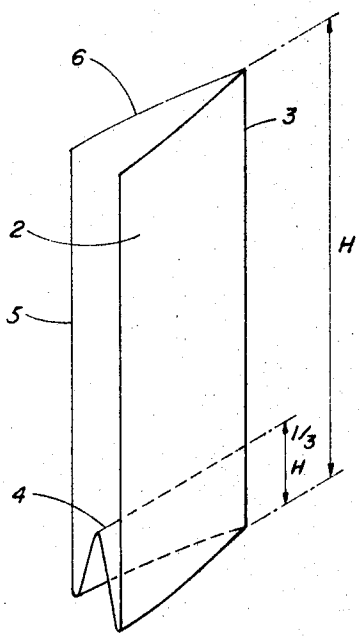
May 14, 1968 W. L. JOHNSON 3,382,971

PACKAGING TWINE

Filed Oct. 16, 1964 2 Sheets-Sheet 1



SECTION OF GUSSETED BAG

FIG. 1.

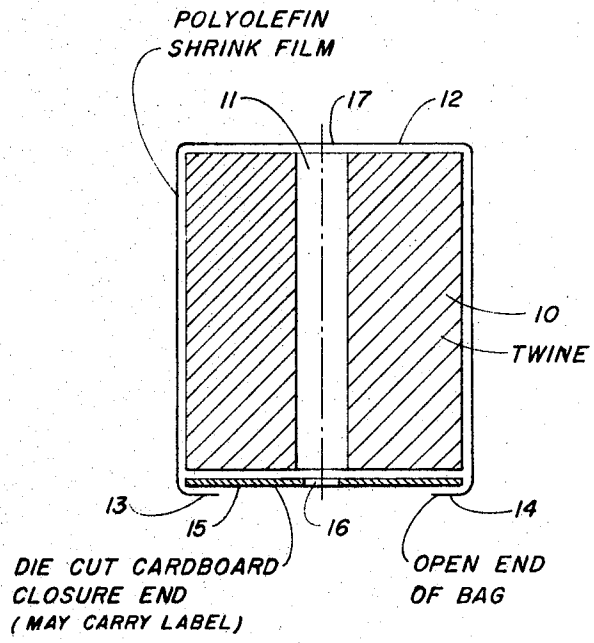


FIG. 2.

WILLIAM LEE JOHNSON
INVENTOR.
BY R. Frank Smith
Harold N. Powell
ATTORNEYS

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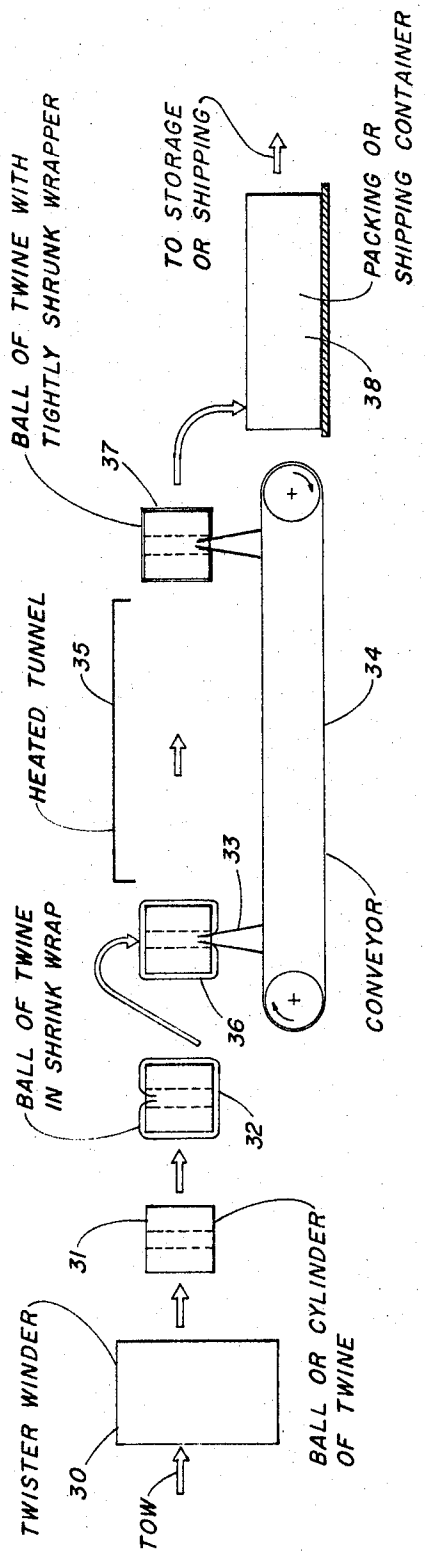

FIG. 3.

WILLIAM LEE JOHNSON
INVENTOR.

BY R. Frank Smith
Harold V. Powell
ATTORNEYS

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PACKAGING TWINE

William Lee Johnson, Kingsport, Tenn., assignor to Eastman Kodak Company, Rochester, N.Y., a corporation of New Jersey

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This invention relates to the packaging of twine or similar attenuated product. More particularly, it concerns the enclosing of balls of baler twine or other balls of twine exemplified by wrapping and packaging twine and string with a certain type and construction of plastic outer cover for the ball of twine.

As already known in the industry, it is usual to enclose twine, string or similar product in a paper wrap. However, paper, excepting to protect to some extent and furnish a surface for advertising or other printed notation, does not perform functions in addition to enclosing as does the present invention. In further detail and with particular reference to a twine, as baler twine, the following has been known in the industry. In shipping and handling such type twine whether the twine be comprised of sisal, hemp or plastic composition such balls of twine have had a tendency toward telescoping. While the paper wrap has possibly assisted in some respect, since paper is susceptible of moisture attack and expansion any packaging pressure exerted by the paper has not been uniform or lasting. Another problem involved with such prior art twine packages is the tendency of the ball to unwind by the loose end during shipping and handling. In actual usage of such twine balls, particularly in automatic machinery where the twine is mechanically withdrawn at high rates of speed, there has been an even greater tendency of the ball package to telescope or collapse after a substantial amount of the twine has been withdrawn.

It is already known to some extent to use plastic in packaging twine and other products. Such is referred to in Patents 1,937,468; 2,342,977 and 2,720,309. These patents are mentioned as illustrative and not necessarily to indicate that such type of patent and publication are the only ones that may be existent in the prior art.

However, as may be noted from the patents referred to above apparently the prior art has used plastic wrapping that necessitated wetting or preheating to pre-expand such prior art wrapping material before use. As it is thought will be understood by those familiar with such subject matter, such prior art procedures have certain disadvantages. Also such prior art suggested plastic materials may have a disadvantage costwise as compared to the present invention.

Hence, it is apparent that the development of a procedure for wrapping twine which is free of or minimizes prior disadvantage, is economical and which is addition to its wrapping or enclosing function may provide other utility represents a highly desirable result. After extensive investigation I have discovered a new procedure for packaging products such as twine and string or other similar balled and wound products with the resultant production of a new packaged product.

This invention has as one object to provide a new and simple method of packing twine, string and the like attenuated products presently available in a ball cylinder

or comparable form. A particular object is to provide a method of packaging which minimizes or prevents the ball or cylinder of twine from prematurely unwinding, collapsing or telescoping. A further object is to provide a new packaged twine which in such package is susceptible to a high degree of rough handling as encountered in transportation and use, then presently available packages. A still further object is to provide a new package of baler twine wherein the twine is better protected from spillage thereon or the like damage than the currently available paper wrapped twine. Other objects will appear hereinafter.

In the broader aspects of my invention I have found that certain non-oriented or partially oriented and generally non-heat set or partially heat set plastic sheeting materials may advantageously be used to wrap twine and the like products of the class indicated. This wrapping produces useful results in addition to the enclosing or packaging function of protecting the surface of the product being packaged. The sheeting just mentioned used in the present invention may be extruded in the usual manner to produce a sheeting of the desired thickness, width and other properties. The sheeting preferably would be transparent, but translucent, opaque or colored sheeting may be prepared and employed in this invention.

After the sheeting is thus extruded rather than fully orienting the sheeting as may be cutomery it would not be oriented or oriented only to a limited extent longitudinally or transversely. Likewise, after such limited orientation, the sheeting is either not heat set or, if heated in its manufacture, heated to a lower or more limited extent than presently used manufacturing techniques.

By thus controlling the amount of orientation (sheet drafting) and heating it is possible to provide a wrapping sheet which has, so to speak, built in a predetermined degree of releasable contraction. In other words, the wrapping sheet may be specifically tailored so that when used in my process to be described in detail hereinafter it can be caused to contract to produce a predetermined and desired pressure against the twine contained within the package.

As already mentioned above, with balls of twine, exemplified by baler twine where the twine is withdrawn from the interior of the package there has been a tendency of such ball in the usual paper wrap to telescope or collapse after even a limited amount of the twine has been withdrawn. This is particularly the situation with respect to baling twine in mobile machinery where the twine package is subjected to considerably rough handling as the equipment is moved over a rough terrain. By enclosing the twine product in the plastic wrap of the present invention as will be seen from the description hereinafter a package is formed having a predetermined control of pressure against the twine. By this elastic like pressure, substantially unaffected by moisture or the heat of the sun the balls of twine are thereby firmly and suitably held during transportation and unwinding even if the ball is shaken or vibrated.

In general, in the maufacture of my package the following steps are carried out. The twine is wound in a ball or cylinder in the usual manner as if it were to be wrapped in paper conventionally. However, in the present invention the ball or cylinder of twine is inserted into a bag made

from the plastic sheeting discussed in detail above. This sheeting as mentioned is such as to have residual contraction of a predetermined degree as may be useful for the particular package being made. This bag is designed to fit around and hold the ball or cylinder of twine. Or the ball or cylinder of twine may be rolled up in the bag and the loose ends are folded over and into an open end of the ball or cylinder. The various details of wrapping or otherwise enclosing the twine within the plastic sheeting will be further apparent from the several examples set forth hereinafter.

The twine thus wrapped with the special sheeting of the present invention is then placed in an oven, or otherwise heated, for a few seconds to cause the desired sheeting contraction thereby causing the wrapper to firmly enclose and in addition pressure support the ball of twine. As will be observed since the plastic bag of the present invention does not need to be wet or preheated prior to use, the procedure of the present invention is simpler and more efficient than prior art procedures. Also since the plastic bag of the present invention is not moisture susceptible or otherwise greatly susceptible to atmospheric conditions, it is possible by the present invention to produce a more permanently protected package than by prior art procedures.

For a still further understanding of my invention reference is made to the attached drawings forming a part of the present application.

FIGURE 1 is a side elevation view of a gusseted bag construction such as may be used to enclose the twine to be packaged. FIGURE 2 is a side elevation view in section of a new twine package in accordance with the present invention.

FIGURE 3 is a flow sheet for illustrating the various operational stations from winding to the finished wrapped product.

Referring to FIGURE 1, a section of sheeting **2** of the type described above and of a height H is folded on one edge as at **3**. A gusset **4** is folded into the bottom. This gusset may be approximately ⅓ H. The production of such bags may be accomplished on commercially available bag making machines as exemplified by Schjeldahl Model 108–41SP. The outer edge **5** and the top **6** may be left open for facilitating the insertion of the ball or cylinder of twine. Or the outer edge **5** may be suitably heat sealed or otherwise closed. However, as will be noted from the examples which follow these outer edges **5** and **6** may be made of a sufficiently greater length than the article to be packaged. Then the article is rolled in the bag and the upper ends tucked or folded into the open center core of the ball or cylinder.

Referring now to FIGURE 2, the ball or cylinder of twine is indicated at **10**. The hollow center is indicated at **11**. The plastic sheeting of the present invention enclosing the ball is indicated at **12**. In the present FIGURE 2 for clarity of presentation FIGURE 2 is depicted in exploded arrangement with sheeting **12** away from the surface of the twine. However, in actual operation and construction, such sheeting **12** is contracted into close and pressure contact with the twine. Hence, this FIGURE 2 may be considered as illustrating the twine package somewhat in the manner it exists before the packages of twine are passed through the heating oven.

While the open ends of the sheeting as at **13** and **14** are shown merely extending a small distance over the edges of the twine package, this is not a limitation on the invention. The edges or ends **13** and **14** may extend further toward the center of the package or may be tucked into the opening **11**.

Preferably, however, there is provided a carboard or polyallomer composition disc **15** upon which the twine package may rest. This disc may be provided with a suitable opening **16** through which the twine is conveniently withdrawn. If it is desired to have the package at the onset substantially completely enclosed rather than opening **16**, a zone of material which may be easily punched out can be provided in disc **15**. Or, in a similar manner on the opposite end of the core space **11** as in the vicinity of area **17**, a weakened spot may be provided by cutting or burning so that the twine may be removed from that end.

Refer now to FIGURE 3 where **30** diagrammatically indicates winder in which the twine is being balled or cylindrically wound into a package. The packages of twine or string **31** which may be wound on commercially available machinery and of the usual ball or cylinder configuration are removed from the winder to bagging station **32**. At this station **32** the bags are already available or are automatically or otherwise prepared from a roll of sheeting.

Assuming the bags are already available, the operator drops the cylinder of twine into the open end of the bag and tucks the ends into the open core of the cylinder or ball. The operator then inverts the package onto the upright prong **33** of conveyor **34**. The conveyor automatically carries the package through the heated tunnel **35**.

The heat of the tunnel and speed of conveyor operation are correlated to subject the loosely wrapped package **36** to sufficient heat treatment to cause the wrapper to contract to the desired extent giving a tighly wrapped package **37** a the exit end of the conveyor. These finished packages may then be tilted off the end of the conveyor into a conventional shipping box or the like container **38**. The boxes then are moved to storage or shipment.

A still further understanding of my invention will be had from a consideration of the following examples which are set forth to illustrate certain embodiments thereof.

EXAMPLE I

In accordance with this example a polypropylene baler twine was being packaged. This twine and its method of manufacture are described in detail in companion pending application of my coworkers Wininger and Dyer Serial No. 257,386. In order to package this twine wherein the strand diameter was 3/16" and the footage and poundage in the cylindrical open core twine package was approximately 4,550 feet and 8⅓ pounds there was made up a number of gusseted bags. These bags were made up on a 108–41SP bag machine to give a bag structure as shown in FIGURE 1. The sheeting used in making these bags was from low density polyethylene composition having a melt index of 1.7 grams per ten minutes and 0.918 grams per milliliter density. The sheeting made from this polyolefin composition although oriented to some extend had a contraction value of about 35 percent in the transverse direction and 45 percent in the machine direction with respect to the line of extrusion of the sheeting. This sheeting used for making up these bags was not heat set.

In this example after the cylinder of twine was inserted into the bag the bag was rolled around the cylinder and the loose ends of the bag tucked into the center hole of the cylinder. These enclosed cylinders of twine as thus bagged were placed on the conveyor prongs and passed through an oven or heating tunnel as illustrated in FIGURE 3. In the oven the packages were subjected to a temperature of 400° F. for approximately 3–5 seconds. The packages in which the twine was now securely held within the plastic wrap were removed from the oven. A small hole was cut in the center of the gusseted end, by a heated ring, to allow access to the loose end of the twine for its removal.

The finished package was approximately 9¼" high and 8¼" in diameter.

As will be apparent from other of the examples which follow, a die cut cardboard or plastic disc inserted as illustrated in FIGURE 2 may be used to facilitate the support of the ball or twine cylinder. Also said disc may be used to carry labels of advertising or other similar notations.

EXAMPLE II

In this example the same type twine and wrapping as in Example I was used. However, at station 32 a cardboard disc approximately the diameter of the cylinder was first inserted in the bag on the end of the twine away from the open end of the plastic bag. The packaged twine was heat treated and otherwise further handled as in Example I. While the disc imparted some further desirable features to the package, the package without said disc is operative and better than prior art paper-wrapped packages. If desired, the disc may be inserted on the opposite end or on both ends of the cylinder.

EXAMPLE III

In this example the twine and other features were the same as in Example I. However, for wrapping there was used an oriented non-heat set polypropylene film. It was found that the thickness of such film had some bearing on the stability of the finished package. It was found that polypropylene 0.5 mil. to 1.0 mil. film, oriented to some extent, was most suitable where surface hardness and abrasion resistance were desired. The resultant polypropylene package tested out satisfactorily as compared with the polyethylene package of Example I as will be apparent hereinafter when certain tests are referred to.

EXAMPLE IV

In this example, which was similar to Example I in operation, there was used Kodar polyester sheeting, for wrapping a more expensive twine or string material than the baler twine of Example I. This shrink polyester film gave a very excellent package which in addition exhibited greater sparkle than the above referred to films.

Some of the advantages of my new package are thought clearly illustrated from the data in the following table. From this data concerning actual trucking operations of packages in accordance with the present invention compared with conventional paper wrapped packages it will be observed that the packages of the present invention withstood such handling better than prior art packages. This advantage is in addition to the instant package being better protected against spillage soaking through the wrap. Also, since the wrap of the present invention may be transparent the contents of the twine may be visibly observed more readily than paper wrap.

Details concerning the rough handling tests are as follows:

Different samples of packaged twine were hauled on a commercial truck for several days in a special test box to determine relative package stability. Each of several samples were placed in an 11-inch square by 12-inch deep plywood section of a box. The size of the individual containers was representative of the average twine box on hay balers. During the test, the box was transported both in its normal upright position and on its side; thus very severe handling in the field was simulated. The descriptions of each original sample and the results of the handling test are as follows:

Sample	Description	Results
1	Normal production twine, wrapped in polyolefin shrink pack of the present invention. Two-thirds of twine had been pulled out. No cardboard wrapper.	Slight tendency to bulge but retained by polyolefin heat shrunk wrap.
2	Conventional prior art paper-wrapped production twine. Two-thirds of twine pulled out.	Package telescoped and collapsed in center.
3	Conventional package coated top and bottom with rubber base glue.	Acceptable condition.
4	9,000 foot conventional paper-wrapped package, ⅓ of twine pulled out.	Package telescoped and collapsed in center.
5	Pressure sensitive tape applied top and bottom to regular paper-wrapped production package. Two-thirds of twine pulled out.	Do.
6	Polyethylene shrink pack of present invention on regular cardboard wrapped production package.	Good condition.
7	Polymeric shrink pack of present invention—no other wrapper.	Do.

Further comparative tests of various twines in commercial hay baling equipment of different makes has been carried out and it was found that packages in accordance with the present invention did not telescope in transit or in use. With other types of packages the twine in some instances would unwind and drop out on the ground. Or with partially used balls of twine left in the baler it was found that the prior art packages collapsed when the baler was transported from one field to another over rough terrain. On the other hand, packages in accordance with the present invention even though the twine had been partially withdrawn therefrom did not collapse.

The thickness of the polyethylene sheeting used to make the above gusseted bags is preferably within the range of 0.00075" and 0.005" but other ranges of thickness may be employed, as for example, the .005" to .01" referred to for polypropylene in Example III. While the polyethylene referred to in detail in Example I is the preferred material because of its lower cost, other polymeric compositions such as polypropylene, as mentioned above, and in some instances polyvinyl chloride may be used.

Although the invention has been described in considerable detail with particular reference to certain preferred embodiments thereof, variations and modifications can be effected within the spirit and scope of the invention as described hereinabove, and as defined in the appended claims.

I claim:

1. A method for pakaging a synthetic twine product comprising the steps of:

(a) winding an elongated twine product of synthetic material into a cylindrical, open core, relatively loose twine package subject to telescoping and collapse upon handling;

(b) placing said cylindrical, open core, twine package into an open-ended bag formed of non-heatset, low density polyethylene sheeting having sufficient molecular orientation to result in a contraction value of about 35% in the transverse direction and about 45% in the machine direction with respect to the line of extrusion of the sheeting from which the bag is formed;

(c) tucking the open end of said bag into the open core of said twine package;

(d) subjecting said twine package to a temperature of about 400° F. for about 3 to 5 seconds to thereby shrink said bag about said twine package and form a tight package having no tendency to telescope or collapse.

2. A method according to claim 1 wherein said low density polyethylene sheeting has a melt index of about 1.7 grams per ten minutes, and a density of about 0.918 gram per milliliter.

3. A method according to claim 2 wherein the thickness of said low density polyethylene sheet ranges from about 0.00075 inch to about 0.01 inch.

4. An article of manufacture comprising:

(a) an elongated twine product of synthetic material wound into a cylindrical, open core, relatively loose, twine package subject to telescoping and collapse resulting from handling;

(b) a bag of non-heatset, low density polyethylene oriented to have a contraction value of about 35% in the transverse direction and about 45% in the machine direction with respect to the line of extrusion of the sheeting from which said bag is formed, heat shrunk about said cylinder to contact all exterior surfaces thereof to thereby prevent collapsing and telescoping of said cylinder of twine during handling and use.

5. An article of manufacture according to claim 4 wherein said low density polyethylene has a melt index of about 1.7 grams per ten minutes, and a density of about 0.918 gram per milliliter.

6. An article of manufacture according to claim 5 wherein said low density polyethylene sheeting has a thickness in the range of about 0.00075 inch to about 0.01 inch.

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WILLIAM T. DIXSON, JR., *Primary Examiner.*