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TREATMENT OF YARN

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This invention relates to the treatment of yarn and relates more particularly to the conditioning of yarn made of organic derivatives of cellulose whereby the same may be more successfully subjected to knitting or other textile operations.

An object of our invention is to treat yarns containing organic derivatives of cellulose with a conditioning fluid whereby the same are rendered more pliable and therefore more suited for use in textile operations, such as knitting, where they are subjected to rather sharp bends and turns.

A further object of our invention is to treat yarns containing derivatives of cellulose with a conditioning fluid containing a softener and a lubricant for such yarns. Further objects of our invention will appear from the following detailed description.

The knitting of yarns made of organic derivatives of cellulose as heretofore presented serious difficulties since if attempts are made to form a closely knit fabric from such yarns, serious defects or faults develop because of the lack of pliability of such yarns. Fibres other than organic derivatives of cellulose can readily be conditioned since they readily absorb oils, water or other conditioning agents, while yarn made of organic derivatives do not absorb these materials. We have found that if such yarns are treated with a conditioning fluid containing an agent which has a softening or swelling effect upon the yarns of organic derivatives of cellulose (hereinafter referred to as a softening agent) and a lubricant, the so treated yarn has highly increased flexibility, and knit fabrics of close construction may be formed therefrom, which fabrics are substantially free from defects occurring in fabrics made from insufficiently conditioned yarn.

In accordance with our invention we treat yarns containing organic derivatives of cellulose with a conditioning agent containing a softening agent and a lubricant and preferably, when required, especially in those cases where the softening agent and the lubricant are immiscible, a common solvent for the ingredients to form a clear and homogeneous solution may be added to the conditioning agent.

The yarns to be treated in accordance with our invention may contain any suitable organic derivatives of cellulose such as organic esters of cellulose and cellulose ethers. Examples of organic derivatives of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose.

This yarn need not consist wholly of yarns of organic derivatives of cellulose but may also contain fibres of other materials such as natural silk, artificial fibres of reconstituted cellulose, wool, cotton, etc. The yarns of organic derivatives of cellulose may be formed from continuous filaments or the same may be spun from short staples or short lengths of such filaments and such spun yarn may also contain fibres of cotton, wool, etc.

Of the softening agents that we employ in the conditioning fluid, we prefer polyhydric alcohols, examples of which are diethylene glycol, ethylene glycol, glycerine, propylene glycol but other softening or swelling agents, may be employed.

The lubricants that may be employed in our conditioning fluid may be a vegetable oil such as castor oil or olive oil, an animal oil such as neatsfoot oil, a mineral oil such as lubricating oils obtained from petroleum or fatty acids derived from animal or vegetable oils. For the best results, we prefer to add to the mixture containing the softening agent and the lubricant a liquid that acts as a solvent for the ingredients so that a clear and homogeneous solution may be formed. Examples of such suitable solvents are butyl alcohol and ethyl alcohol, but any other solvent may be employed.

The proportions of the ingredients employed in the conditoning fluid may be varied within wide limits depending on the nature of the specific ingredients employed and the results to be attained. Generally speaking one to two parts of softening agent, one to two parts of lubricant and one to two parts of solvent generally produce useful results.

As to the amount of conditioning agent applied to the yarn, this also may be varied and we have found that if 8 to 50% of the same based on the weight of the yarn to be treated, and preferably 15 to 35% of the conditioning fluid, are applied to the yarn, excellent results are obtained.

The conditioning fluid may be applied to the yarn in any suitable manner. Thus it may be applied by immersing of hanks of yarn to be treated in a bath containing the conditioning fluid. If desired, the conditioning fluid may be applied to the yarn while it is in transit from package to package. This may be done by passing the yarn over pads or wicks that are impregnated with the conditioning fluid or by passing over rollers the bottoms of which are im-

mersed in the conditioning fluid. The conditioning fluid may be dripped onto the yarns while they are in transit, and also the yarns may be caused to dip into a bath containing the conditioning fluid while they are in transit prior to bring wound onto a suitable package. In another form, the conditioning fluid may be applied as a spray onto cones, bobbins, pirns or other packages while the same are being wound, so that the spray is being continuously applied during the formation of the package. If desired, the yarn may be treated with a conditioning agent while it is being transmitted from the cabinet in which it is spun from solutions of organic derivatives of cellulose and prior to being wound and/or wound and twisted into yarn, or one or both of the conditioning agents may be incorporated in the solution of the organic derivatives of cellulose and the yarn then spun therefrom.

Yarn when treated in accordance with our invention is well lubricated and is very flexible. Because of these properties, such treated yarn may be knitted in a circular knitting machine to form fabric of very close construction, having say 55 to 65 courses and a large number of wales per inch, and such fabric is substantially free of the distortions, tension lines, or rowiness occurring in fabrics of such close construction made from yarn that has not been treated in accordance with our invention. An important application of our invention is for the knitting of hosiery and other garments as well as the circular knitting or warp knitting of fabrics. While the greatest advantages accrue from the use of yarn treated in accordance with our invention for knitting purposes, such treated yarn is also highly useful for the weaving of fabrics.

In order to illustrate our invention, but without being limited thereto, the following specific example of the application thereof is given.

Example

A conditioning fluid is made up as follows:

	Part by weight
Diethylene glycol	1
Castor oil	1
Butyl alcohol	1

This conditioning fluid is applied to a yarn consisting wholly of cellulose acetate by dripping the same onto the yarn while it is being transmitted to a coning machine, the amount of conditioning fluid applied being 33% of the weight of the yarn. When such yarn is knitted into a circular knit fabric, a fabric having more than 60 courses per inch may be formed, which fabric is substantially free from rowiness or other distortions.

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

Having described our invention, what we claim and desire to secure by Letters Patent is:

1. The method of conditioning yarns containing organic derivatives of cellulose in order to render them more amenable to knitting comprising incorporating or applying a conditioning liquid containing a liquid polyhydric alcohol and an oil in such proportion and amounts as to render such yarn capable of being knit into a fabric of close construction substantially free of defects and a solvent for the polyhydric alcohol and the oil.

2. The method of conditioning yarns containing cellulose acetate in order to render them more amenable to knitting comprising incorporating or applying a conditioning liquid containing a liquid polyhydric alcohol and an oil in substantially equal proportions and in such amounts as to render such yarn capable of being knit into a fabric of close construction substantially free of defects.

3. The method of conditioning yarns containing cellulose acetate in order to render them more amenable to knitting comprising incorporating or applying a conditioning liquid containing diethylene glycol and an oil in such proportion and amounts as to render such yarn capable of being knit into a fabric of close construction substantially free of defects and a solvent for the diethylene glycol and the oil.

4. The method of conditioning yarns containing cellulose acetate in order to render them more amenable to knitting comprising incorporating or applying a conditioning liquid containing diethylene glycol and castor oil in such proportion and amounts as to render such yarn capable of being knit into a fabric of close construction substantially free of defects and a solvent for the diethylene glycol and the oil.

5. The method of conditioning yarns containing cellulose acetate in order to render them more amenable to knitting comprising incorporating or applying a conditioning liquid containing a liquid polyhydric alcohol and an oil in such proportion and amounts as to render such yarn capable of being knit into a fabric of close construction substantially free of defects and a solvent for the polyhydric alcohol and the oil.

6. Yarns containing organic derivatives of cellulose containing a conditioning liquid comprising a polyhydric alcohol and an oil in such amounts and proportions that said yarn is capable of being knit into a fabric of close construction substantially free of defects and a solvent for the polyhydric alcohol and the oil.

7. Yarns containing cellulose acetate containing a conditioning liquid comprising a polyhydric alcohol and an oil in such amounts and proportions that said yarn is capable of being knit into a fabric of close construction substantially free of defects and a solvent for the polyhydric alcohol and the oil.

8. Yarns containing cellulose acetate containing a conditioning liquid comprising diethylene glycol and an oil in such amounts and proportions that said yarn is capable of being knit into a fabric of close construction substantially free of defects and a solvent for the diethylene glycol and the oil.

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