Oct. 18, 1966 W. B. ELAM ET AL 3,279,675

SPIRALLY WOUND CONTAINER BODY

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FIG. 1

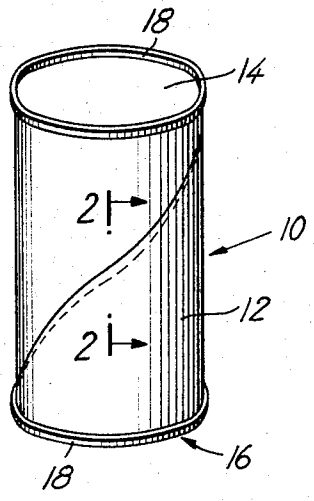

FIG. 2

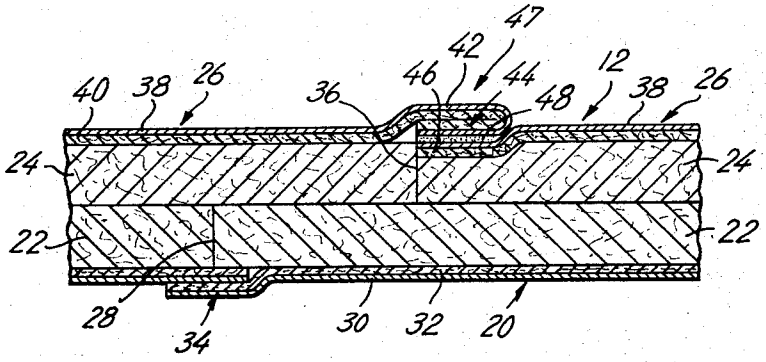

FIG. 3

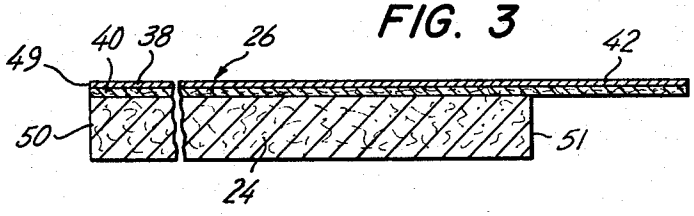

FIG. 4

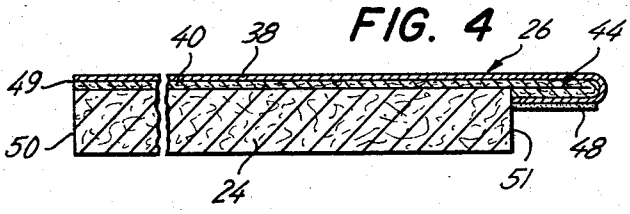

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FIG. 5

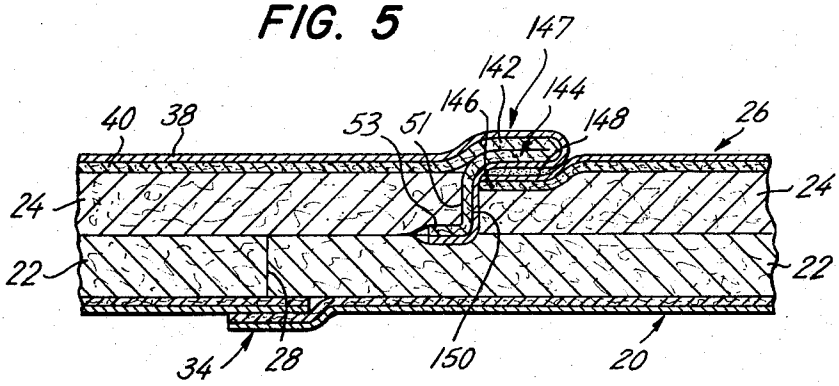
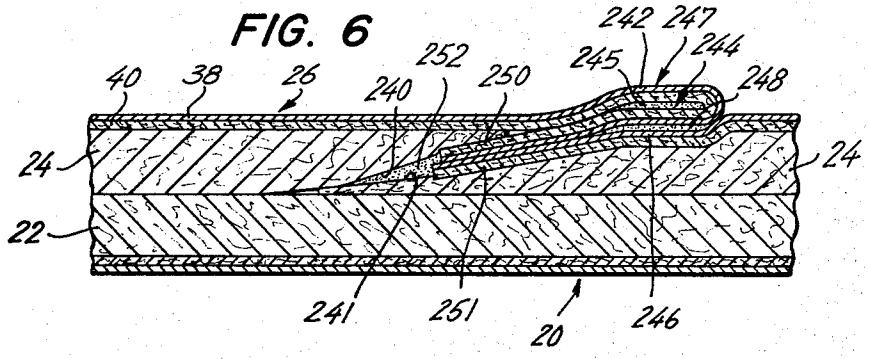


FIG. 6



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SPIRALLY WOUND CONTAINER BODY

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4 Claims. (Cl. 229—4.5)

The present invention relates generally to spirally wound fibre container bodies, and more particularly to improved helical joints for such bodies and to an improver method of making the same.

It is an object of the present invention to provide a spirally wound fibre container body having an improved helical liner ply joint which is impervious to penetration by liquids within the container.

Another object is to provide such a container body wherein the helical liner ply joint extends radially inwardly from the liner ply to prevent any outwardly extending depressions or cavities in the liner ply through which fluids within the container might travel and possibly leak through the end seams thereof.

A further object is the provision of an improved method of making such a leak-proof, spirally wound container body.

Numerous other objects and advantages of the present invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

FIGURE 1 is a perspective view of a composite, spirally wound container embodying the principles of the instant invention;

FIG. 2 is an enlarged sectional view taken substantially along line 2—2 in FIG. 1;

FIGS. 3 and 4 are fragmentary sectional details showing in successive stages how the liner ply is prelaminated to the inner body ply in accordance with the method of the instant invention;

FIG. 5 is a sectional view similar to FIG. 2, showing a modified form of impervious helical liner ply joint; and

FIG. 6 is a sectional view similar to FIG. 2, showing another modified form of impervious helical liner ply joint.

As a preferred and exemplary embodiment of the instant invention, FIG. 1 illustrates a composite container **10** which is formed with a cylindrical, spirally wound body **12** having its opposite ends closed by top and bottom imperforate end members **14** and **16**, respectively, which are secured thereto in fluid-tight end seams **18** which may be of any suitable type, such as crimped single seams of the type disclosed in United States Patent 1,920,504 or interfolded double seams of the type disclosed in United States Patent 2,633,095.

The container body **12** of FIGS. 1 and 2 is formed of a plurality of plies of material which are helically wound around a winding mandrel (not shown) to form a continuous tube which is subdivided into short sections of uniform length, each of which forms a body **12**.

As seen in FIG. 2, the body **12** is formed of four helically wound plies, the mutually contacting surfaces of which are secured together by suitable adhesives (not shown) in order to form a solid, integral body structure. These comprise an exterior label ply **20**, an outer main fibre body ply **22**, an inner main fibre body ply **24**, and a liner ply **26**. The number of plies obviously may be varied to meet various packaging requirements.

The helically disposed edges of the outer main body ply **22** are preferably disposed in abutting relationship

to form a helical butt joint **28**. The label ply **20** preferably comprises an outer layer **30** of a thin impervious material such as an aluminum foil or plastic which is prelaminated to an inner supporting layer **32** of a suitable strong backing such as kraft paper. The marginal edge portions of the label ply **20** are disposed in a helical lap joint **34** which may be disposed over the helical butt joint **28** of the outer body ply **22**. Interposed between the lapped marginal portions of the label ply **20** is a suitable adhesive (not shown), such as a thermoplastic adhesive, which seals the lap joint **34**.

The helically disposed edges of the inner body ply **24** are disposed in abutting relationship to form a helical butt joint **36** which is offset circumferentially from the butt joint **28** of the outer body ply **22**. The liner ply **26** preferably comprises an inner layer **38** of a thin, fluid impervious material such as aluminum foil or plastic which is prelaminated to an outer supporting layer **40** of a strong suitable backing such as kraft paper.

In order to seal off the kraft backing layer **40** of the liner ply **26**, and thereby prevent the fluid contents (not shown) of the container **10** from wicking into this kraft layer **40** and thus gaining access to the main body plies **22** and **24** and softening them sufficiently to cause weakening of the container body **12**, one of the helical marginal edge portions **42** of the helically wound liner ply **26** is hemmed outwardly upon itself to form a hem **44**, and this hemmed liner edge portion **42** is lapped over the opposite marginal edge portion **46** of the liner ply **26**, as best seen in FIG. 2, thus bringing the impervious layer **38** of the hem **44** into mutually facing engagement with the impervious layer **38** in the underlapped opposite marginal edge portion **46** to form a helical lap joint **47**. The ends of the edge portions **42**, **46** in this fluid impervious lap joint **47** of the liner ply **26** are disposed substantially in alignment with the butt joint **36** of the inner main body ply **24**.

Preferably, a fluid-impervious adhesive layer **48** is interposed between the outer surface of the hem **44** and the underlapped marginal portion **46** of the liner ply **26**, thereby insuring against leakage of the fluid within the container through the lap joint **47** and into the body plies **22**, **24**. Although the specific adhesive **48** used in the helical joint **47** of the liner ply **26** forms no part of the instant invention, the seal can be obtained, for example, through the use of a thermoplastic or pressure sensitive adhesive. One suitable adhesive is the hot melt polyamide resin adhesive disclosed in United States Patent 2,840,264. Among other types of suitable adhesives are those comprising copolymers of vinyl chloride and vinyl acetate, either alone or in admixture with maleic anhydride or vinyl alcohol modified vinyl chloride-vinyl acetate copolymers.

An adhesive (not shown) of any suitable type, such as dextrin, preferably is interposed between the mutually contacting surfaces of the kraft backing layer **40** in the hem **44** of the inner marginal edge portion of the liner ply **26**.

The helical, hemmed lap joint **47** of the liner ply **26** is formed by first prelaminating the liner ply **26** to the inner body ply **24**, as shown in FIG. 3, with one edge **49** of the ply **26** in alignment with the adjacent edge **50** of the ply **24**. It will be understood that in this specification and in the appended claims, the term "alignment" as used to describe the relationship between the adjacent edges **49**, **50** does not necessarily indicate exact alignment, but means any condition of these edges which will insure that at least a portion of the marginal portion **46** extends beneath the hem **44**. Thus, the edge **49** may stop somewhat short of the edge **50**, may be in exact alignment with it, or may project beyond it to some extent.

An adhesive (not shown) of any suitable type is interposed between the liner ply **26** and body ply **24**, and the helical marginal edge portion **42** of the liner ply **26** extends beyond the adjacent edge **51** of the body ply **24**, the liner ply **26** being sufficiently wider than the body ply **24** to provide for the portion **42**. A suitable adhesive (not shown), such as dextrin, is then applied in any conventional manner to the exposed undersurface of the unfolded kraft backing layer **40** of the marginal edge portion **42** of the liner ply **26** which is shown in FIG. 3.

Thereafter, as shown in FIG. 4, the marginal edge portion **42** of the liner ply **26** is folded upon itself to bring its edge into substantial engagement with the edge **51** of the body ply **24** to form the hem **44**. The impervious adhesive layer **48** is then applied to the undersurface of the hem **44** in any suitable manner prior to the winding of the laminated body ply **24** and liner ply **26** on a conventional winding mandrel (not shown). Thereafter, the prelaminated liner and body plies are advanced onto and wound around the winding mandrel to form the helical, hemmed lap joint **47** of the liner ply **26** as shown in FIG. 2.

This method of forming the hemmed lap joint **47** in the liner ply **26** is particularly advantageous in that, by prelaminating the liner ply **26** and adjacent body ply **24** prior to the time they are wound onto the winding mandrel, the hemmed marginal edge portion **42** of the liner ply **26** is helically wound on the mandrel in a uniform manner without any possibility of wrinkling, a condition which might result in leakage at the wrinkled portions of the helical lap seam. Also, the hemmed marginal edge portion **42** is accurately positioned with respect to the edge **51** of the adjacent body ply **24** and can be accurately wound over the opposite marginal edge portion **46** on the liner ply **26** because of the above prelaminating steps. In addition, this prelaminating step assures uniform adhesive contact between the plies **24** and **26**, and makes possible the complete elimination of air blisters between these plies which are frequently encountered when the thin liner ply **26** is wound separately onto the winding mandrel.

FIG. 5 discloses a modified form of impervious helical joint **147** for the liner ply **26**. This modified liner ply joint **147** is similar to the form shown in FIG. 2 in that the marginal edge portion **142** of the liner ply **26** is folded outwardly to form the hem **144** which overlaps the opposite marginal edge portion **146** of the liner ply **26**, and a thermo plastic adhesive layer **148** is interposed therebetween. The modified liner ply joint **147** shown in FIG. 5, however, differs from the liner ply joint **47** shown in FIG. 2 in that the end portion **150** of the marginal edge **142** of the liner ply **26** is disposed beyond the hemmed portion **144** thereof. The end portion **150** extends between the adjacent end portions of the inner body ply **24** and is wrapped around the edge **50** of the body ply **24** to terminate between the inner and outer main body plies **24** and **22**, respectively. The end portion **150** of the marginal edge portion **142** of the liner ply **26** preferably is adhered in any suitable manner to the edge **51** and the adjacent outer surface **53** of the inner main body ply **24**.

This modified helical lap seam **147** of the liner ply **26**, as shown in FIG. 5, is advantageous in that the end portion **150** of the liner ply **26** surrounds and covers the fluid pervious portions **51**, **53** of the main body ply **24**, and also, since it is tightly wound between the inner and outer body plies **22** and **24**, the end portion **150** serves as an anchor to firmly position the hemmed portion **144** of the helical lap seam **147** of the liner ply **26**.

A further modified form of impervious helical lap seam for the liner ply **26** is shown in FIG. 6, wherein the inner main body ply **24** is provided with oppositely bevelled or skived edges **240**, **241** on the marginal edge portions thereof. The marginal edge portion **242** of the liner ply **26** is folded outwardly over itself to form a hem **244** which is lapped over the opposite marginal edge portion **246** to form a helical joint **247**. An adhesive **245** of any suitable type is interposed between the mutually contacting surfaces of the kraft backing layer **40** in the hem **244**, and a fluid impervious adhesive layer **248** is interposed between the hemmed portion **244** and the underlapped opposite marginal edge portion **246** of the liner ply **26** to insure against leakage through the liner ply seam **247**. The end portion **250** of the marginal edge portion **242** and the end portion **251** of the marginal edge portion **246** of the liner ply **26** both extend in overlapped relationship between the oppositely bevelled edges **240**, **241** of the inner body ply **24**. A suitable adhesive **252**, such as dextrin, is interposed between the balance of the space between the bevelled edges **240**, **241** of the body ply **24** to completely seal the skived joint **247** thereof.

The bevelled or skived joint **247** in the body ply **24** of FIG. 6 possesses the advantage of insuring that contact is made between the opposite edge portions of the inner body ply **24**, and any space left between the oppositely bevelled edges **240**, **241** is filled by the adhesive **252** and by the ends **250** and **251** of the marginal liner ply edge portions **242** and **246**, respectively, thereby preventing the formation of any gaps or spaces between the contiguous edges of the inner body ply **24**.

The liner ply joints **47**, **147**, and **247** shown in FIGS. 2, 5 and 6, respectively, all protrude inwardly from the liner ply **26** and thus leave no outwardly extending depressions or cavities through which fluid within the container could flow and possibly leak through the end seams **18** of the container **10**.

It is to be understood that the modified forms of the liner ply helical joints **147** and **247** shown in FIGS. 5 and 6 preferably would be made in accordance with the method shown in FIGS. 3 and 4 of the drawings, i.e., in each case the liner ply **26** would be prelaminated to the inner body ply **24**, and the hemmed portion would be formed in the marginal edge portion of the liner ply and wrapped around and adhered to the adjacent edge of the body ply **24** prior to the advancement of the prelaminated liner ply **26** and body ply **24** onto the winding mandrel.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the instant invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

What is claimed is:

1. In a spirally wound container body which is formed with at least one fibre body ply having the helical edges thereof disposed in slightly spaced relationship,

a helical liner ply formed of a layer of fluid impervious material laminated to a pervious backing,

said liner ply being disposed within the fibre body ply with its fluid impervious layer disposed inwardly and with its pervious backing layer adhesively secured to the fibre body ply, the edge of one of the marginal portions of said liner ply being in substantial alignment with the adjacent edge of said body ply,

the opposite marginal portion of said liner ply extending beyond the adjacent edge of said body ply and being hemmed outwardly and overlapped over said one marginal portion of said body ply to bring the impervious layers of said liner ply marginal portion into face-to-face relationship,

a fluid-impervious adhesion between said overlapped portions of said liner ply to form a fluid tight seam therebetween,

said opposite marginal portion of said liner ply extending outwardly from the hemmed and overlapped portion thereof and between said spaced helical edges of the body ply and folded into overlapping relationship against the outer surface of the marginal portion of said body ply from which said liner ply marginal portion extends.

2. In a spirally wound container, at least one fibre body ply having its marginal portion formed with oppositely bevelled edges which are disposed in partially spaced relationship in a helical bevelled butt joint,

a helical liner ply formed of a layer of fluid and impervious material laminated to a pervious backing,

said liner ply being disposed within the fibre body ply with its fluid impervious layer disposed inwardly and with its pervious backing layer adhesively secured to the fibre body ply, the edge of one of the marginal portions of said liner ply being in substantial alignment with the adjacent edge of said body ply,

the opposite marginal portion of said liner ply extending beyond the adjacent edge of said body ply and being hemmed outwardly and overlapped over said one marginal portion of said liner ply to bring the impervious layers of said liner ply marginal portion into face-to-face relationship,

a fluid-impervious adhesion interposed between said overlapped marginal portions of said liner ply to form a fluid tight seam therebetween,

the ends of said overlapped marginal portion of said liner plys extending into said bevelled joint between the spaced portions of said bevelled body ply edges.

3. The container of claim 2 wherein an adhesive is interposed between said bevelled edges within said bevelled butt joint of said body ply.

4. In a spirally wound container body which is formed with at least one fibre body ply having a helical bevelled joint, the improvement comprising:

a helical liner ply formed of a layer of fluid impervious material laminated to a pervious backing,

said liner ply being disposed within the fibre body ply with its fluid impervious layer disposed inwardly and with its pervious backing layer adhesively secured to the fibre body ply, the edge of one of the marginal portions of said liner ply being in substantial alignment with the said helical joint at the inner surface of said body ply,

said helical bevelled joint extending from the inner surface of said body ply outwardly and away from said one marginal portion,

the opposite marginal portion of said liner ply extending beyond said helical bevelled joint, substantially all of said opposite marginal portion being hemmed outwardly and overlapped over said one marginal portion of said liner ply to bring the impervious layers of said liner ply marginal portions into face-to-face relationship, and

a fluid-impervious adhesive interposed between said overlapped marginal portions of said liner ply to form a fluid-tight seam therebetween.

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