



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 595 802 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.11.2005 Bulletin 2005/46

(51) Int Cl.7: **B65D 3/22, B65D 8/02,
B65D 51/20**

(21) Application number: **05252817.1**

(22) Date of filing: **07.05.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

(72) Inventor: **Nomula, Srinivas**
Hartsville South Carolina 29550 (US)

(74) Representative: **Kinsler, Maureen Catherine et al**
Marks & Clerk,
19 Royal Exchange Square
Glasgow G1 3NA (GB)

(30) Priority: **12.05.2004 US 843970**

(71) Applicant: **Sonoco Development, Inc.**
Hartsville, South Carolina 29550 (US)

(54) **High-barrier liner for beaded composite can**

(57) A high-barrier liner (14) for a composite container (10) for products comprises a tubular body member (11) comprising at least one paperboard body ply (12) having an inner surface. The composite container (10) further comprises a liner ply adhered to the inner surface of the tubular body member. The liner ply (14) comprises a metallized film (24) disposed between inner and outer sealant layers (20 and 22 respectively). The metallized film (24) comprises a polymer film substrate (30) and a vapor-deposited metal layer (28) on one surface of the substrate (30). The metallized film (24) is advantageously oriented such that the metal layer (28) of the metallized film faces towards an interior of the composite container.

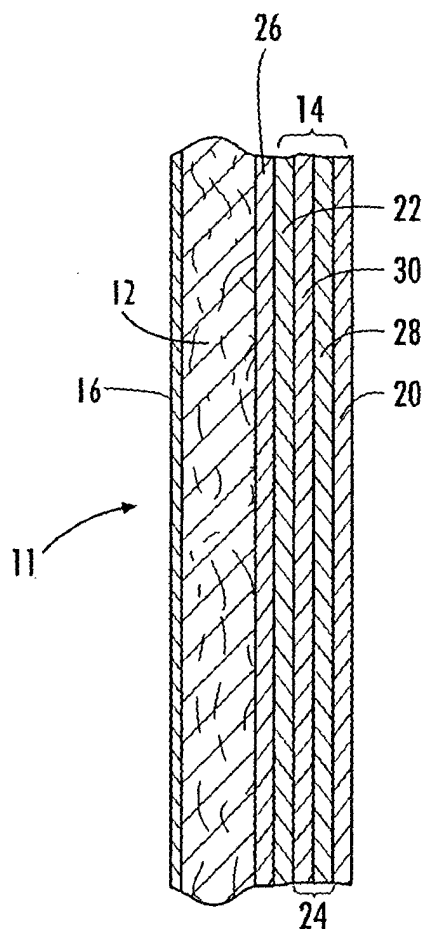


FIG. 2

EP 1 595 802 A2

Description

BACKGROUND OF THE INVENTION

[0001] Food and drink products and other perishable items are often packaged in tubular containers, which are sealed at both ends. These tubular containers typically include at least one structural body ply an impervious liner ply, and are formed by wrapping continuous strips of body and liner ply material around a mandrel of a desired shape to create a tubular structure. The plies may be spirally wound around the mandrel or passed through a series of forming elements so as to be wrapped in a convolute shape around the mandrel. At the downstream end of the mandrel, the tube is cut into discrete lengths and is then fitted with end closures to form the container.

[0002] Current commercial containers often have membrane-type lids or end closures heat sealed to a curled or bead-shaped rim of the composite container wall to form a peelable seal. The rim is formed by turning outwardly the end of the container to position the inner layer of the liner material on the outwardly curved surface.

[0003] As noted, tubular containers of this type typically include a liner ply on the inner surface of the paperboard body ply. The liner ply prevents liquids, such as juice, from leaking out of the container and also prevents liquids from entering the container and possibly contaminating the food product contained therein. Preferably, the liner ply is also resistant to the passage of gases, such as oxygen, water vapor, and nitrogen, so as to prevent odors of the food product in the container from escaping and to prevent atmospheric air from entering the container and spoiling the food product. Thus, the liner ply provides barrier properties and the body ply provides structural properties.

[0004] Conventional composite containers having high-barrier liners have employed foil-based liners. Foil is laminated to a paper or film layer on one side, and a sealant layer is laminated to or extrusion-coated onto the other side of the foil. The sealant layer forms the inside surface of the container such that it is the exposed surface of the bead. A membrane lid is heat sealed to the sealant layer on the liner. Examples of sealant layers include Surlyn® polymer (E.I. du Pont de Nemours and Company), high-density polyethylene (HDPE), Surlyn®-HDPE coextrusion, or low-density polyethylene (LDPE)-HDPE coextrusion. If a sealant is used in place of the paper or film layer, the sealant and sealant layer can seal to each other to form a lap seal between opposite edge portions of the liner ply so the liner forms a continuous barrier along the inner surface of the container. Possible sealants include LDPE, ethylene-methyl acrylate (EMA), or a blend or coextrusion of the two.

[0005] Foil-based liners are relatively expensive. Moreover, a liner comprising foil supported by a paper layer (e.g., kraft) has substantial thickness, and when

the necessary fold seal is used to seal adjacent edges of the liner strip together (i.e., "anaconda" seal), this can create problems in forming a hermetic seal between a container end and a membrane lid. For these and other reasons, consideration has been given to making liners based on alternative barrier materials such as metallized film. However, liners based on metallized films have yet to attain acceptable barrier performance required for some high-barrier applications. In addition, barrier properties of metallized films have been susceptible to deterioration under high temperature and high humidity conditions. Thus, a high-barrier liner is sought that would advantageously solve these problems with current liners.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention addresses the above needs and provides other advantages, by providing a container having a high barrier liner that comprises a metallized film oriented with the metal layer facing inwards towards the interior of the container. Surprisingly, it has been found that the directional orientation of the metal layer has an effect on barrier performance. In particular, the inward-facing orientation is superior to an outward-facing orientation in terms of barrier performance, and also is less susceptible to deterioration in high-temperature, high humidity conditions.

[0007] In accordance with one embodiment of the invention, a composite container for products comprises a tubular body member comprising at least one paperboard body ply having an inner surface. The composite container further comprises a liner ply adhered to the inner surface of the tubular body member. The liner ply comprises a metallized film disposed between inner and outer sealant layers. The metallized film comprises a polymer film substrate and a vapor-deposited metal layer on one surface of the substrate. The metallized film is advantageously oriented such that the metal layer of the metallized film faces radially inwardly towards an interior of the composite container.

[0008] Various materials can be used for the metallized layer, including but not limited to metallized polyethylene, metallized polypropylene, or metallized polyester such as metallized polyethylene terephthalate. Each of the inner and outer sealant layers preferably comprises at least one of polypropylene, ionomer resin, high density polyethylene, low density polyethylene, linear low-density polyethylene, metallocene catalyzed polyolefins, ethylene-methyl acrylate, and copolymers, coextrusions, and blends thereof. The inner layer can also comprise ethylene acid copolymer having acid groups partially neutralized by zinc or sodium ions.

[0009] The inner and outer sealant layers and metallized film can be configured and attached using various techniques. For example, the inner sealant layer can be attached to the metal layer of the metallized film, and the outer sealant layer attached to both an opposite sur-

face of the metallized film and the inner surface of the paperboard body ply. The metallized film can be adhesive or extrusion laminated to the inner sealant layer. Alternatively, the inner sealant layer can be extrusion coated on the metallized film. The outer sealant layer can be extrusion coated on the metallized film, or integral with the metallized film in additional embodiments of the present invention.

[0010] The composite container can optionally include further features. For instance, there can be a second metallized film disposed between a metallized film and the inner sealant layer. Also, the liner ply can further comprise a protective coating applied over the metal layer of the metallized film, with the protective coating disposed between the metallized film and the inner sealant layer. Furthermore, the metallized film can further comprise an adhesion-promoting material applied between the polymer film substrate and the metal layer to promote adhesion of the metal layer to the substrate. A top end of the tubular body member can be rolled outwardly to form a rim on which the liner ply is exposed, and a lid heat sealed to the rim.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0011] Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 is a perspective view of a container in accordance with one embodiment of the invention illustrating the opening mechanism;

FIG. 2 is a cross-sectional view of the liner showing the multiple layers of the liner;

FIG. 3 is a cross-sectional view of the liner in accordance with another embodiment of the present invention; and

FIG. 4 is a fragmentary and enlarged cross-sectional view of the liner illustrating the metal-in configuration of the liner at the sealed end of the container.

DETAILED DESCRIPTION OF THE INVENTION

[0012] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some but not all embodiments of the invention are shown. Indeed, this invention can be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0013] FIGS. 1-3 depict a container **10** in accordance

with one embodiment of the invention. The container **10** includes a tubular container body **11** that may be formed by various methods and may have various constructions. In general, the container body **11** can be made by winding at least one structural body ply **12** about a forming mandrel (not shown) and either adhering overlapping edges of a single body ply to each other to form a tubular structure, or, in the case of multiple body plies, winding the plies one upon another and adhering opposing faces of the plies to one another to form a tubular structure. Although illustrated as having a circular cross section, the container **10** may have any cross-sectional shape that can be formed by wrapping the container about an appropriately shaped mandrel. The body ply or plies **12** can be wound either spirally or convolutely. The body ply or plies **12** advantageously comprise paperboard. The container body **11** may also include an outer label ply **16** wrapped about an exterior surface of the outermost body ply **12** and adhered thereto. The label ply **16** may comprise, for example, a thin non-structural ply of paper or polymer film, and may include graphics and/or indicia printed or otherwise provided on its exterior surface.

[0014] The container body **11** also includes a liner ply **14** adhered against an inwardly facing surface of the innermost body ply **12**. The liner ply **14** is provided for forming a barrier substantially impervious to moisture and/or gases such as oxygen. In the packaging of food and drink products in particular, it is often important to ensure that the container wall have a water vapor transmission rate (WVTR) below a certain specified value, (e.g., WVTR < 0.01 g/100 in²/day) and/or to ensure that the container wall have an oxygen transmission rate (OTR) below a certain specified value (e.g., OTR < 0.01 cc/100 in²/day). Depending upon the requirements in a particular case, the material(s) that are suitable for the liner ply **14** may vary.

[0015] In the embodiment illustrated in FIG. 2, the liner ply **14** includes an inner sealant layer **20**, an outer sealant layer **22**, a metallized film **24**, and an adhesive layer **26**. The metallized film **24** is resistant to the passage of liquids and gasses such as oxygen and includes a metal layer **28** vapor deposited onto a polymer substrate **30**. The metal layer **28** is typically vapor deposited on the polymer substrate **30** in a vacuum chamber. If a high barrier is required for both liquids and gasses, preferred metallized films **24** are metallized polyethylene, metallized polypropylene, or metallized polyester such as metallized polyethylene terephthalate, although it is understood that various materials could be employed with the metallized film of the present invention. It is possible to have more than one metal layer **28** oriented in a metal-in configuration in instances where increased barrier properties are desired.

[0016] The inner sealant layer **20** is the radially innermost layer of the liner ply **14**, and is attached to the metal layer **28** of the metallized film **24**. The outer sealant layer **22** is attached to the body ply **12** with the adhesive **26**

and is also attached to the polymer substrate **30** of the metallized film **24**. The inner **20** and outer **22** sealant layers could be polypropylene, ionomer resin (e.g., **Suryln®**), high density polyethylene, low density polyethylene, linear low-density polyethylene, metallocene catalyzed polyolefins, or ethylene-methyl acrylate, or copolymers, coextrusions, and blends thereof. The previous list of materials is not meant to be limiting, as it is understood that the inner **20** and outer **22** sealant layers could be any suitable material capable of being used with a liner ply **14**, as known to those skilled in the art. The adhesive **26** could be any suitable adhesive capable of bonding the body ply **12** to the outer sealant layer **22**, such as a water-based wet adhesive. The inner **20** and outer **22** sealant layers are generally formed of materials that allow the liner to form a lap seal, although it is understood that the liner could be sealed by a fold seal in alternative embodiments.

[0017] The metal layer **28** is oriented such that the metal layer faces towards the interior of the container **10** (referred to as "metal-in"). The metal-in orientation has shown improved barrier performance and slower deterioration of the barrier in high-temperature, high-humidity conditions, relative to a metal-out orientation. Testing has indicated that the WVTR can be lower in the metal-in orientation than in a metal-out orientation over the same testing period. In addition, the unsupported liner ply **14** according to the present invention is significantly thinner than conventional supported liners and thus the liner seal (i.e., fold or lap seal) is substantially thinner than an anaconda fold seal of a conventional supported liner. Accordingly, much smaller discontinuities are presented at the point where the seam crosses the bead. Thus, the membrane closure **32** can be cheaply and easily sealed to the bead **19** with a minimum amount of sealant **36**, and the fit and removability of the overcap can be improved.

[0018] The inner **20** and outer **22** sealant layers and metallized film **24** can be attached using various techniques, as known to those skilled in the art. For instance, in accordance with one embodiment of the present invention, the metallized film **24** is adhesive or extrusion laminated to the inner sealant layer **20**. Alternatively, the inner sealant layer **20** can be extrusion coated on the metallized film **24**. The outer sealant layer **22** can be extrusion coated on the metallized film **24**, or integral with the metallized film in additional embodiments of the present invention.

[0019] In alternative embodiments of the present invention shown in FIG. 3, the liner ply **14** can further comprise a protective coating **31** applied over the metal layer **28** of the metallized film **24**, with the protective coating disposed between the metallized film and the inner sealant layer **20**. Furthermore, the metallized film **24** can comprise an adhesion-promoting material **33** applied between the polymer substrate **30** and the metal layer **28** to promote adhesion of the metal layer to the substrate during metallization. Also, a primer or tie layer **31**,

as known to those skilled in the art, could be employed to promote adhesion between the metallized layer **24** and the inner or outer sealant layers.

[0020] As shown in FIG. 4, the container **10** can also include a rolled bead **19** at a top end of the container body **11**, formed by rolling the top edge of the wall of the container body **11** radially outwardly and then downwardly toward a lower end of the container body. The bead **19** can be formed by providing a die of suitable configuration and forcing the top end of the container body axially against the die to roll an upper portion of the body outwardly and then downwardly. The bead **19** is provided in part so that a removable and replaceable overcap **18** can be snap-fit onto the top end of the container **10** in engagement with the bead. The overcap **18** provides a way to re-close the container **10** after it has initially been opened.

[0021] The primary or original sealing of the top end of the container **10**, however, can be provided by a flexible membrane closure **32** that is bonded to the end surface of the bead **19** after the container is filled. The membrane closure **32** can be of various constructions, but generally includes at least a moisture and/or gas barrier layer **35** and can include one or more further layers if desired, such as a paperboard layer **34**. To bond the membrane closure **32** to the bead **19**, the membrane closure includes on its under surface a sealant **36** that is heat-sealable to the inner sealant layer **20** of the liner.

[0022] After the membrane closure **32** is bonded to the bead **19**, the overcap **18** is then placed over the membrane and engaged with the bead **19**. When the consumer wishes to open the sealed container, the overcap **18** is removed and then the membrane closure **32** is peeled off the bead **19** as depicted in FIG. 1. The container is re-closed by replacing the overcap **18**.

[0023] The container **10** could be manufacturing using a variety of techniques, as known to those skilled in the art. For example, U.S. Patent No. 6,350,500, which is incorporated herein by reference, utilizes a continuous strip of paperboard body ply that is first advanced toward a shaping mandrel. As the paperboard body ply material is advanced toward the shaping mandrel, the body ply is advanced through an adhesive applicator that applies an adhesive to the inner surface of the body ply. A continuous liner ply is also advanced onto the shaping mandrel such that the liner ply is adhered to the body ply. As the body ply and liner ply are advanced in a helical fashion, a continuous label ply may be adhered to the outer surface of the body ply and the container cut into discrete lengths at a cutting station.

[0024] Many modifications and other embodiments of the invention set forth herein will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be in-

cluded within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. A composite container for products comprising:

a tubular body member comprising at least one paperboard body ply and having an inner surface; and
a liner ply adhered to the inner surface of the tubular body member and comprising a metallized film disposed between an inner sealant layer and an outer sealant layer, the metallized film comprising a polymer film substrate and a vapor-deposited metal layer on one surface of the substrate, wherein the metallized film is oriented such that the metal layer of the metallized film faces towards an interior of the composite container.

2. A composite container according to Claim 1, wherein the metallized film comprises metallized polyethylene.

3. A composite container according to Claim 1, wherein the metallized film comprises metallized polypropylene.

4. A composite container according to Claim 1, wherein the metallized film comprises metallized polyester

5. A composite container according to Claim 1, wherein the metallized film comprises metallized polyethylene terephthalate.

6. A composite container according to Claim 1, wherein the liner ply further comprises a second metallized film disposed between the metallized film and the inner sealant layer.

7. A composite container according to Claim 1, wherein the inner sealant layer is attached to the metal layer of the metallized film and the outer sealant layer is attached to both an opposite surface of the metallized film and the inner surface of the paperboard body ply.

8. A composite container according to Claim 7, wherein the metallized film is adhesive laminated to the inner sealant layer.

9. A composite container according to Claim 7, wherein the metallized film is extrusion laminated to the

inner sealant layer.

10. A composite container according to Claim 7, wherein the inner sealant layer is extrusion coated on the metallized film.

11. A composite container according to Claim 7, wherein the outer sealant layer is extrusion coated on the metallized film.

12. A composite container according to Claim 7, wherein the outer sealant layer is integral with the metallized film.

13. A composite container according to Claim 1, wherein each of the inner and outer sealant layers comprises at least one of polypropylene, ionomer resin, high density polyethylene, low density polyethylene, linear low-density polyethylene, metallocene catalyzed polyolefins, ethylene-methyl acrylate, and copolymers, coextrusions, and blends thereof.

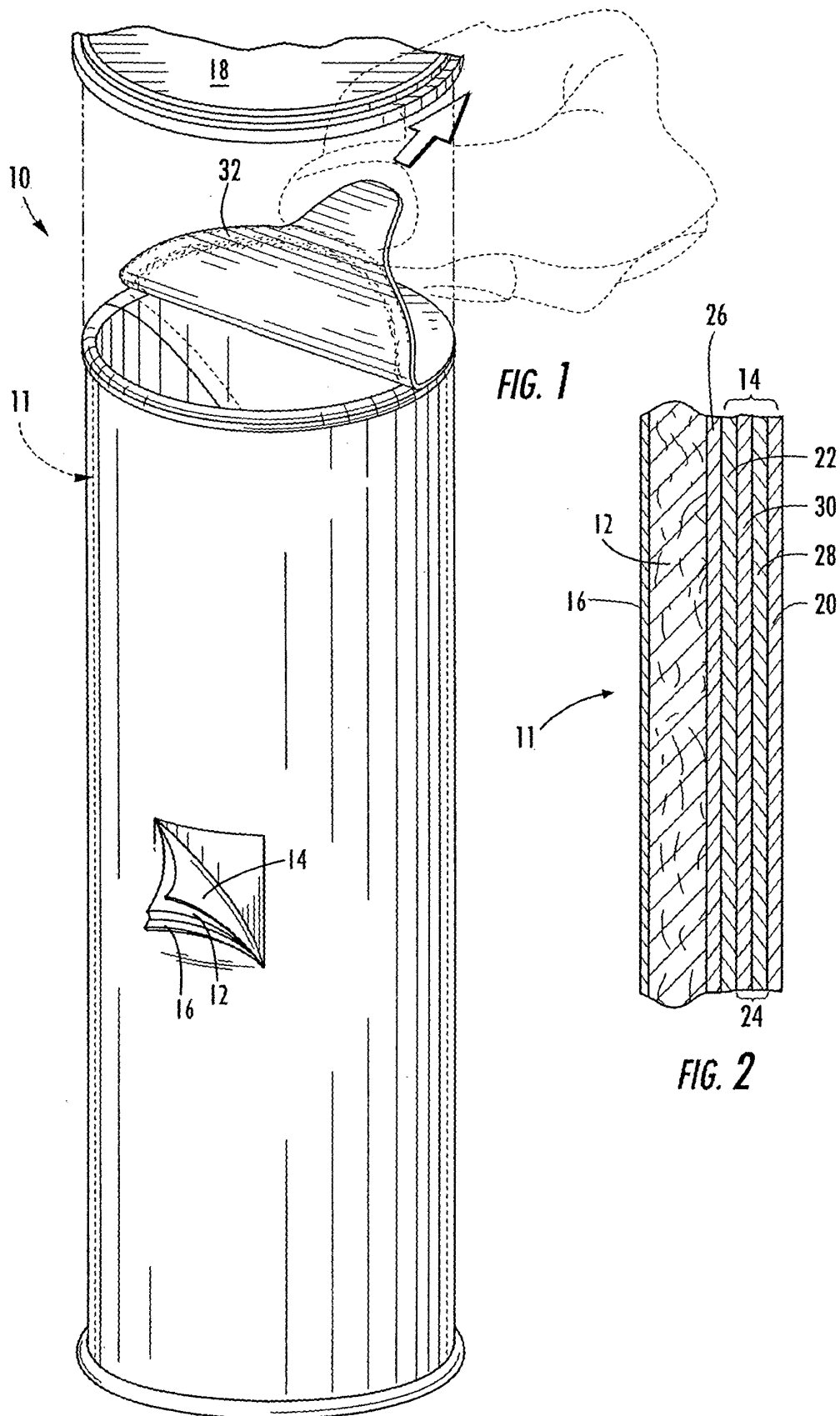
14. A composite container according to Claim 1, wherein the inner layer comprises ethylene acid copolymer having acid groups partially neutralized by zinc or sodium ions.

15. A composite container according to Claim 1, wherein the liner ply further comprises a protective coating applied over the metal layer of the metallized film, the protective coating disposed between the metallized film and the inner sealant layer.

16. A composite container according to Claim 1, wherein the metallized film further comprises an adhesion-promoting material applied between the polymer film substrate and the metal layer to promote adhesion of the metal layer to the substrate.

17. A composite container according to Claim 1, wherein a top end of the tubular body member is rolled outwardly to form a rim on which the liner ply is exposed.

18. A composite container according to Claim 17, further comprising a lid heat-sealed to the rim.



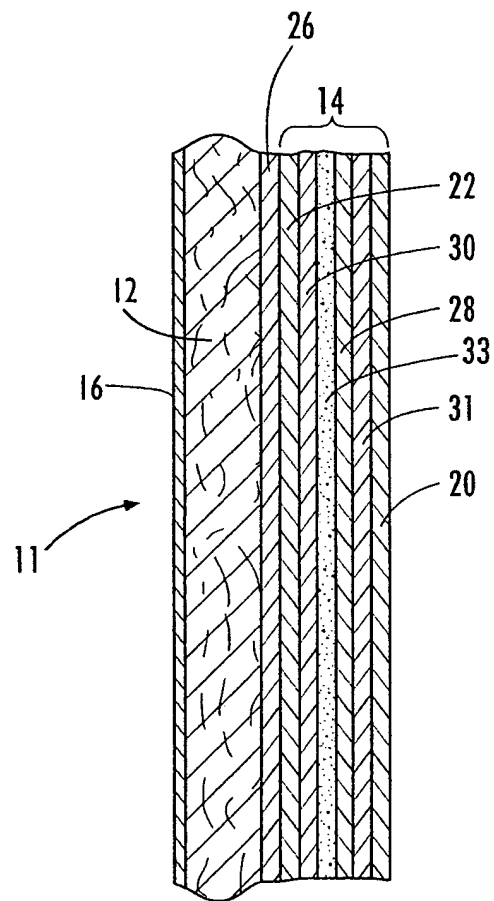


FIG. 3

