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(54) **Composite container having a hermetically sealed polymeric sleeve**

(57) A container (10) for protectively encapsulating a product, such as a perishable food product, during shipment and display. The container includes a tubular body (11) constructed of a composite sheet material and defining a receptacle for receiving the food product. An outer surface of the body defines an edge surrounding an entrance of the receptacle. An end closure (15,16) abuts the edge of the tubular body so as to extend over

the entrance. Extending over the end closure and the outer surface of the body is a film sleeve (17) that serves to secure the end closure to the body. An adhesive can be used to seal the film sleeve to the end closure and body so as to hermetically seal a juncture (18) between the end closure and the body. A score line (124) on the film sleeve (17) facilitates opening of the container while extending only partially through the film sleeve to preserve its barrier properties.

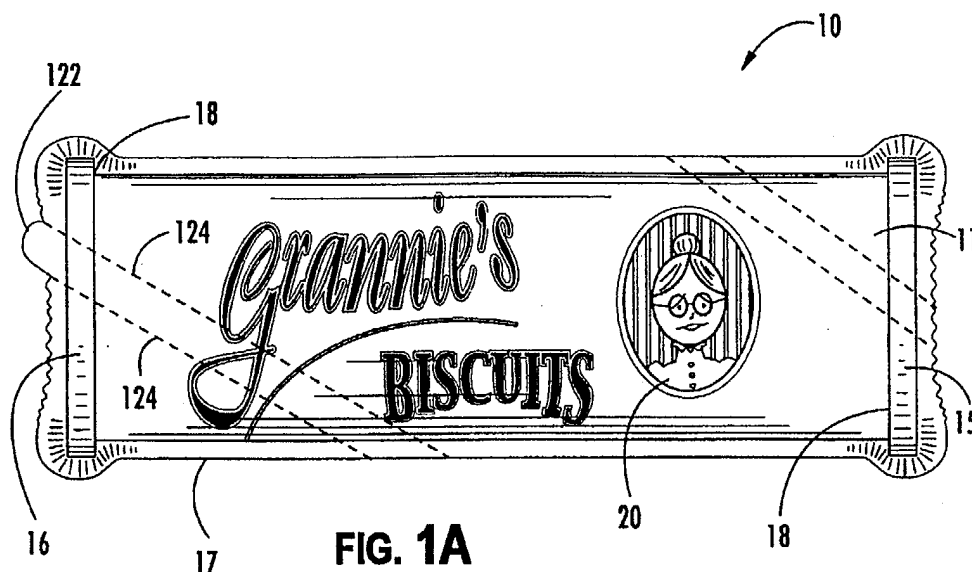


FIG. 1A

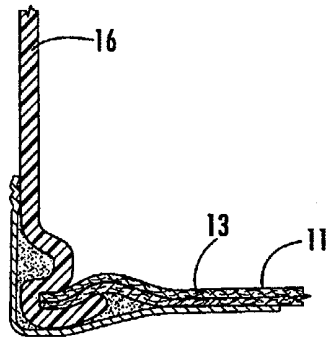


FIG. 1B

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to composite containers for food products, and more particularly, to multiple-ply tubular containers including a paperboard ply, an inner liner ply and an outer polymeric sleeve.

Description of Related Art.

[0002] In the packaging of perishable food products, a container is required that is rigid enough to retain its shape when subjected to internal pressure produced in the container while tightly sealing the food product to protect against deterioration, leakage and contamination. Thus, perishable food products are often packaged in composite tubular containers that are sealed at both ends. The tubular body portion of these containers conventionally includes three separate plies or sets of plies.

[0003] At least one structural body ply made of paperboard material is included which is formed into a tubular structure by wrapping a continuous strip of body ply paperboard material around a shaping mandrel. The body ply strip 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 to form the tubular structure. As it is formed, the tubular structure is advanced to a cutting station. At the cutting station, the tube is cut into predetermined lengths at the downstream end of the mandrel and fitted with one end closure to prepare the container for shipping to the customer. The can is then filled and the other end closure is applied.

[0004] The completed container includes a heat-sealable liquid impermeable ply ("the liner ply") adhered to the inner surface of the paperboard ply. The liner ply seals the food product, such as potato crisps, chips, refrigerated dough or juice, within the container, and also prevents liquids, which may possibly contaminate the food product, from entering the container. Some liner plies are also gas and vapor impermeable, so as to not only prevent food product odors from escaping the can, but also prevent atmospheric air and water vapor from entering the container and spoiling the food product. Thus, while the purpose of the body ply is to provide necessary structural properties to the container, the liner ply provides barrier properties necessary to protect and maintain the perishable food product. The liner ply is typically integrated into the can during the mandrel winding process.

[0005] A label ply, which is typically a paper-based ply, is included and adhered to the outer surface of the paperboard body ply. The label ply serves two primary functions. First, a composite can label is a source of information. The label carries the graphical matter that

conveys product information, instructions, and regulatory compliance information. The label is also preferably decorative and aesthetically pleasing to the consumer, which enhances shelf appeal and increases consumer interest in the food product. In particular, the gloss of a label is important for consumer appeal, with high and even gloss being preferable. The label is commonly integrated into the can during the mandrel winding process, although convolute labels may be applied at a later time.

[0006] The graphics included on conventional paper labels are either rotogravure or flexographically printed and may require thermosetting-type overlacquers over the inks to protect the inks used in the label printing process. However, the overlacquers may not absorb evenly into the paper resulting in inconsistent gloss characteristics. In addition, paper labels have a relatively high surface roughness which reduces the smoothness of the label even after application of the overlacquer.

[0007] In addition to being a source of information, the composite can label imparts physical characteristics to the can. For example, the wet strength of the label ply can be an important factor in composite container design. If the container is exposed to moisture and the paperboard ply gets wet, the strength of the can may be compromised. Such moisture is sometimes encountered during shipping. At other times, condensation may form on the surface of the can if the can is refrigerated, or otherwise exposed to cold temperatures, and then moved to a warmer, humid environment. If the wet strength of the label ply is low, then the label will provide little additional strength to the body ply to prevent the premature rupturing of the container.

[0008] The wet strength of conventional paper label plies is especially important when the plies are used in conjunction with composite cans for dough. Composite dough cans are designed differently from other composite containers such that most of them can be opened by forcefully striking container against a sharp surface, such as the edge of a kitchen counter. Others are designed to self-open immediately once the label has been peeled off. The edges of the body ply strip are typically abutted and held together with an unadhered, or weakly adhered, joint or seam. Accordingly, when the label ply is removed the internal pressure of the dough, and in the case of non self-opening cans the force of the impact against a sharp edge, causes the body ply seam to separate. Separation of the body ply seam causes failure of the liner ply and allows removal of the dough product from the can. The label ply is thus designed to provide a substantial component of the total strength of the can necessary to prevent the can from prematurely opening. Exposure of the paperboard ply, which has a low wet strength, makes the strength of the label ply even more critical.

[0009] U.S. Patent No. 6,290,119 to Reese et al. ("Reese"), commonly assigned and incorporated herein by reference, discloses a composite container **10** having

a polymer film label ply. As shown in Figure 1 of Reese, the composite container includes a tubular body ply **12**, a liner ply **13** adhered to the inner surface of the tubular body ply, and a film label ply **14** adhered to the outer surface of the tubular body ply. A pair of end closures **16, 18** are secured to opposite ends of the composite container.

[0010] During assembly, the liner and tubular body plies are wound around a mandrel **26**, as shown in Figure 6 of Reese. The film label ply includes reverse-printed indicia and a heat-sealing adhesive coating on its inner surface. The film label ply is passed through a heater **44** which activates the adhesive coating. Once heated, the film label ply is applied to the outside of the body ply so as to form a continuous tube. The continuous tube is cut into discrete lengths in register to label graphics at a cutting station **48**, one end closure is applied to each of the discrete lengths for shipping to, and later filling and application of the second end closure at, the customer.

[0011] Advantageously, the film layer increases the gloss of the label ply and protects the indicia applied to its inner surface. In addition, the film label ply is relatively strong and isolates the body ply from moisture to prevent premature opening of the can. Despite these advantages, additional improvements in the strength, durability and protective ability of composite cans are highly desirable.

[0012] Therefore, it would be advantageous to have a composite can that protectively contains perishable food items and isolates the food items from the environment. It would be further advantageous if the can had a glossy outer surface bearing indicia so as to be easily handled and attractive to consumers. It would be further advantageous if the composite can had an outer ply that provides additional strength to the can and inhibits premature opening of the can.

BRIEF SUMMARY OF THE INVENTION

[0013] The present invention addresses the above needs and achieves other advantages by providing a container for protectively encapsulating a product, such as a perishable food product, during shipment and display. The container includes a tubular body constructed of a composite sheet material and defining a receptacle for receiving the food product. An outer surface of the body defines an edge surrounding an entrance of the receptacle. An end closure abuts the edge of the tubular body so as to extend over the entrance. Extending over the end closure and the outer surface of the body is a polymeric film sleeve. The polymeric sleeve has a glossy outer surface, and durable, appealing graphics through reverse printing on its interior surface. An adhesive can be used to seal the film sleeve to the end closure, or to seal the film sleeve to both the end closure and the body, so as to hermetically seal a juncture between the end closure and the body. Opening of the con-

tainer may be facilitated by laser scoring a spiral liner score line onto the film sleeve that extends only partially through the film sleeve to preserve its barrier properties. Alternatively, a tear strip or notch may be incorporated on the edge of film which may have a spiral or linear tear preference.

[0014] In one embodiment, the present invention includes a container for protectively encapsulating a product during shipment. The container includes a body, at least one end closure, a film sleeve and an adhesive. A receptacle is defined within the body and the body includes an outer surface. The outer surface of the body defines an edge surrounding an entrance of the receptacle. The receptacle and the entrance are sized and shaped to receive the product. Abutting the edge of the body is the end closure which extends over the entrance of the receptacle. The end closure includes an outer end closure surface wherein adjacent portions of the outer end closure surface and outer body surface form a juncture. The film sleeve covers the body and extends over the juncture between the body and outer end closure surfaces. The adhesive adheres the film sleeve to the outer surface of at least the end closure so as to seal the juncture between the end closure and the body.

[0015] In another embodiment, the present invention includes a container for protectively encapsulating a perishable food product during shipment and display. The container includes a tubular body constructed of a composite sheet material including a body ply and an inner liner ply. Also, the tubular body has an outer surface and defines a cylindrical receptacle having a pair of opposing end entrances. Defined by the outer surface of the body is an edge that surrounds each entrance to the cylindrical receptacle. The cylindrical receptacle and at least one of the entrances are sized and shaped to receive the perishable food product. An end closure is shaped to abut the edge of the tubular body and extend over one of the entrances of the cylindrical receptacle. The end closure includes an outer end closure surface wherein adjacent portions of the outer end closure surface and outer body surface form a juncture. A film sleeve covers the body and extends over the juncture between the body and the outer end closure surfaces.

[0016] In another aspect, the end closure has a circular shape and is sized to abut the circular shaped edge defining the entrance to the receptacle. The other end of the tubular body also has a circular shape and the container includes a second end closure having a circular shape. The second end closure is sized to abut the circular shaped edge of the other end of the tubular body. Similar to the first end closure, the second end closure has an outer end closure surface with a portion adjacent to a portion of the outer body surface so as to form a second juncture. The film sleeve extends over the second juncture and the adhesive adheres the sleeve to at least the outer surface of the second end closure. Additionally, the film sleeve may be adhered to the outer body surface.

[0017] In yet another aspect, the outer ply is a paper-board ply and the inner liner ply is at least partially impermeable to fluids, gasses and vapors. The inner liner ply may include a metal foil, or a metalized film layer.

[0018] The adhesive may include several types of material. Preferably, the adhesive is an ethylene acrylic acid dispersion. Optionally the adhesive may be any one of a number of materials such as a latex acrylic, an ionomer dispersion, a heat-activated urethane, a heat-activated acrylic or a heat activated PVDC (polyvinylidene dichloride). The film sleeve may also be constructed of different types of materials such as oriented polyethylene terephthalate, oriented polypropylene, oriented polyvinyl chloride or oriented polystyrene or oriented polyethylene terephthalate glycol. A perforation or score line may also be defined by the sleeve to facilitate opening of the container, wherein the sleeve extends between the ends of the body. The score line may be accompanied by a tear strip to further facilitate opening of the container, or a blank container may have an eyespot line along the body ply seam that is used to register the scored film line to the body ply seam. Preferably, the film sleeve is shrink-fit onto the end closures and the body so as to create a hermetic seal between the film and the end closures.

[0019] In still another aspect, coupons or game pieces may be incorporated under or inside the film sleeve, especially between the film sleeve and one of the end closures.

[0020] Among the advantages of the present invention is the benefit of a container hermetically sealed by a shrink wrapped, polymeric sleeve, and adhesive applied thereto, against the passage of gasses, vapors and fluids that might contaminate the products, such as perishable foods, enclosed therein. This is especially useful in refrigerated environments that are moist and can discolor, or cause mildew to grow on, the paper-board or other materials of the tubular body. In addition, the polymeric sleeve has an increased ability to contain internal pressures and guard against premature opening as compared to conventional labels. Generally, the container can be manufactured at a lower cost than conventional composite containers having fluid permeable outer labels. For instance, the increased strength of the sleeve, and its ability to block the passage of fluids that weaken the tubular body plies allows the use of generally weaker (and less expensive) paperboard and liner materials. Further, the polymeric sleeve is generally cheaper to manufacture than conventional containers having multiple foil layers, such as an outer label constructed of a foil material. The advantage of shifting application of the polymeric sleeve to the filler is that there is no need to stock multiple types of printed cans at the filler. Each can is labeled as it is filled, allowing quick changes for short-run promotions.

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

[0021] 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:

Figure 1A is a perspective view of a composite container of one embodiment of the present invention; Figure 1B is a sectional view of the composite container shown in Figure 1A demonstrating a film label sleeve sealed over a crimped end closure and body of the composite container using an adhesive;

Figure 2 shows an enlarged sectional view of the film label sleeve shown in Figures 1A and 1B;

Figure 3 is a fragmentary and enlarged view of the film label sleeve shown in Figures 1A and 1B demonstrating graphical matter on at least a portion of its inner surface;

Figure 4 is a reverse fragmentary and enlarged view of a film label sleeve of another embodiment of the present invention demonstrating graphical matter and the adhesive in a dot pattern on an inner surface of the film label sleeve;

Figure 4A is an enlarged view of the adhesive in a dot pattern on the inner surface of the film label sleeve shown in Figure 4;

Figure 4B is an enlarged view of an adhesive on the inner surface of the film label sleeve in a strip pattern of another embodiment of the present invention;

Figure 5 is a greatly enlarged sectional view of the adhesive in a dot pattern taken along line 5-5 of Figure 4A;

Figure 6 is a plan view illustrating a method for making a tubular body of the composite container shown in Figure 1A;

Figure 7 is a front elevation view of a sleeving machine for applying the film label sleeve around the filled and capped tubular body to form the composite container shown in Figure 1A; and

Figure 8 is a side elevation view of the sleeving machine of Figure 7 including a film sleeve supplier.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The present inventions 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, these inventions may 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.

[0023] The present invention includes a sealed, composite container **10** for protectively encapsulating a con-

sumer product during shipment and display, as shown in Figure 1A. The container includes a tubular body **11** constructed of a composite sheet material, which in the illustrated embodiment includes a body ply **12**, and an inner liner ply **13** adhered to the inner surface of the body ply. The tubular body **11** has a pair of open ends **14**, the open ends being covered by a pair of end closures **15**, **16**. A film ply or sleeve **17** extends over the outer surface of the body ply **12** and further over a juncture **18**, or seam, between the body **11** and the end closures **15**, **16**.

[0024] Although illustrated as having a circular cross-section, the tubular body **11** may have any cross-sectional shape which can be formed by wrapping the composite sheet material around an appropriately shaped mandrel. One example is a generally rectangular shaped tubular body having rounded comers. The container **10** of the present invention is particularly advantageous when used to encapsulate perishable goods that should be isolated from the environment to ensure freshness, such as dough or potato crisps. The container **10** of the present invention may also be used to encapsulate other consumer products that are sensitive to the environment, such as tennis balls or grass seed.

[0025] The body ply **12** of the composite container **10** of one embodiment of the present invention is preferably formed of a paperboard material. The film sleeve **17** is adhered to the outer surface of either, or both, of the end closures **15**, **16**. Optionally, the film sleeve **17** is adhered to the outer surface of the body ply **12** and extends over the end closures **15**, **16**. Adherence of the film sleeve **17** to the paperboard material of the body ply **12** seals the tubular body **11** against the passage of liquids, gasses and vapors. Adhering the film sleeve **17** to both of the end closures **15**, **16** seals each juncture **18** against entrance or exit of fluids, vapors and gasses. Preferably, extension of the film sleeve **17** over the body ply **12** and each juncture **18** is combined with fluid, gas and vapor impermeable end closure **15**, **16** materials. For instance, the end closure materials may include a metal, such as a tin-free chrome plated steel, or a barrier plastic sufficiently strong to withstand external and internal pressures on the container **10**. In this manner, the entire container **10** can be hermetically sealed against the environment to provide improved protection for the perishable food product enclosed therein.

[0026] The film sleeve **17** is preferably constructed of a polymeric material that can either be transparent or opaque, and includes an inner surface **17A** and an outer surface **17B**, as shown in Figure 3. One type of film sleeve **17** that can be used is oriented polyvinylchloride (PVC) that has an attractive gloss and predictable tear characteristics, such as 200 gauge, SR-AE PVC film from Bonset America Corporation of Browns Summit, NC. During formation, oriented polypropylene is stretched a number of cycles in a machine direction and different number of cycles in a cross-machine direction under selected heating conditions. Such differential stretching gives the material a preferred orientation that

promotes predictable tearing patterns facilitating its use as an outer ply in dough containers that must be split open. Other materials that may be used for film sleeve **17** include oriented polyethylene terephthalate, oriented polyethylene terephthalate glycol, oriented polypropylene, oriented polystyrene and laminates thereof.

[0027] In one embodiment, the inner surface **17A** of the film sleeve **17** is printed with graphical matter **20**, such as product information, package opening instructions, and regulatory compliance information. The graphical matter is preferably printed on the inner surface **17A** of the film sleeve **17**, instead of on the outer surface **17B** of the film sleeve, by a reverse printing process. Reverse printing the graphical matter **20** on the inner surface **17A** of the film sleeve, which is adhered to the outer surface of the body ply **12**, advantageously protects the graphical matter from exposure to outside elements. The graphical matter **20** can be rotogravure or flexographically printed, with an overlacquer (not shown) included over the graphical matter to further protect its ink. Generally, the overlacquer is not necessary on reverse printed film sleeves and labels.

[0028] As shown in Figure 4, the inner surface **17A** of the film sleeve **17** also preferably includes an adhesive **22** for adhering the film sleeve to the outer surface of the body ply **12** and the end closures **15**, **16**. The adhesive **22** is preferably an ethylene acrylic acid dispersion which is a water-based adhesive that bonds well to both metal, paperboard and films. Additional adhesives that may be used include temperature-activated urethane and acrylic heat seal coatings, and cold seal coatings which are activated by pressure. Still other adhesive compositions that can be used include a latex acrylic which bonds well to plastic as a cohesive material, or an ionomer which is an acid polymer revitalized with a metal salt.

[0029] The adhesive **22** can be applied to the entire inner surface **17A** of the film sleeve **17** and over the printed graphical matter **20** as shown in Figure 2. Alternatively, the adhesive **22** can be applied to a portion of the inner surface **17A** of the film sleeve **17** in a pattern of dots **23**, as shown in Figure 4A, or in a pattern of strips **24**, as shown in Figure 4B. The adhesive strips may also be printed in an angular pattern as is prompted by the helical construction of the tubular body **11** so as to influence or enhance the tear properties of the film sleeve **17**. Further, the adhesive may be applied in a continuous strip at the edges of the film for adhesion to the metal end closures **15**, **16**. As shown in Figures 2 and 5, the adhesive **22** is disposed on the inner surface **17A** of the film sleeve **17**, but over the reverse-printed graphical matter **20**. An adhesive could also be separately applied to the body ply **12** and the film sleeve **17** during manufacture such as with rollers and the like. For example, adhesion can be promoted by applying the ethylene acrylic acid to both the body ply **12** and the film sleeve **17**.

[0030] Figures 6-8 illustrate a method of making a

multiple ply composite tubular body for use in the present invention. A continuous strip of body ply **12** (preferably a paperboard ply) is advanced toward a shaping mandrel **26**. As the body ply **12** is advanced toward the shaping mandrel **26**, the body ply is advanced through a wet-bond adhesive applicator **28** which applies an adhesive **30** to the inner surface of the body ply, as shown in Figure 6. The liner ply **13** is also continuously advanced toward the shaping mandrel **26** as a lubricant from a roller **38** is applied to its inner face. The optional lubricant allows the liner ply **13** to slide smoothly along the mandrel **26**. The liner ply **13**, which is preferably constructed of a heat sealable material, is heated by an air-knife heater (not shown) causing it to become sealed to itself as it is wound around the mandrel **26**. The mandrel may be chilled to promote the self sealing of the liner ply **13**.

[0031] It will be understood to those skilled in the art that various liner constructions with various barrier materials or properties could be employed depending upon the item being packed in the composite container **10**. The liner ply **13** may be wider than the body ply **12** depending upon the amount of liner overlap that is desired.

[0032] The body ply **12**/liner ply **13** laminate is then wrapped around the shaping mandrel **26**. The laminate is first wrapped under the mandrel **26** and then back over the top in a helical fashion with the liner ply **13** wound against the surface of the mandrel **26**. As the body ply **12**/liner ply **13** laminate advances back under the mandrel **26** after one complete revolution, its trailing edge is brought into contact with the leading edge of the ensuing portion of the body ply/liner ply laminate, which is first coming into contact with the mandrel. The edges become abutted together to form a continuous, spirally wound tube that advances along the mandrel **26**.

[0033] The tube is then advanced down the mandrel **26** by a winding belt **40** that extends around a pair of opposed pulleys **42**. The winding belt **40** not only rotates and advances the tube, but applies pressure to the overlapping edges of the body ply **12** and the liner ply **13** to ensure a secure bond between the respective ply edges. Instead of the "same side winding" process described above, however, the body ply **12** and liner ply **13** could be brought together at the mandrel **26** from opposite sides of the mandrel in a process known as "opposite side winding." The pressure of the winding belt **40** causes the body ply **12** and liner ply **13** to be adhered together. After the body ply and liner ply are adhered together on the mandrel **26**, the continuous tube is cut into discrete lengths at a cutting station **48** and then removed from the mandrel. Each discrete length, i.e., each tubular body **11** has one end **15** attached and then may be filled with dough, or other consumer products. The filled body then has its second end **16** attached by crimping one or both end closures **15,16**, as illustrated in Figure 1B, or in a manner well-known in the art, such as by conventional double-seam end application.

[0034] Once the tubular body **11** has been filled with

product, and the end closures **15,16** have been applied (typically, one of the ends has been applied before filling), the tubular body is ensleeved by a continuous feed sleeving machine **50**, as shown in Figure 7. The sleeving machine is fed by an input conveyor **74** or other conventional feeding apparatus. The filled tubular bodies may be transported in a single-file fashion or via a flood feed. The tubular body **11** is picked up by a timing screw **70** at one of its furrows, so that only one tubular body is transported to a pedestal system **64** at any one time. The timing screw **70** is constructed so as to engage the tubular body **11** at its center of mass so that there are few torques upon the tubular body. The tubular body may be trapped between the timing screw **70** and a rail or guard on the opposite side. The tubular body **11** is then moved onto a pedestal **66** of the pedestal system **64**.

[0035] As the filled tubular body **11** makes its transition onto the pedestal **66**, a sleeved iris carrier **54** moves synchronously with the tubular body. As the tubular body **11** travels on the pedestal system **64**, the iris carrier **54** with its film sleeve **17** (not shown in Figure 7 for clarity) descends about the tubular body. As the iris carrier **54** approaches the middle portion of the tubular body **11**, the film sleeve **17** is disposed about the tubular body **11**, end closure **15** and end closure **16**. Fingers present on the iris carrier **54** contract, causing the top of the sleeve **17** to engage the exterior of the filled tubular body **11**. The film sleeve **17** begins to adhere to the sides of the tubular body **11** by friction fit and by the cold, minimally tacky adhesive **20** applied thereon.

[0036] The fingers of the iris carrier **54** are generally smooth to provide a low-friction surface engaging the interior surface of the film sleeve **17**. As the sleeve slightly adheres to the side of the tubular body **11**, the iris carrier **54** and its sleeve-carrying fingers begin to disengage the sleeve **17**, leaving it behind on the tubular body. As the iris carrier **54** continues to descend towards the bottom of the tubular body **11**, having either the end closure **15** or end closure **16** attached thereto, the fingers increasingly disengage the sleeve, leaving it to circumscribe the exterior of the tubular body and the end closures.

[0037] The iris carrier **54** descends until the sleeve-carrying fingers completely disengage the sleeve **17**. At this point, the fingers then dilate, moving outward to expand the central aperture of the iris carrier **54** and the iris carrier begins its upward ascent about the tubular body **11** from its base to its top. In so traveling, the iris carrier **54** may help the tubular body **11** make the transition from the pedestal system **64** to the exit conveyor **76**. Once the iris carrier **54** has fully disengaged the tubular body **11** by ascending past its top, the iris carrier is ready to receive another sleeve from a sleeve feeder **52**.

[0038] It should be noted that the embodiment of the sleeving machine **50** described above is considered to be exemplary. Other apparatuses known to those of skill

in the art may also be employed and still achieve the objective of positioning the sleeve **17** about the filled tubular body **11** and the end closures **15, 16**.

[0039] The sleeving machine **50** is continuously supplied with tubular film sleeves each having an opening therethrough sized to receive the tubular body **11** and a length greater than the tubular body. Preferably, the length of the "un-shrunk" film sleeve **17** is sufficient to also extend past the end closures **15, 16** attached to the ends of the tubular body **11**. The tubular film sleeves may be supplied in a number of ways known to those of skill in the art. For example, the sleeve feeder **52** includes a stepper motor **104** that controls a nip roller **106** that receives a ribbon **108** of pre-printed, adhesived sleeve material, as shown in Figure 8. The ribbon **108** is held on one, or more, spools **112** each mounted on a shaft **116** which is supported by a stand **114**. The nip roller **106** controls the travel of the unspooled ribbon **108** into the sleeving machine **50**. The stepper motor **104** controls the length and rate of travel of the ribbon **108**. The stepper motor **104** causes the ribbon to pause briefly so that it may be cut by a guillotine-type cutter. As a discrete sleeve **17** is being cut, it is engaged and opened by a pair of sleeve feeding arms **120** which release it onto the iris carrier **54**.

[0040] The ribbon **108** is constructed of a continuous sheet of polymeric material. The graphical matter **20** is pre-printed on the sheet's inner surface. The adhesive **22** is also applied to the inner surface of the polymeric sheet material, but over the graphical matter. The adhesive **22** is gravure-applied continuously, or in a pattern, depending upon the portions of the tubular body **11**, closure **15** and end closure **16** to which the sleeve **17** is meant to adhere. Other methods of applying the adhesive **22** and graphical matter **20**, and the machines for such application, are known to those of skill in the art and are therefore not described herein in further detail. The sheet of polymeric material is then shaped into a tube, flattened and wound into spools **112** as is also known to those of skill in the art.

[0041] Once the sleeve **17** has been disposed over the tubular body **11**, the filled tubular body and its sleeve is advanced into a heat tunnel. The heat tunnel generates heat, such as through the use of resistive heating elements and laminar airflow, or the generation of steam, that causes the sleeve **17** to shrink about the tubular body **11** and end closures **15, 16**. In addition to causing the polymeric material of the sleeve **17** to shrink, the heat causes the temperature of the adhesive **22** to rise and become tacky. Once tacky, the adhesive causes the sleeve **17** to adhere to a portion of the outer surfaces of the end closures **15, 16**. Closely adhering the fluid and gas impermeable sleeve **17** to the end closures **15, 16**, which are also preferably constructed of fluid, vapor and gas impermeable materials, hermetically seals the composite container **10**. Optionally, the adhesive **22** can be applied over the juncture between the end closures **15, 16** and the body ply **12**, for additional barrier

protection. Further optionally, the adhesive can be applied to the entire inner surface **17A** of the film sleeve **17**, for even more barrier protection and/or body ply strength enhancement.

[0042] As yet another option, the polymeric sleeve **17** may be scored, such as during or after application of the sleeve, to facilitate opening of the container **10**, as shown in Figure 1A. For instance, a double-line peel tab **122** may be positioned at one end of the container **10**. Extending from the peel tab **122** is a parallel set of score lines **124** that generally follow the directional tearing tendency of the polymeric material, especially if it is oriented material such as OPP, extending in the direction of the other end of the container **10**. The score lines **124** may be formed by a conventional cutting apparatus, or are preferably formed using a laser that can cut the polymeric sleeve **17** material to a half depth, thereby preserving its barrier properties.

[0043] The score lines **124** may also be registered with the seam between the abutting edges of the spirally wound plies **12, 13** of the tubular body **11**. During the sleeving operation, registration of the score lines **124** with the seam of the body **11** can be facilitated by marking spots on the body ply **12**. These "eye spots" are positioned along one of the edges of the body ply **12** material and allow the use of a sensor to track the ply edges and register them with the score lines **124**. Other score line configurations may also be used, such as a single, linear score line between the ends of the container **10**, or multiple score lines without the use of a peel tab. The peel tab **122** could also be combined with a thickened strip of polymeric material extending between parallel score lines **124** to further facilitate opening of the container **10**. As yet another option, the peel tab **122** could be employed without the score lines **124** and be initiated with starter notches.

[0044] Among the advantages of the present invention is the benefit of a container **10** hermetically sealed by a shrink wrapped, polymeric sleeve **17**, and adhesive **22** applied thereto, against the passage of gasses, vapors and fluids that might contaminate the products, such as perishable foods, enclosed therein. This is especially useful in refrigerated environments that are moist and can discolor, or cause mildew to grow on, the paperboard or other materials of the tubular body **11**. In addition, the polymeric sleeve **17** has an increased ability to contain internal pressures and guards against premature opening. The container **10** can be manufactured at a lower cost than conventional composite containers. For instance, the increased strength of the sleeve **17**, and its ability to block the passage of fluids that weaken the tubular body plies **12, 13** allows the use of generally weaker (and less expensive) paperboard and liner materials. The container with the polymeric sleeve **17** is also cheaper to manufacture than conventional containers having foil layers, such as an outer label constructed of a foil material. The polymeric sleeve **17** has a glossy outer surface, and durable, appealing graphics through

reverse printing on its interior surface. The polymeric sleeve **17** allows flexibility with selected opening methods, such as the peel tab **122** and dual score lines **124**.

[0045] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. For instance, the polymeric film could be adhered over the tubular body **11**, the closure **15** and the end closure **16** by being spirally wound similar to the construction of the plies of the tubular body, and then heat shrunk. However, sleeved application of the polymeric material generally has improved barrier properties for blocking the passage of fluids and gasses into, and out of, the container **10**. 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 container for protectively encapsulating a product during shipment, said container comprising:

a tubular body constructed of a composite sheet material and including an outer body surface, said body defining therein a receptacle, said outer surface of the body defining an edge surrounding an entrance of the receptacle, said receptacle and entrance sized and shaped to receive the product;

a end closure shaped to abut the edge of the body and extend over the entrance of the receptacle, said end closure including an outer end closure surface wherein adjacent portions of the outer end closure surface and outer body surface form a juncture;

a film sleeve covering the body and extending over the juncture between the body and outer end closure surfaces; and

an adhesive adhering the film sleeve to the outer surface of at least the end closure so as to seal the juncture between the end closure and the film.

2. A container of Claim 1, wherein the body has a tubular shape including a pair of opposed ends, at least one of the ends having a circular shaped edge defining the entrance to the receptacle.

3. A container of Claim 2, wherein the end closure has a circular shape and wherein the end closure abuts the circular shaped edge.

4. A container of Claim 3, further comprising a second end closure having a circular shape, wherein the second end closure abuts a circular shaped edge of the other end.

5. A container of Claim 4, wherein the second end closure has an outer end closure surface with a portion adjacent to a portion of the outer body surface so as to form a second juncture.

6. A container of Claim 5, wherein the film sleeve extends over the second juncture and wherein the adhesive adheres the film sleeve to the outer surface of the second end closure.

7. A container of Claim 1, wherein the composite material includes multiple plies.

8. A container of Claim 7, wherein the multiple plies include an inner liner ply and an outer paperboard ply.

9. A container of Claim 8, wherein the inner ply is at least partially impermeable to fluids.

10. A container of Claim 8, wherein the inner ply is at least partially constructed of a metal foil.

11. A container of Claim 7, wherein the inner ply is a metalized film.

12. A container of Claim 1, wherein the adhesive is an ethylene acrylic acid dispersion.

13. A container of Claim 1, wherein the adhesive is any one of a latex acrylic, an ionomer, a heat-activated urethane, a heat-activated PVDC and a heat-activated acrylic material.

14. A container of Claim 1, wherein the film sleeve includes at least one ply of a polyethylene terephthalate, oriented polypropylene, oriented PVC, oriented polystyrene and oriented polyethylene terephthalate glycol materials.

15. A container of Claim 1, wherein the film sleeve defines a score line extending between the ends of the body.

16. A container of Claim 15, wherein the score line penetrates only a portion of the thickness of the film sleeve.

17. A container of Claim 16, wherein the score line is in registration with a seam in the composite sheet material.

18. A container of Claim 1, wherein the film sleeve de-

fines a pair of parallel score lines and further includes a peel tab between the pair of parallel score lines.

19. A container of Claim 18, wherein the score line penetrates only a portion of the thickness of the film sleeve.

20. A container of Claim 1, wherein the adhesive also adheres the film sleeve to the outer body surface.

21. A container of Claim 1, wherein the film sleeve is shrink-fit onto the end closure and body.

22. A container for protectively encapsulating a perishable food product during shipment and display, said container comprising:

a tubular body constructed of a composite sheet material including an body ply and an inner liner ply, said tubular body having an outer surface and defining a receptacle having a pair of opposing end entrances, said outer surface of the body defining an edge surrounding each entrance of the receptacle, wherein said receptacle and at least one of the entrances are sized and shaped to receive the product;

an end closure extending over one of the entrances of the receptacle and abutting the edge of the entrance, said end closure including an outer end closure surface wherein adjacent portions of the outer end closure surface and outer body surface form a juncture;

a second end closure extending over, and fixed to, the other one of the entrances of the receptacle and abutting the edge of the entrance, said second end closure including an outer closure surface wherein adjacent portions of the outer closure surface and outer body surface form a second juncture;

a film sleeve extending over the outer surface of the tubular body, the junctures and onto the outer surfaces of the end closures, said film sleeve adhered to at least the outer surfaces of the end closures.

23. A container of Claim 22, further comprising an adhesive adhering the film sleeve to the outer surfaces of the end closures.

24. A container of Claim 23, wherein the adhesive is an ethylene acrylic acid.

25. A container of Claim 23, wherein the adhesive is any one of a latex acrylic, an ionomer, a heat-sealing urethane and a heat-sealing acrylic materials.

26. A container of Claim 22, wherein the inner liner ply

is fluid resistant and the body ply is constructed of a paperboard material.

27. A container of Claim 22, wherein the inner ply is at least partially constructed of a metal foil.

28. A container of Claim 22, wherein the inner ply is a metalized film.

29. A container of Claim 22, wherein the film sleeve includes at least one ply of a polyethylene terephthalate, oriented polypropylene, oriented PVC, oriented polystyrene and oriented polyethylene terephthalate glycol materials.

30. A container of Claim 22, wherein the film sleeve defines a seam extending between the ends of the body.

31. A container of Claim 22, wherein the film sleeve defines a score line extending between the ends of the body.

32. A container of Claim 31, wherein the score line penetrates only a portion of the thickness of the film sleeve.

33. A container of Claim 31, wherein the score line is in registration with a seam in the composite sheet material.

34. A container of Claim 22, wherein the film sleeve defines a pair of parallel score lines and further includes a peel tab between the pair of parallel score lines.

35. A container of Claim 34, wherein the score line penetrates only a portion of the thickness of the film sleeve.

36. A method of manufacturing a container having a composite tubular body and an outer polymeric sleeve, said method comprising:

applying an end closure to one end of the composite tubular body;

applying an adhesive to at least one of an inner surface of the polymeric sleeve and an outer surface of the composite tubular body;

sleeving the polymeric sleeve about the composite tubular body and over the end closure; and

adhering the polymeric sleeve to the end closure of the composite tubular body so as to hermetically seal the container.

37. A method of Claim 36, further comprising applying a second end closure to another end of the com-

posite tubular body after applying the end closure and wherein adhering the polymeric sleeve includes adhering the sleeve to the end closure.

38. A method of Claim 36, wherein adhering the polymeric sleeve includes heating the polymeric sleeve and shrinking the polymeric sleeve onto the composite tubular body, end closure and end closure and heating the adhesive until tacky.

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39. A method of Claim 36, further comprising scoring the polymeric sleeve.

40. A method of Claim 39, wherein scoring includes laser scoring the polymeric sleeve to a depth that is only a portion of the thickness of the polymeric sleeve.

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41. A composite container for products, comprising:

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a tubular body of wound sheet material including at least one structural paperboard ply, the body having an open end;

an end closure affixed to the body so as to close the open end, the end closure having an outer surface extending adjacent to an outer surface of the body; and

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a sleeve of polymer film encircling the body so as to fully cover the outer surface thereof, the sleeve also extending onto the outer surface of the end closure so as to substantially seal a juncture between the end closure and the body against passage of fluid.

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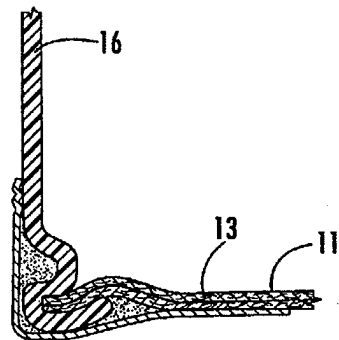
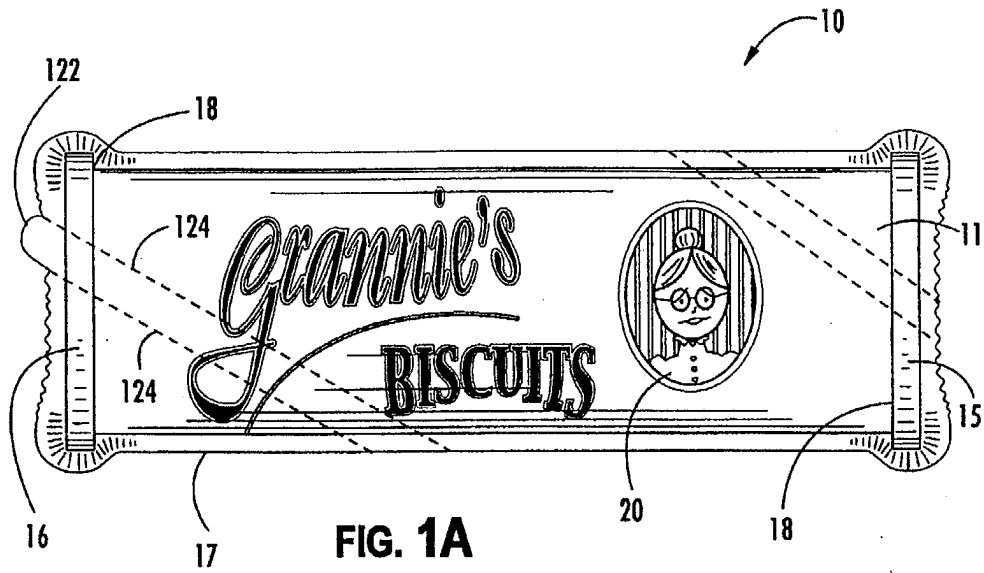


FIG. 1B

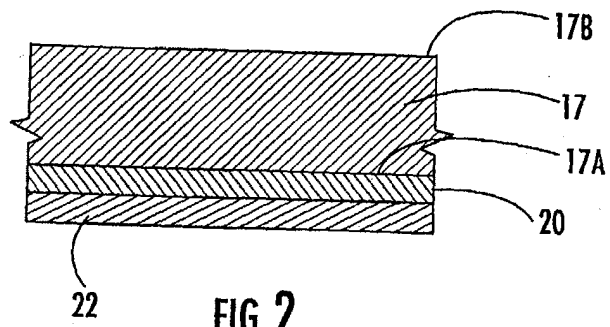


FIG. 2.

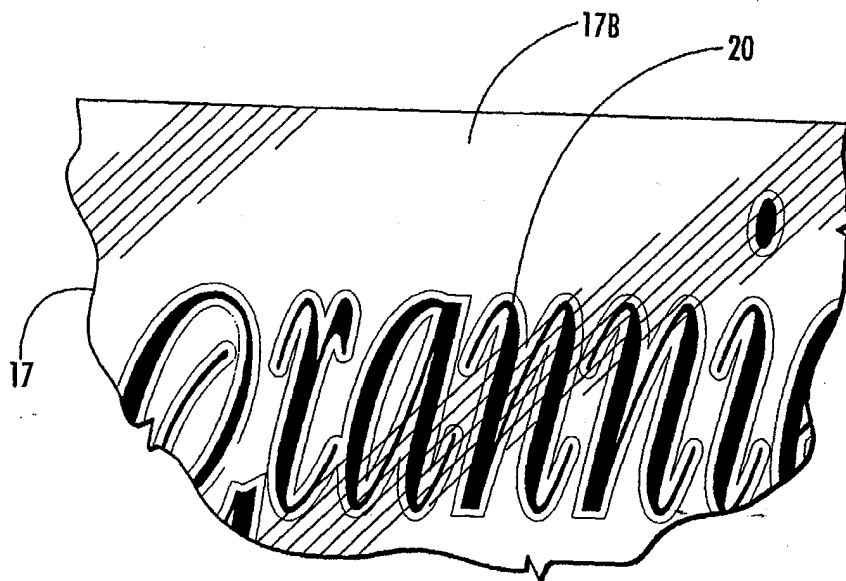


FIG. 3.

