This invention relates to the preparing of wound packages of filamentary material, and especially rayon cakes of annular shape formed in centrifugal spinning buckets, for processing with liquids and gases.

The principal object of the present invention is to provide an improved wrapper of permeable paper or paper-like material which is capable of withstanding normal handling and abuse during the liquid treatment operations and during subsequent shipment of the cake. It has herebefore been suggested to wrap cakes or other annular wound packages of rayon or other artificial filaments with a paper, but the systems herebefore used have been accompanied by disadvantages of providing a large excess of paper either inside the cake or around the outer circumference of the cake. In the former case, troubles arise when the wrapped cake is placed upon a rod such as a perforated rod for conveying liquids to the interior of the cake. When a surplus amount of paper is crumbled up adjacent the internal wall of the cake, the operator must exert extreme care in placing the cake upon the rod; otherwise, the wrapper will catch upon the rod and be torn from the cake as it is being placed upon the rod. Similarly an excessive amount of crumpled paper upon the external circumference of the cake presents numerous opportunities for the wrapper to be caught upon projecting edges or corners of objects, such as crates, machines and the like adjacent which the operator must carry or move the cakes in order to place them upon the liquid-treating machine or pack them in shipping cartons. In addition, the surplus crumpling of the paper adjacent the internal and external peripheries of the cake tend to impart irregularity to the treatment of the cake.

The present invention provides a protective cover, which is in spite of its inexpensiveness and disposability is of sufficient durability to withstand the wet processing conditions and serve subsequent to the wet processing to withstand normal abuse during shipment to a winding, twisting or other textile fabric or preparatory operation either within the original production plant or in an outside plant such as that of a customer of the artificial filament producer. The present invention also provides a disposable wrapper which can be rewet any number of times, such as in dyeing the otherwise finished product shipped to the customer by the artificial filament producer. The wrapper of the present invention lacks the disadvantages mentioned above so that no special care need be taken to avoid tearing the wrapper off the cake during the normal application of the cake to customary liquid-treating apparatus, such as insertion of a perforated liquid-applying rod through the hollow interior of the annular cake or package.

The drawings illustrate a preferred embodiment of the invention, and Figures 1 is a perspective view illustrating the first steps of applying the wrapper to a cake, Figure 2 is a side elevation showing a later step of the procedure, Figure 3 shows a still later step, Figure 4 shows the final sealing step, and Figure 5 shows the wrapped product.

As shown and described hereinafter, the invention generally comprises the steps of applying two wrappers, one to the interior of the annular package and the other to the exterior thereof. Each wrapper has approximately the diameter of the windings of the package adjacent which they are applied. Thus, a tube or a sheet lapped upon itself so that its diameter is substantially that of the interior of the cake is placed inside the cake and then a second tube or sheet lapped upon itself so that its diameter corresponds approximately to the outside diameter of the annular package is placed around the package and the two wrappers are joined together.

As shown in Figure 1, a sheet 2 of thin, flexible, gas-permeable and liquid-permeable paper or paper-like material is lapped around an expandible mandrel 3 and the annular package or cake 4 is placed over the sheet 2 and then the mandrel is expanded. Sealing means is placed around the protruding portions of the inside wrapper and, as shown, this sealing means may advantageously comprise one or more thermoplastic filaments or yarns 5 laid side by side or twisted together around each of the protruding ends of the wrapper. The invention is not limited to any particular adhesive, however, and it is to be understood that any form of glue or cement may be applied instead of the thermoplastic filaments or yarns. If desired, one of the two inter-twisted filaments or yarns 5 may be of a heat-resistant type, so that even after the sealing, this resistant thread remains to facilitate tearing the juncture of the package open or apart. If desired, the wrapper material may comprise thermosensitive material which becomes adhesive upon application of heat. For example, a paper may comprise a substantial proportion (15 to 100%) of thermosensitive fibers, for example thermoplas-
tic fibers formed of vinyl resins of which "Vinyon" is representative. In this case, the application of sealing means is unnecessary. After application of the sealing means about the circumference of each protruding end of the wrapper, when such sealing means is necessary, a second wrapper sheet or tube of permeable paper or paper-like material is placed about the outer circumference of the package as shown in Figure 2 so preferably that it fits snugly thereabout though a small amount of looseness may be tolerated.

Thereafter the protruding ends of the outer wrapper are folded down into engagement with the inner wrapper or, when the wrappers do not contain thermosensitive material, with the sealing means as shown in Figure 3 and as shown in Figure 4, the package may be sealed by the application of a hot iron I. Sealing by means of the iron may extend completely all the way around or it may be accomplished as spaced spots thereabout. As shown in Figure 4, the heat-resistant thread, where used, may extend out from the seal at 5a so that it is available for subsequent tearing after treatment and shipping of the package is completed. As shown in Figure 5 the portions of the wrapper projecting outwardly from the sealed wrapper may be torn at spaced points 8 and then folded back against the annular ends of the cake.

In general the materials from which the covers of this invention are made comprise those papers or paper-like felts which are highly permeable and have good wet strengths. Such papers as have found use in the manufacture of individual portion tea bags are satisfactory. Papers made from regenerated cellulose fibers, such as are obtained from viscose or other cellulose solutions, lengths from about 7/16 inch to one inch or longer have high wet strengths and may be used successfully in the practice of this invention. Any permeable paper which has in creased wet strength as the result of resin impregnation during or subsequent to its formation into a sheet is suitable. Examples of such papers are those which are formed from fibers impregnated with urea-formaldehyde, phenyl-formaldehyde, melamine formaldehyde resins and the like. Paper-like suitable for converting materials are those of paper-thin felts made from fibers either of paper- or textile-making length comprising a small proportion of heat-activatable fibers or consisting entirely thereof which are caused to adhere to each other as well as the non-activatable fibers, if any, wherever they touch by activation to an adhesive state and subsequent deactivation. Suitable activatable fibers include thermoplastic fibers of the cellulose ester type, such as cellulose acetate, and of the vinyl resin type, such as the polyvinyl chlorides, copolymers of vinyl chloride with vinyl acetate, and after-chlorinared polyvinyl chlorides or copolymers of vinyl chloride and vinyl acetate. Such fibers may be activated to an adhesive condition by heat or by solvent or swelling agents. The papers or paper-like felts containing the fibers may be converted under pressure while the fibers are in adhesive condition to assure adhesion together at their points of crossing and may be deactivated by cooling or evaporation of solvent. The use of the vinyl resin fibers is especially advantageous where the processing liquids to which the wound packages are subjected are highly corrosive, and for this purpose, a paper composed entirely of chemically resistant vinyl resin fibers may be used, the permeability and wet strength in such case being controlled either by careful control over the conditions of activation or by mixing a selected proportion of vinyl resin fibers which, and other table at a lower temperature or by a lower concentration of solvent agent than the rest of the vinyl resin fibers. Thus fibers made of the less easily activated after-chlorinated copolymers of 70 to 93 parts by weight vinyl chloride with 30 to 5 parts by weight of vinyl acetate may be mixed with a predetermined proportion of fibers made of the corresponding unchlorinated copolymers.

The wrappers may be perforated or slitted, but preferably they are of sufficient permeability without perforation or slitting to allow free passage of the treating fluids and the gases during liquid treatment, vapor treatment, and the like.

The permeable paper or paper-like wrappers of this invention have numerous advantages as will be apparent from the description above. They are inexpensive and hence they may be disposed of after they are used for protecting the wound filamentary packages during liquid treatment, vapor treatment, drying and the like and finally during transportation of the package to another plant for rewinding, throwing, and textile or preparatory operations. This makes it more economical to ship cakes or other packages of rayon or other artificial filaments. Herefore, in the production of artificial filaments, the general practice has been to rewind such original collection packages into other forms, such as cones or skeins, and to ship the latter packages. This involves an extra winding operation when the customer requires a different type of package for his operation which can only be avoided by making it possible to ship the original collection packages. The knitted wrappers hereabove used for protecting the packages during processing are too expensive to be thrown away after a single use and hence any shipment of the packages in such a wrapper requires an extra charge for the wrapper or the nuisance of returning them to the artificial filament producer.

The lack of crumpled paper within the interior of the package as well as at the outer circumference of the packages greatly reduces the opportunities for tearing through the package during handling operations. Similarly, by securing the inside and outside paper wrappers to form a neat, snugly wrapped package, the wrapped package can be subjected internally or externally to liquids, gases and the like without uncovering the windings and risk of tangling thereof.

While preferred embodiments have been shown herein, it is to be understood that the description is merely illustrative and that modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A disposable wrapper for protecting during handling an annular wound filamentary package contained under pressure while the fibers are in adhesive condition to assure adhesion together at their points of crossing and being deactivated by cooling or evaporation of solvent. The use of the vinyl resin fibers is especially advantageous where the processing liquids to which the wound packages are subjected are highly corrosive, and for this purpose, a paper composed entirely of chemically

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ameter of the package and fitting snugly thereagainst, the outer sheet being folded inwardly at each end against the end walls of the annular wound package and bonded to the inner sheet, overlapping portions of the two sheets extending outwardly from the bonds being at least partially torn and folded back against the inward folds of the outer sheet.

2. A disposable wrapper for protecting during handling an annular wound filamentary package contained therein and having internal and external surfaces connected by end walls, said wrapper comprising a permeable paper or paperlike tube-shaped sheet having a diameter approximately the same as the internal diameter of the package and fitting snugly thereagainst, a second larger tube-shaped sheet of substantially the same permeability as the first sheet concentrically arranged around the first and having a diameter approximately the same as the external diameter of the package and fitting snugly thereagainst, end portions of at least one of the sheets being folded against the end walls of the annular wound package and extending into engagement with portions of the other sheet adjacent the ends of the package to form an enclosure thereabout, each of said sheets having terminal portions protruding outwardly from the enclosure, said sheets being adhesively bonded between their protruding portions.

3. In combination, a wound filamentary package of annular shape and a permeable paper wrapper thereon comprising an inside sheet conforming substantially to the size and shape of the internal surface of the package and an outside sheet of substantially the same permeability as the first sheet conforming substantially to the external circumferential surface of the package, the outer sheet having generally annular portions folded snugly against the end surfaces of the package, said folded portions extending into engagement with the inside sheet adjacent the inside periphery of the ends of the package to form an enclosure thereabout, each of said sheets having generally annular terminal portions protruding outwardly from the enclosure, said sheets being adhesively bonded between their protruding portions.

4. In combination, a wound filamentary package of annular shape and a permeable paper wrapping thereon comprising an inside sheet conforming substantially to the size and shape of the internal surface of the package and an outside sheet conforming substantially to the external circumferential surface of the package, the inner and outer sheets of said wrapper being unslit and unperforated and of substantially the same permeability, the outer sheet having generally annular portions folded snugly against the end surfaces of the package, said folded portions extending into engagement with the inside sheet adjacent the inside periphery of the ends of the package to form an enclosure thereabout, each of said sheets having generally annular terminal portions protruding outwardly from the enclosure, said sheets being adhesively bonded between their protruding portions.

5. A wrapper as defined in claim 2 in which the sheets are unslit and unperforated.

6. A combination as defined in claim 3 in which the sheets are unslit and unperforated.

DONALD C. THOMPSON.

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