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METHOD AND APPARATUS FOR PROCESSING YARN

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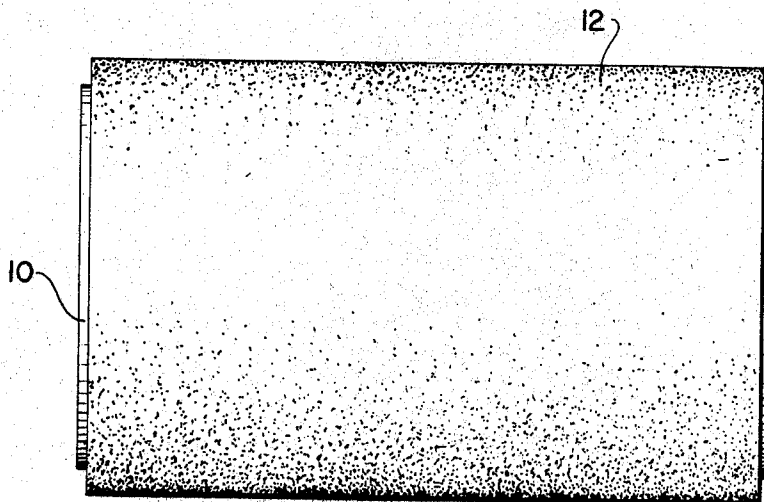


FIG. 1

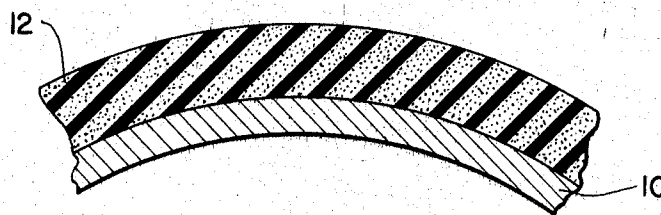


FIG. 2

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## METHOD AND APPARATUS FOR PROCESSING YARN

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3 Claims

### ABSTRACT OF THE DISCLOSURE

The disclosure concerns a method of processing false twist yarn into a "set" yarn wherein the false twist yarn is wound into a soft package on a package support which comprises a hard core around which is snugly fit a sleeve of resilient foam material as, for example, polyurethane which is chosen to have a compressibility factor which is equal to the compressive force exerted by the yarn on the package support when the packaged yarn is autoclaved in the course of making the "set" yarn.

This application is a continuation of my application No. 551,480, filed Apr. 22, 1966, now abandoned.

The present invention relates to textured synthetic yarn and more particularly to a process and apparatus for producing such yarn.

Synthetic thermoplastic yarns are conventionally given stretch or elastic properties by being highly twisted, heat set in the twisted form and then untwisted. A process and apparatus for continuously so treating yarn is disclosed in U.S. Pat. No. 3,152,436 issued Oct. 13, 1964 to C. J. Dudzik et al. In the apparatus disclosed in the Dudzik et al. patent a yarn feed roller is provided for drawing the strand of yarn being treated through a heating zone and a false twist spindle and advancing the yarn to a winding mechanism. The winding mechanism customarily winds the yarn at a speed slower than the speed at which the feed roller advances it to permit the yarn to relax or contract a predetermined amount as it is wound.

Yarn produced by the Dudzik apparatus possesses a great amount of stretch or elasticity, customarily being capable of stretching at least 500% from its relaxed condition. For many uses this amount of stretch is undesirable, and it is customary in the art to modify such yarn by further heating it in a partially extended condition to remove much of the stretch characteristics but to leave predetermined desired bulk or textured characteristics. When yarn produced by the apparatus disclosed in said Dudzik et al. Pat. 3,152,436 is wound by its winding mechanism in a sufficiently relaxed condition the characteristics of said yarn can be modified by placing the packages in an autoclave or similar heating means such as a hot dye bath, and heating the yarn to a temperature slightly above the temperature at which it was set.

Stretch yarn modified in the above described manner lacks uniformity between the yarn on the outside of the package and yarn on the inside of the package. This lack of uniformity is due to the different amounts the yarn can shrink or contract as it is heated.

One object of the invention is to provide a method of processing yarn which comprises the steps of continuously twisting a running strand of yarn, continuously untwisting said strand, and winding said strand into a soft package advancing said strand towards a takeup package having a uniformly compressible core at a linear speed greater than the surface speed of said package.

A further object of the invention is to provide a core upon which yarn may be wound having a relative in-

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compressible portion and a soft compressible outer portion.

Other and further objects and advantages will become apparent upon a reading of the more specific description which follows taken together with the accompanying drawings.

In the drawings:

FIG. 1 is an elevation view of a textile core embodying the present invention; and

FIG. 2 is an enlarged arcuate section taken through the body of the core.

Tube 10 may be of fibrous or other suitable material. An annular integument 12 of flexible foam material is receivable thereon, preferably by means of a snug fit, although an adhesive bond or other mode of fastening can be employed. The snug fit is desirable for ease of removable of the integument from the reusable tube after the setting process has been completed while yet preventing undue creep of the integument across the surface of the tube during the winding operation. The reason for removing the integument from the tube after the setting process resides in the fact that flexible foam materials are sufficiently deformed by the setting process that they are not desirably reusable. Thereupon, a fresh integument must be applied to the tube prior to an ensuing operation again employing the flexible core. The composition of the integument is desirably an open-cell flexible foam material such as latex rubber foam or one of a large range of foam plastic materials. A composition which produced the satisfactory results over the range of overfeeds currently employed for modifying yarns was found to be a flexible urethane foam bearing the composition number P-22 and produced by the General Tire and Rubber Company. Closed cell foam materials have also been found suitable for use in the integument herein. However, if the package is to be subsequently dyed, for example, such closed cell integument may restrict dye penetration to all parts of the package.

Tube 10 is of particular value for use in taking up yarns produced on the apparatus disclosed in said Dudzik Pat. 3,152,436 and which is to be subsequently modified by treatment in an autoclave or hot dye bath. It has been determined that the quality of a modified textured yarn so produced varies in relation to the percentage of overfeed and the compressibility of the integument. That is, an integument which is too soft will allow too much yarn shrinkage and cause a reverse variation wherein greater stretch properties are retained by yarn located in the region of the core than the running yarn. Oppositely, as the integument is made harder the yarn variation exhibited approaches that of yarn wound on a conventional non-yieldable core. Then too, the lower the percentage of overfeed, the greater must be the initial compressibility of the integument because yarn so wound will have a comparatively greater tendency to compress the core than yarn wound at a higher percentage of overfeed. In like fashion, a softer integument is desired for the higher percentages of overfeed. When the yarn is treated in the autoclave or hot dye bath, the foam is caused to be compressed by reason of the shrinkage of the yarn. By choosing an integument having the proper compressibility, i.e., having a compressibility factor equal to or slightly less than that exerted by the shrinkage forces of the yarn as the yarn is shrunk during subsequent processes such as dyeing or autoclaving, the yarn located next to the core of the package shrinks uniformly in the same proportion as the yarn located in regions distant from the core. The resulting package manifests a uniformity which was heretofore unattainable, and fabrics woven or knitted therefrom are of superior quality.

An example of yarn processed in accordance with the instant invention is as follows. A polyester yarn manu-

factured by E. I. du Pont de Nemours and Company, and sold under the designation Dacron 150 denier, 34 filament R 10, Type 56 was processed on apparatus of the type disclosed in U.S. Pat. 3,152,436. The yarn was wound onto a form constituted as a conventional hard paper tube having an internal diameter of 3.25 inches and having a wall thickness of generally .19 inch. The paper tube was covered with a uniform layer .25 inch in thickness of flexible urethane foam sold by the General Tire and Rubber Co. under the compound number "P-22." The finished package dimensions were 5.5 inches in width and 9 inches in diameter. The package weighed about 2 pounds. The overfeed employed was 12%. The wound package was processed in an autoclave manufactured by the Gaston County Company. The cycle consisted of:

- (a) 5 minutes of vacuum at 26 inches of mercury.
- (b) 45 minutes of dry steam at 27 pounds gage pressure (270° F.).
- (c) 10 minutes of vacuum at 26 inches of mercury.
- (d) 3 minutes of exhaust.

The processed yarn was unwound and found to be uniform in its stretch properties, shrinkage characteristics, texture, and torque angle throughout its entire length.

Although specific practices have been set forth, and description has been made of preferred embodiments constructed of preferred materials, it should be understood that various changes, modifications, additions, and substitutions may be effected by those skilled in the art without departure from these teachings, and it is directed in the appended claims to embrace all such variations as fall within the true spirit and scope of this invention.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. The method of using a yarn core comprising a rigid central tube the outer surface of which is covered by a

flexible foam material said method comprising winding a false-twist textured thermoplastic yarn at an overfeed rate onto said core to form a yarn package in which said textured yarn is in a partially extended condition, and heating said package, whereby the stretch properties of said yarn are modified with substantial uniformity from the center to the outside of said package.

2. The method of claim 1 wherein said foam is open-celled.

3. The method of uniformly modifying the stretch properties of a synthetic yarn which has been highly twisted, heat set in the twisted form and then untwisted by heat setting said yarn in a partially extended condition comprising:

- advancing a strand of said yarn toward a winding mechanism at linear rate greater than the winding speed of said mechanism,
- winding said yarn by said winding mechanism into a package upon a core having an outer surface with a uniform compressibility factor substantially equal to the compressive force exerted thereupon by the shrinkage of said yarn during subsequent processing, and heating the yarn thus wound.

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