

[54] **METHOD OF ENCLOSING A PACKAGE OF FLEXIBLE MATERIAL AND PACKAGE PRODUCED THEREBY**

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[52] U.S. Cl. **206/52 W, 206/46 Y, 206/59 B, 206/65 S, 229/DIG. 12, 242/163, 53/13**

[51] Int. Cl. **B65d 85/04, B65d 85/675, B65d 85/16**

[58] Field of Search **206/52 W, 52 R, 46 Y, 206/46 Z, 59 B, 64, 83.5, 65 Y, 65 S, 229/DIG. 12; 53/13-30; 242/163**

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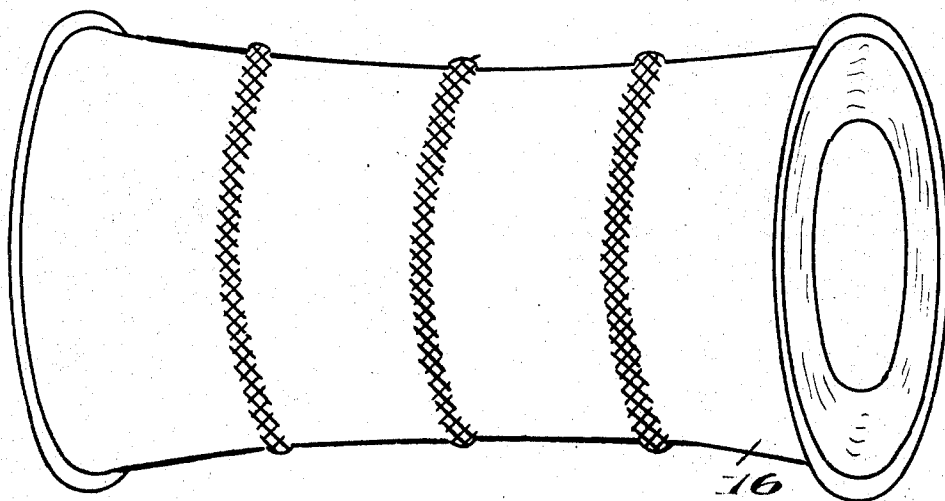
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[57] **ABSTRACT**

A package of flexible material of the universal type having a radial opening into the axial opening through which the inner end of the material is led out is wound on a collapsible mandrel. After the collapsible mandrel has been slightly collapsed, end members are positioned on the mandrel and are pushed towards each other to compact the package. The end members are of slightly greater diameter than the package. A tube of shrink-wrap material is then applied over the package extending slightly beyond the end members. Heat is applied by a gun to the end portions of the sleeve to produce a slight shrinking around the edges of the end members and then to the remainder of the sleeve to shrink the tube on the package. Rings are then applied at each end, against the end members, these rings having an outer diameter slightly less than the end members and having a central opening of substantially less diameter than the diameter of the holes in the end members. Heat is then applied to the ends of the package to shrink the shrink-wrap material inwardly over the end members and rings.

14 Claims, 6 Drawing Figures



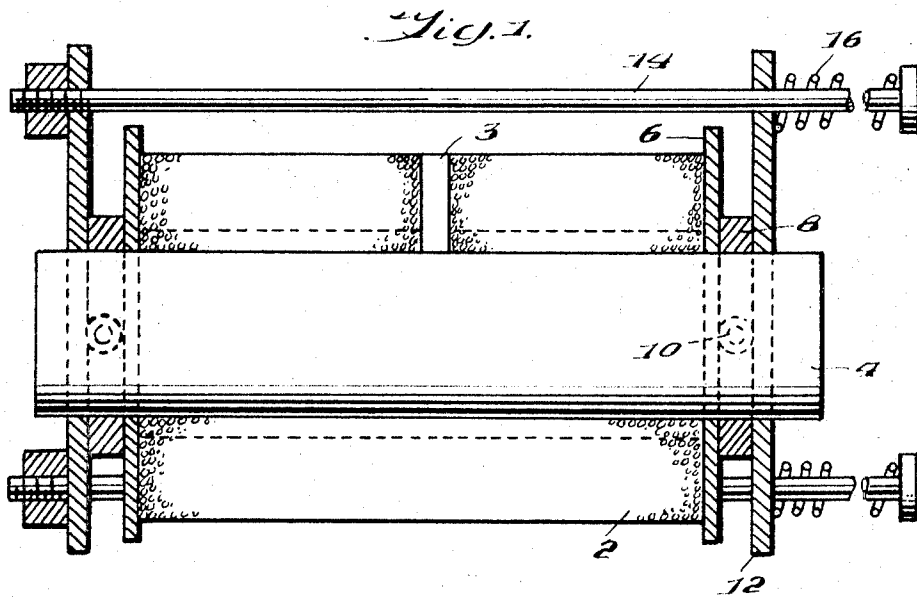


Fig. 2.

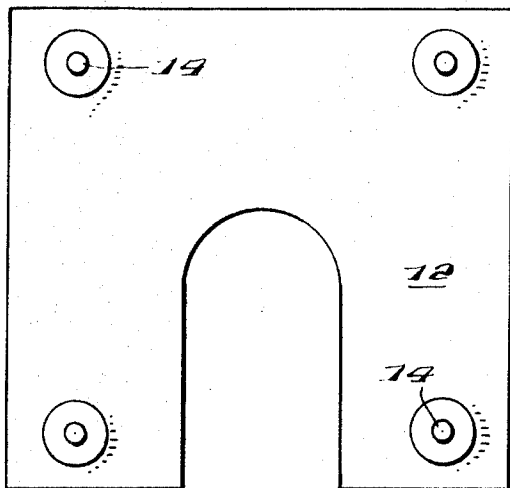
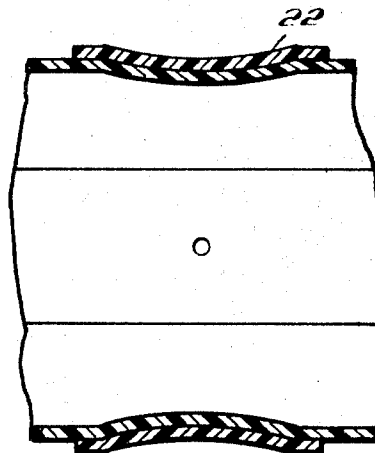


Fig. 3.



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Fig. 3.

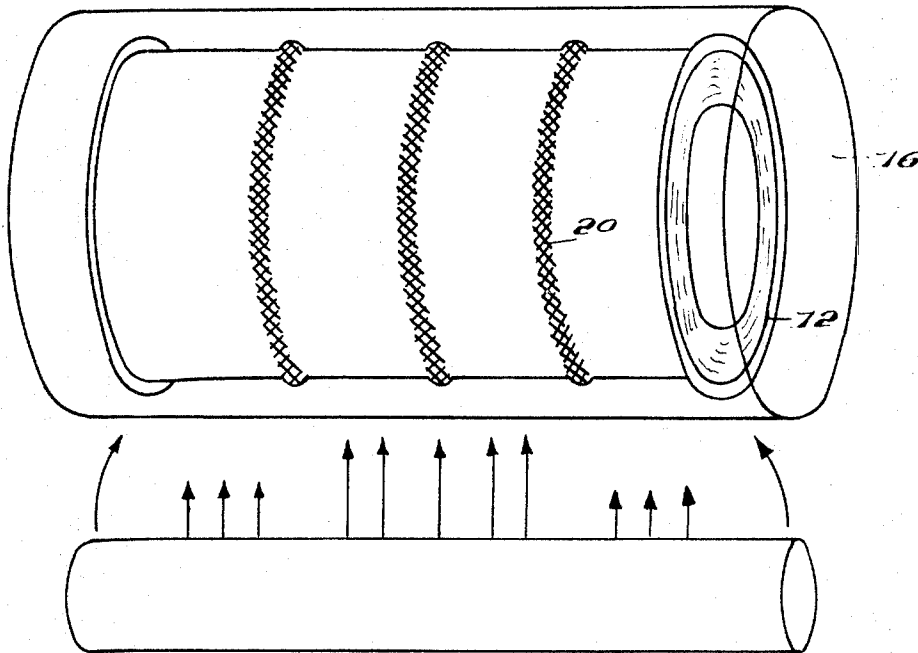


Fig. 4.

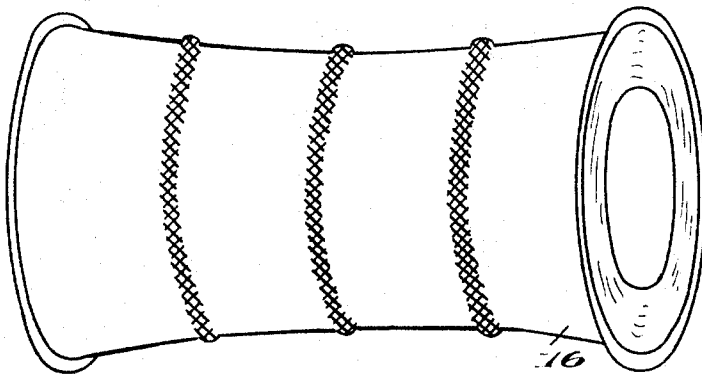
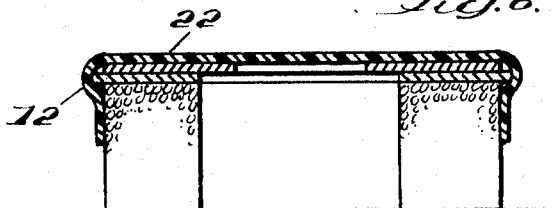


Fig. 6.



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METHOD OF ENCLOSING A PACKAGE OF FLEXIBLE MATERIAL AND PACKAGE PRODUCED THEREBY

PRIOR APPLICATIONS

The subject matter of FIGS. 1 to 5 of the present application is embodied in applicant's disclosure W-3, Ser. No. 003,448, filed Nov. 10, 1970.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to packages of flexible material in the nature of a universal wind having a radial opening into the axial opening through which the inner end of the material is led out for twistless payout and a method of enclosing such packages. More particularly it relates to the enclosure of such a coil in order to make it more suitable for shipping and handling and to prevent birdsnesting in the payout.

2. The Prior Art

Packages of flexible material having a radial opening into the axial opening through which the inner end of the material is led out are known for example in Taylor U.S. Pat. No. 2,767,938. It is known to enclose such packages in various ways for the purpose of preventing damage to them in handling and shipping.

SUMMARY OF THE INVENTION

According to the present invention, a package of flexible material of the universal type having a radial opening into the axial opening through which the inner end of the material is led out is wound on a collapsible mandrel. After the collapsible mandrel has been slightly collapsed, end members are positioned on the mandrel and towards each other to compact the package. The end members are of slightly greater diameter than the package. A tube of shrink-wrap material is then applied over the package extending slightly beyond the end members. Heat is applied by a gun to the end portions of the sleeve to produce a slight shrinking around the edges of the end members and then to the remainder of the sleeve to shrink the tube on the package. Rings are applied at each end, against the end members, these rings having an outer diameter slightly less than the end members and having a central opening of substantially less diameter than the diameter of the holes in the end members. Heat is then applied to the ends of the package to shrink the shrink-wrap material inwardly over the end members and rings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 shows in cross-section the procedure for producing a package according to the invention ready for wrapping;

FIG. 2 is an end view of one of the compression members of FIG. 1;

FIG. 3 shows a package according to the invention enclosed in a shrink-wrap tube before the application of heat;

FIG. 4 shows the package after the application of heat;

FIG. 5 shows the central portion of a modified form of package; and

FIG. 6 shows in longitudinal cross-section a portion of a further modified form of package.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 to 4, a package 2 of flexible material of universal type having a built-in radial hole 3 opening into the central axial opening is formed on a slightly collapsible mandrel 4. After the wind is completed, the mandrel carrying the wind is removed from the winding machine. The mandrel is then collapsed slightly, for example by an amount of 5 - 10 percent of the diameter of the axial opening.

Thereafter, end pieces 6 are applied at each end of the winding, these end pieces being of inexpensive material such as plastic, and collars 8 with set screws 10 are applied outside the end pieces. The end pieces have a diameter slightly greater than the diameter of the finished wind while the collars have a diameter considerably less than the diameter of the end pieces. The set screws are however left loose temporarily.

Spring clamps of the type shown in FIGS. 1 and 2 are then applied on the outsides of the collars in expanded condition, and are allowed then to approach each other. These clamps consist of end members 12 with rods 14 secured at one end of the end pieces and passing slidably through one of the end pieces with coil springs 16 on the outside of and between one of the end pieces and heads on the end of the rods. This arrangement when applied to the collars will compress the package simultaneously and substantially equally from both ends. This compression will compact the wind to some extent, reducing its axial dimension and at the same time making it more stable for handling and shipping.

A tube 18 of shrink-wrap material (see FIG. 3) somewhat longer than the package, for example one-half inch, and of an inner diameter substantially equal to the diameter of the end pieces 12 is then slipped over the package, extending beyond the end pieces equally at both ends of the wind. The material is now rotated in front of a source of heat such as a heat gun with a restricted nozzle, applied first at each end of the package. This shrinks the end portions of the tube upon the end pieces, with the protruding portions folding themselves around the outside of the end pieces as shown in FIG. 4.

Thereafter, the remainder of the tube wall is submitted to heat.

In packages of the universal wound type having a radial opening formed in them, there is a certain unevenness in the wall of the package, which is slightly thicker at the lines where the cross-overs 20 of the figure-eight coils occur. This results in the formation of one or more ribs around the package such as is indicated in FIG. 3. In heating the package, it is preferable to heat the areas of the cross-overs somewhat less than the other area, so that the shrink-wrap material does not exert as much pressure on these ridges. This heat differential is represented by the varying length of the arrows in FIG. 3. The result is that the ridges are not compressed so as to cause them to project from the inner wall of the axial opening, where they might interfere with possible payout.

Also, it is desirable to heat the central portion of the package of the wrap to a somewhat greater degree than the end portions. This results in causing a compression of the coil of the wrap which tends to push the end por-

tions outwardly and to prevent or limit endwise inward collapse of the coil during handling and shipping.

A similar result (FIG. 5) can be obtained by first shrinking the wrap substantially equally, other than at the cross-over lines; and thereafter applying an additional strip 22 of shrink-wrap material around the central zone of the coil, securing its end firmly and heating it to create further pressure in this zone.

It may also improve the winds if a ring of fairly stiff material such as cardboard is positioned beneath the ring 22 (FIG. 5) and slightly narrower than the plastic ring.

It has been found that in packages of the type heretofore described there is a tendency for the end portions of the innermost layers to escape around the inner edges of the rings 12. To prevent this, as shown in FIG. 6, it is desirable in the first stages of shrinking to shrink the tube opposite the end forms only slightly, then to apply to the ends of the package retaining rings 22 having an outer diameter only slightly less than rings 12 but a substantially smaller central opening, large enough however to receive guide cones as referred to hereinafter. The end shrinkage is then completed, the shrink-wrap material then holding the retaining rings firmly at the ends of the package with the edges of the openings therein at a substantial distance radially inward from the inner wall of the package.

If no cones are to be used, the retaining rings may be replaced by solid discs.

Taylor U.S. Pat. No. 2,317,830 shows the formation of a wind using separated end forms. The present invention also contemplates the application of a shrink-wrap to a package of the type shown in that package, utilizing the separated end forms as end pieces to form part of the finished package after application to it of the shrink-wrap material in the manner described herein.

The use of a secured layer of shrink-wrap as described can perform the function of holding a flanged feedout tube in place, and providing a hole that will be properly sized for the material which is led out through it. A quick pass of heat on this area will serve to smooth the surface edges of the hole so that harmful friction areas are not set up. The hole may be so small as to prevent entry of any substantial amount of dirt or humidity into the package.

By immersing the package before wrapping in a suitable lubricant, it is possible to produce the effect of relaxing the tensioning of the wind and swelling the small humps caused by the cross-over points of the wind (numbering three in a "two-wind").

The application of heat is accompanied by a rotation of the wind. By conforming to the cross-over bump protrusions, the shrink tube reduces the tendency of the cross-over bumps to protrude into the inside air core, after removal of the wind, which tendency would be emphasized or assisted by pressure from an outside relatively stiff wrap-around. Application of extra heat on more of a pin-point basis to the areas between the bumps gives added emphasis to the protective tendency of this step.

By shrinking the shrink tube over the end rings, a tight package is created, holding all exterior surfaces of the wind and leaving the axial cavity free for payout cones. By allowing the ring forms to be slightly larger in diameter than the wind (by approximately one-sixteenth to one-eighth on the circumference) a com-

mercial "coffee can" plastic lid can be snapped on to effect a tight closure and hold cones such as are described in the Newman application filed Feb. 8, 1971, for Package of Flexible Material with Twistless Payout in place. Cones can also be formed to snap into the under side of the lid to make one piece of cone and lid.

By applying graduated heat to a revolving finished two-wind by means of a method which conducts more or less heat to the surface of the shrinking material, the pressure exerted by the material can be made to be greater in the central areas of the wind and the outer edges — thus forcing the wind to spread against the end rings and at the same time to contain the movement outward of the end rings. This can be accomplished also in an emphasized manner by applying the second layer of shrinkable material as a second step to the shrink-portion of the wind which requires the extra pressure, for instance, the portion between the two outside cross-over bumps. The reason these tendencies are so is that the wind inherently contains a torque force that wants to make individual coils spring toward either end and outside the axial hole. By emphasizing this and utilizing pressure of the shrink force to increase the pressure towards the ends and at the same time hold these forces in place by the tightened ends, a tighter wind that resists axial collapse is created without the use of increased tension in the wind. By revolving the wind fairly rapidly while it is still on its winding mandrel the distribution of shrinkage is even and partial collapse of the air core that might be caused by unequal shrink-wrap pressure is avoided. The fact that the wind must necessarily be wound at lower tensions in order to protect the integrity of the air core — and must necessarily have more looseness to form the hole — is offset, as far as stability is concerned, by this means of applying a shrink-wrap material and forming it into the basic container.

We claim:

1. Method of forming a package of flexible material of the universal type having a radial opening into the central axial opening through which the inner end of the material is led out which comprises winding a package of such material on a collapsible mandrel, applying relatively rigid end pieces at each end of the package slightly collapsing the mandrel, pushing said end pieces against the ends of the package to produce a decrease in the length thereof, applying a tube of shrink-wrap material around the package having a length slightly greater than the length of the package and shrinking such material upon the package and around the ends thereof to a sufficient extent to engage over said end pieces and hold them in position against the walls of the package.

2. A method as claimed in claim 1, in which the end pieces are discs having a diameter slightly greater than the package.

3. A method as claimed in claim 1, in which the shrinking includes the step of heating the shrink-wrap material while applying greater heat to central portions of the package than to the ends thereof.

4. A process as claimed in claim 1, in which said package has ridges extending from the outer surface thereof at the cross-over points, which includes shrinking the shrink-wrap material to a greater degree between such ridges than at the ridges.

5. A process as claimed in claim 1, in which the end pieces have central openings therein of the same diam-

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eter as the axial opening, which comprises shrinking the shrink-wrap material over the end pieces only partially, applying to the ends of the package retaining members which extend inwardly to a substantially greater distance than the inner edges of the openings in the end pieces, and thereafter shrinking the ends of the shrink-wrap over both the end pieces and the retaining members.

6. A package of flexible material of the universal type having a radial opening therethrough into the axial opening through which the inner end of the material is led out, having at each end of the package a ring of relatively rigid flat material and having a tube of shrink-wrap material shrunk against the wall of the package and over the ends thereof to retain said rings in position, said package being longitudinally compressed.

7. A package as claimed in claim 6, in which the rings have an outside diameter slightly greater than the outside diameter of the package.

8. A package as claimed in claim 6, having ridges running around the same as the cross-over points of the flexible material, and having the shrink-wrap material shrunk less strongly over said ridges than over the remaining wall of the package.

9. A package as claimed in claim 6, in which the inner diameter of the rings is equal to the diameter of the axial opening in the package, and retaining members of flat rigid material secured by the shrink-wrap on each end wall of the package overlying said rings and extending inwardly towards the center of the package substantially further than the inside wall of the axial opening of the package.

10. Method of forming a package of flexible material of the universal type having a radial opening into the central axial opening through which the inner end of the material is led out which comprises winding a package of such material, applying relatively rigid end pieces at each end of the package, applying a tube of shrink-wrap material around the package having a length slightly greater than the length of the package and shrinking such material upon the package and around the ends thereof to a sufficient extent to engage over said end pieces and hold them in position against the walls of the package while applying greater heat to central portions of the package than to the ends thereof.

11. Method of forming a package of flexible material of the universal type having a radial opening into the central axial opening through which the inner end of the material is led out which comprises winding a package of such material, applying relatively rigid end pieces at each end of the package, applying a tube of shrink-wrap material around the package having a

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length slightly greater than the length of the package and shrinking such material upon the package and around the ends thereof to a sufficient extent to engage over said end pieces and hold them in position against the walls of the package, said package having ridges extending from the outer surface thereof at the cross-over points, and the shrinking including shrinking the shrink-wrap material to a greater degree between such ridges than at the ridges.

12. Method of forming a package of flexible material of the universal type having a radial opening into the central axial opening through which the inner end of the material is led out which comprises winding a package of such material, applying relatively rigid end pieces at each end of the package, the end pieces having central openings therein of the same diameter as the axial opening, applying a tube of shrink-wrap material around the package having a length slightly greater than the length of the package, shrinking the shrink-wrap material over the end pieces only partially, applying to the ends of the package retaining members which extend inwardly to a substantially greater distance than the inner edges of the openings in the end pieces, and thereafter shrinking the ends of the shrink-wrap over both the end pieces and the retaining members.

13. A package of flexible material of the universal type having a radial opening therethrough into the axial opening through which the inner end of the material is led out, having at each end of the package a ring of relatively rigid flat material and having a tube of shrink-wrap material shrunk against the wall of the package and over the ends thereof to retain said rings in position, said package having ridges running around the same as the cross-over points of the flexible material, and having the shrink-wrap material shrunk less strongly over said ridges than over the remaining wall of the package.

14. A package of flexible material of the universal type having a radial opening therethrough into the axial opening through which the inner end of the material is led out, having at each end of the package a ring of relatively rigid flat material and having a tube of shrink-wrap material shrunk against the wall of the package and over the ends thereof to retain said rings in position, the inner diameter of the rings being equal to the diameter of the axial opening in the package, and retaining members of flat rigid material secured by the shrink-wrap on each end wall of the package overlying said rings and extending inwardly towards the center of the package substantially further than the inside wall of the axial opening of the package.

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