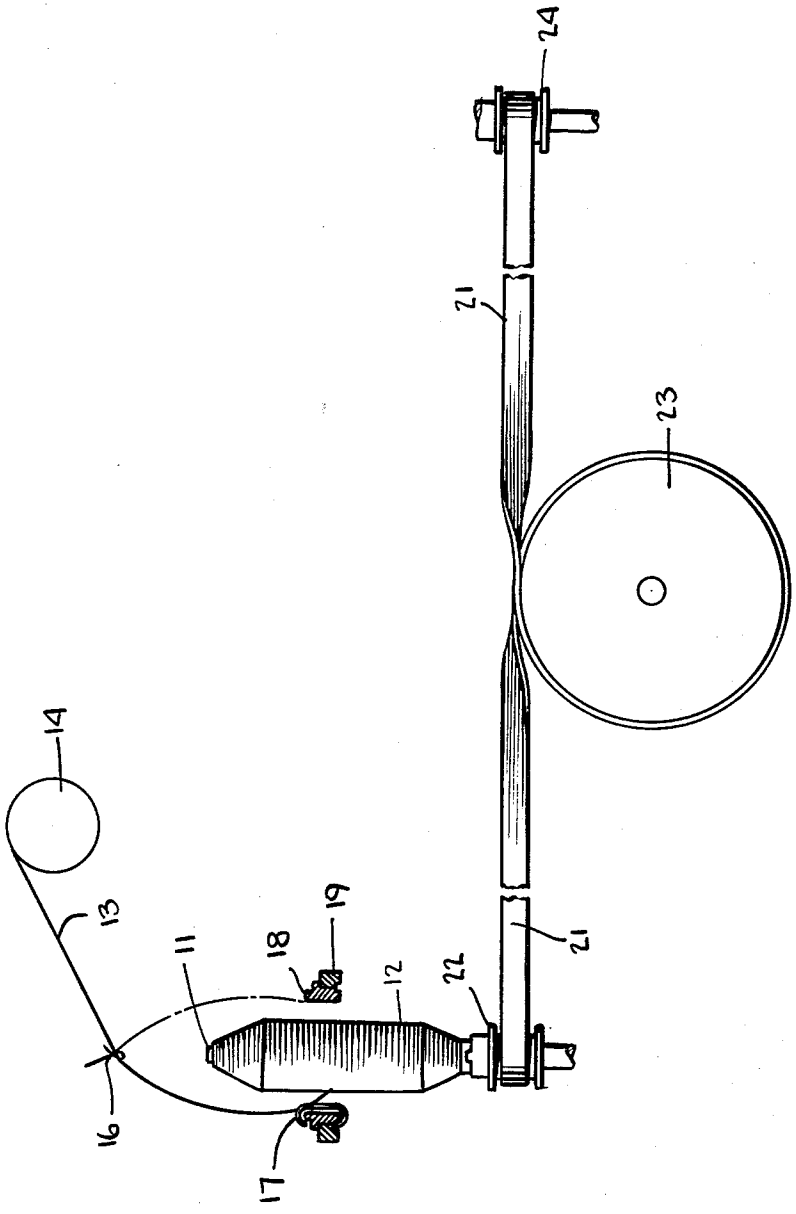
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SPINDLE TAPES

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SPINDLE TAPES

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This invention relates to textile machinery such as yarn winding and twisting devices and relates more particularly to spindle tapes employed in connection with such devices.

In one common form of device employed for the winding and twisting of yarn, a bobbin or other yarn package support is mounted on a metal spindle which is rotated at high speed by frictional contact with a driven belt, usually termed a "spindle tape." The spindle tape is, in turn, driven by frictional engagement with a large drive wheel rotating on an axis which is at right angles to the axis of rotation of the spindle. As a result, during operation the spindle tape is subjected to severe twisting stresses and abrasion, and is also exposed to the detrimental action of the oils and greases used for lubricating the machine parts. A suitable spindle tape should be resistant to all of these unfavorable influences and at the same time should have excellent frictional characteristics to insure that no slippage takes place between the spindle tape and the spindle or between the spindle tape and the drive wheel. However, the spindle tapes now available, which have suitable frictional characteristics, are not sufficiently resistant to wear and tend to break in service after a relatively short period of use.

It is therefore an object of this invention to provide a spindle tape having excellent frictional characteristics and having greatly improved service life.

Other objects of this invention will be apparent from the following detailed description and claims.

In accordance with one aspect of this invention, a spindle tape woven of cellulose yarns is impregnated with a resinous copolymer comprising about 95 to 50% of vinyl acetate and correspondingly about 5 to 50% of another mono-ethylenically unsaturated ester of a carboxylic acid. Examples of such esters are dibutyl fumarate, vinyl propionate, vinyl butyrate, vinyl stearate, ethyl acrylate, dibutyl itaconate, butyl acrylate, dibutyl maleate and dioctyl fumarate. The copolymers which are most useful in the practice of this invention have molecular weights in the range of about 15,000 to 60,000 as measured by viscosity determinations of dilute solutions of the copolymer in a suitable solvent such as benzene or acetone. One very suitable copolymer contains about 20% of dibutyl fumarate and the balance vinyl acetate and has a molecular weight in the range of 20,000 to 24,000.

The woven tape is preferably made of cotton but it may also contain or be made wholly of other cellulose fibers, such as high-tenacity rayon. The tape is usually about ½ to 2 inches in width and is about 1/32 inch to 1/16 inch in thickness. It is formed into an endless belt (which may, for example, be 120 to 132 inches long) by overlapping its ends and stapling or stitching together said ends; this may be done before or after the woven tape is impregnated.

It has been found that impregnation of a spindle tape in accordance with this invention greatly increases the life of the tape. Thus, one high quality spindle tape, made of cotton and now on the market, has a service life of about 100 days. By impregnation of the same tape a

product is obtained which has excellent frictional characteristics and which has a service life which is at least double that of the unimpregnated tape.

The impregnation of the tape may be carried out conveniently by simply immersing the tape for a suitable period into a bath of a latex of the copolymer to be used and then withdrawing the tape from the bath. For ease and economy of operation, it is preferred to use a relatively fluid latex, e.g. one containing about 5 to 50% of copolymer, the balance of said latex being water and minor amounts of dispersing agents. The amount of copolymer incorporated into the tape may suitably comprise about 50 to 70% of the weight of the impregnated tape, the balance being the cellulose fibers of the tape.

After impregnation the tape is dried. Thus, the tape may be permitted to dry in air at room temperature or may be passed through a heated drying oven. The tapes tend to shrink during the impregnation and drying procedure and, for best reuslts, they should be stretched to their original length. This may be done after drying.

The single figure of the drawing is a view in elevation of a portion of a textile twisting machine of conventional construction.

Referring now to the drawing reference numeral **11** designates a spindle, adapted to be rotated rapidly, carrying a yarn package **12**, on which package a yarn **13** is being wound. The yarn is fed at a constant rate by a positively driven feed roll **14**, and passes from said feed roll through a stationary balloon guide **16** and then through a C-shaped traveler **17**, which traveler **17** is mounted on a ring **18** supported on a vertically reciprocating ring rail **19**. As is well known in the art, the traveler **17** moves freely in a circular path, on the ring **18**, around the package **12** and is moved up and down relative to the package **12** by the reciprocating action of the rail **19**.

The spindle **11** is rotated about a vertical axis by a rapidly moving driven belt **21** which passes around a whorl **22** of said spindle. Power is supplied to the belt **21** by a driven wheel **23** mounted for rotation about a horizontal axis. The belt **21** makes one turn around the wheel **23** and then passes around another spindle whorl **24**, which is identical with, and mounted parallel to, the whorl **22**. As is common in the art, the belt **21** also passes around two other whorls identical with whorls **22** and **24**, and thus serves to drive four spindles.

The following example is given to illustrate this invention further.

Example

A twill-woven cotton spindle tape, 1¼ inches wide, about 0.038 inch thick, and 11 feet long, and having its ends spliced, with nylon sewing thread and with a 12 inch overlap, to form an endless band, is impregnated by dipping it into a bath of a latex comprising 53% of a copolymer of 20% of di-n-butyl fumarate and 80% of vinyl acetate; 44% of water; 0.6% of "Cellosize WP–09" (comprising hydroxyethyl cellulose); and the balance comprising surface active agents including sodium dodecyl benzene sulfonate and water-insoluble condensates of polyethylene oxide and polypropylene oxide, the latex having been produced by emulsion polymerization and the polymer particles of said latex being less than 0.5 micron in size, the average particle size being about 0.3 micron. The copolymer has a molecular weight of 20,000 to 24,000. The fabric is then dried in air to produce a product containing 60% of its weight of said copolymer. The tape, which shrinks 8%–10% during the impregnation (which takes place at room temperature) and the drying, is then stretched back to its original length. Tapes produced in this manner are employed in textile winding and twisting machines as shown in the drawing.

After 200 to 250 days, representing 4,800 to 6000 hours of effective operation, the tapes are removed from the machines. In contrast, identical, but unimpregnated, cotton spindle tapes fail after an average of 102 days of operation.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a winding apparatus comprising a spindle, a drive wheel and a spindle tape operatively connecting said drive wheel and said spindle, an improved spindle tape comprising a woven cellulose fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of another mono-ethylenically unsaturated ester of a carboxylic acid.

2. In a winding apparatus comprising a spindle, a drive wheel and a spindle tape operatively connecting said drive wheel and said spindle, an improved spindle tape comprising a woven cellulose fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of dibutyl fumarate.

3. In a winding apparatus comprising a spindle, a drive wheel and a spindle tape operatively connecting said drive wheel and said spindle, an improved spindle tape comprising a woven cellulose fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of another mono-ethylenically unsaturated ester of a carboxylic acid, said copolymer constituting about 50 to 70% by weight of the impregnated fabric.

4. In a winding apparatus comprising a spindle, a drive wheel and a spindle tape operatively connecting said drive wheel and said spindle, an improved endless spindle tape comprising a woven cellulose fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of dibutyl fumarate, said copolymer constituting about 50 to 70% by weight of the impregnated fabric.

5. In a yarn winding and twisting apparatus comprising, a drive wheel, a plurality of spindles each having a whorl and each rotating on an axis at right angles to the axis of said drive wheel, and a spindle tape engaging said drive wheel and said whorls to transmit power from said wheel to said spindles, an improved spindle tape comprising a woven cellulose fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of another mono-ethylenically unsaturated ester of a carboxylic acid.

6. In a yarn winding and twisting apparatus comprising a drive wheel, a plurality of spindles each having a whorl and each rotating on an axis at right angles to the axis of said drive wheel, and a spindle tape engaging said drive wheel and said whorls to transmit power from said wheel to said spindles, an improved spindle tape comprising a woven cotton fabric impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of dibutyl fumarate, said copolymer constituting about 50 to 70% of the weight of the impregnated fabric.

7. In a winding apparatus comprising a spindle, a drive wheel and a spindle tape operatively connecting said drive wheel and said spindle, an improved woven spindle tape about ½ to 2 inches wide and about 1/32 to 1/16 inch thick comprising cotton fibers impregnated with a resinous copolymer of about 50 to 95% of vinyl acetate and about 5 to 50% of dibutyl fumarate, said copolymer constituting about 50 to 70% by weight of the impregnated fabric, the service life of said tape being at least double that of an identical unimpregnated tape.

References Cited in the file of this patent

UNITED STATES PATENTS

380,784	Binns	Apr. 10, 1888
2,628,198	Arundale	Feb. 10, 1953
2,701,242	Erchak	Feb. 1, 1955
2,715,590	Brockman	Aug. 16, 1955
2,758,439	Bradshaw	Aug. 14, 1956
2,763,578	Simons	Sept. 18, 1956

FOREIGN PATENTS

581,473	Great Britain	Oct. 14, 1946