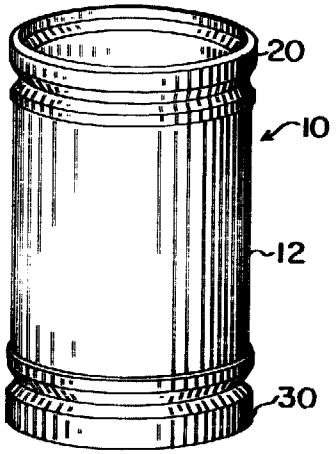

Fig. 1.

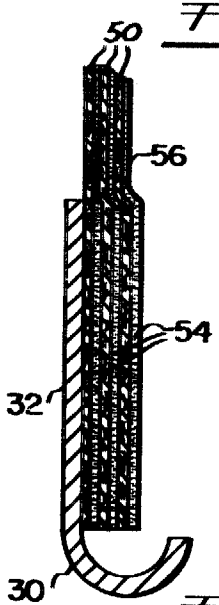

Fig. 3.

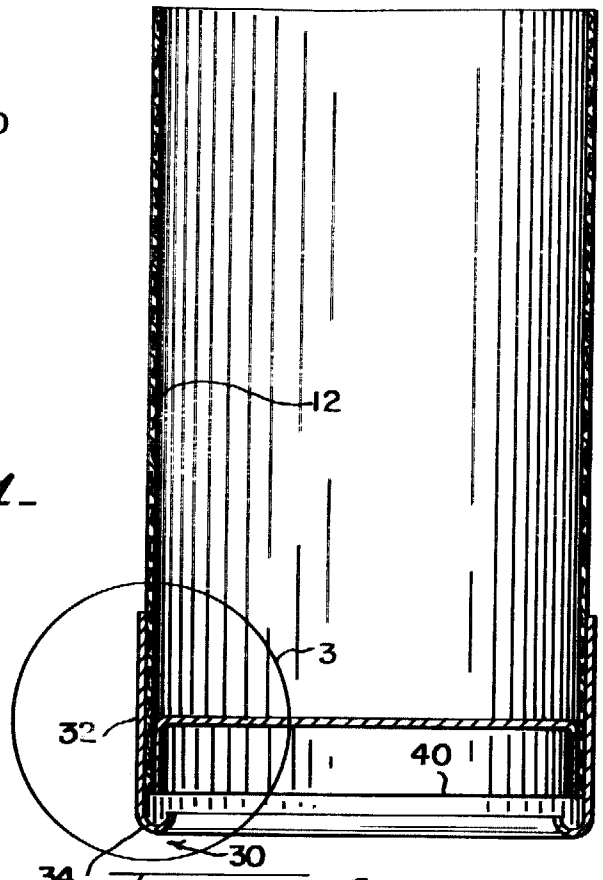

Fig. 2.

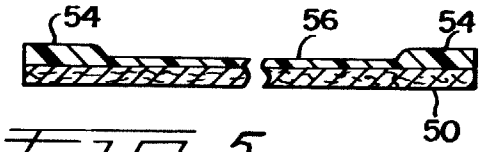

Fig. 5.

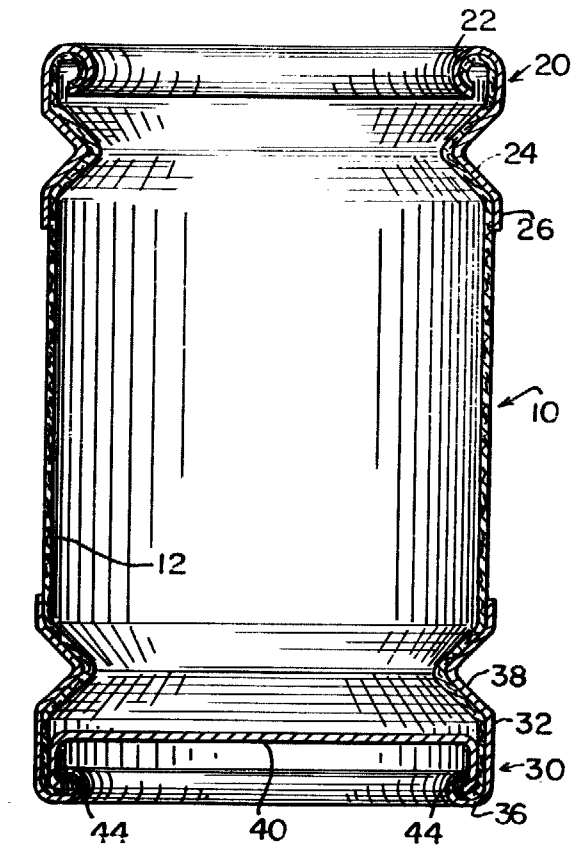

Fig. 4.

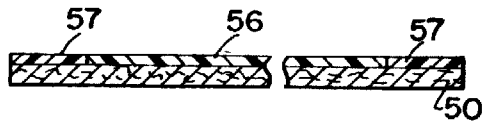

Fig. 6.

CONVOLUTE WOUND FIBRE DRUM WITH THERMOPLASTIC ADHESIVE

BACKGROUND OF THE INVENTION

This invention relates to containers formed of convolutely wound paperboard. More specifically, it relates to a convolutely wound tubular member having a thermoplastic adhering several plies of paperboard together and chimes at each end for securing a closure thereto.

Fibre drums are conventionally manufactured by convolutely winding paperboard about a mandrel while applying a water base or hot melt adhesive to one side of the paperboard to bind the plies of the paper one to another. The resulting tubular member has substantial stacking strength and is suited for use as a container which is completed by crimping a metal chime to the upper and lower end for securing closures thereto. However, the crimping operation requires a pliable tubular member, but such can not be readily obtained when conventional adhesives are utilized. For these reasons, the manufacturer of such drums in the prior art has sprayed water or wetting agents on the paperboard as it was wound about the mandrel so as to permit the desired distortion of the paper in the chime areas without rupture of the paper plies. However, such wetting also reduces the vertical stacking strength of the container, and requires that such drums, after manufacture, be stored so as to permit the wetted portion to dry. Obviously, such causes substantial inventory problems.

SUMMARY OF THE INVENTION

In order to obtain a convolute wound fibre drum which omits the wetting requirement of the prior art manufacture, the instant invention relates to a convolute wound drum having a thermoplastic adhesive between the plies of paperboard. Additionally, the thermoplastic is either selected or placed upon a board in such a manner as to provide substantial rigidity over a major portion of the drum and yet provide greater elasticity at the ends thereof so as to permit deformation of the wound tubular member without rupture of the paperboard.

Accordingly, it is an object of the instant invention to provide an improved fibre drum utilizing convolute wound, thermoplastic coated container board. Too, it is an object of the instant invention to provide a convolute wound tubular member which will provide enhanced stacking strength as well as sufficient flexibility to permit crimping and deformation of the tubular member without rupture of the fibres upon attachment of the metal chimes thereto. Finally, it is an object of the instant invention to provide a process for the manufacture of convolute wound fibre drums which avoids the necessity for wetting the fibre of container board prior to the crimping and attachment of the metal chimes, and to additionally eliminate the need for a drying out period.

DESCRIPTION OF THE DRAWINGS

The manner in which the objects of the instant invention is attained will be made clear by a consideration of the following specification and claims when taken in conjunction with the drawings in which:

FIG. **1** is a perspective view of a convolute wound fibre drum;

FIG. **2** is a side elevation view in section of a preferred embodiment of my invention prior to attachment of the metal chimes and end closures.

FIG. **3** is an enlarged view of a portion of FIG. **2**;

FIG. **4** is a side elevation view in section illustrating the complete embodiment of FIG. **2**;

FIG. **5** is a side elevation view in section of a thermoplastic coated paperboard used in the manufacture of my invention; and

FIG. **6** is a side elevation view in section of another thermoplastic coated board which may be used in the manufacture of my invention.

DETAIL DESCRIPTION

As depicted in FIG. **1**, the conventional appearance of the fibre drum **10** takes the shape of an upstanding tubular member **12** formed of several plies of convolutely wound paperboard. At each end of this tubular member **12** is attached a metal chime **20** and **30**, both of which may be adhesively secured to the paperboard as well as mechanically interlocked thereto by indentations **24** and **38** and curls **22** and **36** as more thoroughly shown in FIG. **4**.

The manufacture of such drums utilizes a convolute wound tubular member **12** having an upstanding side wall of several plies of paperboard as illustrated in FIGS. **2** and **3**. These tubular members are conventionally formed by winding the board about a mandrel with a hot melt adhesive being applied to one side of the board during winding so as to effect adhesion between the plies. After this member is formed, a lower metal chime having a cylindrical side wall **32** and a bottom curl **34** is placed over the lower end while a closure member **40** having a depending annular flange **44** is placed inside member **12** adjacent the end. The upper chime **20** initially takes a form similar to that of the lower chime **30** as depicted in FIG. **2**.

After the tubular member **12** and bottom **40** is forced downwardly into the curl **34**, the metal chime and tubular member **12** is subsequently formed by completion of the curl as depicted in FIG. **4**, and by a deformation or indentation of both the tubular member **12** and the metal chime **30** as shown in FIG. **4**.

In the prior art manufacture, such a large deformation of the paper plies which results from the crimping action to form the groove **38**, and the curling action to complete the curl **36** often rupture or fracture the paperboard thus resulting in poor containers. In order to overcome this problem, the prior art has utilized a wetting agent to wet the varies plies of paper as they are wound about a mandrel so as to provide more flexibility to the tubular member **12** in the vicinity of the chimes **20** and **30**. However, such wetting reduces the vertical stacking strength of the container and requires a storage time for the finished containers to permit the paper to dry out.

In order to overcome this problem, the preferred embodiment of my invention utilizes paperboard having a thermoplastic adhesive previously extruded or placed thereon by other means. In making the tubular member **12**, the coated board is unwound across a table and cut into the length required to form the member **12** with the desired number of plies, and then is wrapped about a mandrel. During this wrapping or winding process, heat is applied to the thermoplastic to render it tacky, and upon cooling, adhesion between the plies results. A thermoplastic such as polyethylene has a greater ad-

hesive strength between two plies of paper when it is extruded or placed upon the paperboard in a very thin layer, but of a sufficient thickness to insure complete coverage of the entire width of the board. Such improves stacking strength, but does not eliminate the problem of permitting deformation of the formed tubular member without rupturing of the container board itself.

To overcome this latter problem, my invention utilizes a paperboard coated with a polymeric material which has sufficient elasticity to accept deformation without rupture of the paperboard or the thermoplastic.

As shown in FIGS. **5** and **6**, the thermoplastic material **54** adjacent each side of the paperboard **50** is formed or constituted to provide greater elasticity so as to absorb the forces causing deformation without transmitting them to the board. In FIG. **5**, the greater elasticity is obtained by increasing the thickness of the thermoplastic material at **54** which ultimately forms the top and bottom end areas of the tubular member **12**. Thus a thin layer **56** of thermoplastic material is placed upon the container board in the intermediate areas, while an increased thickness is placed at **54** upon which the metal chimes are placed and crimped. This greater thickness which is indicated at **54** will accept greater shearing forces in the crimping process without rupturing the thin film and subsequently permitting seepage of water through the side walls of the container. Preferably, it has been found that the intermediate area **56** of the paperboard between the metal chimes should have a thickness no greater than 0.5 mils, while the thermoplastic material at the ends of the tubular member **12** should have a thickness greater than 0.5 mils.

In the alternative embodiment of FIG. **6**, protection against rupture of the fibre material upon crimping is effected by the selection of different thermoplastic adhesives. For example, the thermoplastic adhesive in the intermediate area **56** may be a low density polyethylene having a low percent elongation, while the thermoplastic adhesive in the areas **57** adjacent the end portions of the tubular member **12** or sheet of paper may comprise a polyethylene formulation having a greater percent elongation. Alternatively, a different thermoplastic might be utilized such as ethylene-vinyl acetate copolymers sold under the trademark Alathon by E.I. du Pont de Nemours, some of said copolymers having a percent elongation two or three times that of many low density polyethylenes.

The thermoplastic adhesives may be placed on the container board by conventional extrusion methods, or in the alternative, one can utilize electrostatic deposition of the powder on the paper with subsequent flame treatment to adhere the same thereto. Obviously, separate extruders or separate application of the electrostatic charged powder may be necessary.

As previously explained, the thermoplastic coated paperboard **50** of FIG. **5** or **6** is wound about a mandrel, and may be heated during winding so as to render the thermoplastic adhesive tacky to obtain the adhesion between the several plies. FIG. **2** and the enlargement thereof in FIG. **3** depict the utilization of the coated board of FIG. **5**, and illustrates the increased wall thickness of the tubular member at the lower end thereof; with the normal thickness in the intermediate area portion of tubular member **12**. After the tubular member **12** is formed, and cooled, such that the thermoplastic material adhesively secures the paper plies one to another, the chime member **30**, and the bottom closure **40** are placed on the lower end of the container, with an upper chime **20** being placed on the upper end. Subsequently, conventional methods are utilized to mechanically curl the chimes **22** and **36** as indicated in FIG. **4**, and to deform the side wall of the metal chime and the container board to form the annular grooves **24** and **38** as indicated.

Due to the greater elasticity of the thermoplastic material adjacent the ends of the tubular member **12**, such deformation permits formation of the curls and grooves without rupturing the thermoplastic film, or of the paper fibre of the container board. Obviously, such eliminates the prior need for the utilization of a wetting agent to permit such deformation, and precludes the necessity for storage and drying of the formed container.

Within the scope of my invention is any tubular member which utilizes a thermoplastic adhesive for securing the convolute wound plies of paper together, and in which the elasticity of the material adjacent those areas which are to be deformed is greater than the elasticity of the thermoplastic material in the intermediate upstanding side walls **12** of the container **10.**

I claim:

1. In a fibre drum container having a tubular body member and a closure attached to at least one end by deformation of the tubular body member, the improvement comprising:

a. several plies of convolutely wound paperboard; and

b. a layer of thermoplastic adhering the plies of paperboard to one another, means for permitting deformation of the body member adjacent said one end without rupture of the paperboard, said means including said thermoplastic adjacent the deformed end having a greater elasticity than the remaining thermoplastic.

2. An article as recited in claim **1** in which said greater elasticity is obtained by:

a. increased thickness of the thermoplastic layer adjacent the deformed end as compared to other of said thermoplastic layer.

3. An article as recited in claim **1** in which:

a. the thickness of the layer of thermoplastic is uniform; and

b. the thermoplastic adjacent the deformed end has a greater percentage elongation prior to rupture.

4. A convolute wound fibre drum comprising:

a. several plies of convolutely wound container board for forming a tubular member, said plies being adhesively secured one to another by a layer of thermoplastic material;

b. a metal chime at each end of said tubular member for securing a closure thereto, said chime being attached to said tubular member by indentation of a portion of said chime and said tubular member; and

c. said layer of thermoplastic material being said plies and intermediate the indentations having a maximum thickness of 0.5 mils, and a thickness greater than 0.5 mils at said indentation for providing elasticity to the tubular member to preclude rupture of the fibre thereof.

5. A container comprising:

a. several plies of paperboard convolutely wound into a tubular member and forming an annular upstanding side wall having two open ends;

b. a thermoplastic adhering the plies of paperboard one to another;

c. metal chimes secured to said open ends for the attachment of end closures to the tubular member, said chimes extending a short distance beyond the ends of the tubular member and overlying a portion

of the side walls, said chimes being secured to the tubular member by an annular deformation of the chimes and the paperboard; and

d. said thermoplastic material between the plies of paperboard having a greater elasticity in the area underneath the metal chimes than the thermoplastic material between the metal chimes.

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