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ARTIFICIAL THREAD DRESSING COMPOSITION

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The present invention relates to the preparation and treatment of artificial cellulosic thread and more particularly relates to the "flexibilizing" of artificial cellulosic threads composed of organic derivatives of cellulose by the use of "flexibilizing compositions", whereby the resulting flexibilized thread may be successfully subjected to knitting or other textile operations.

By the terms "flexibilizing" and "flexibilizing compositions" as used hereinafter throughout the specification and claims is meant the rendering of threads more flexible and pliant or to the use of compositions which when applied to threads will render the same more flexible and pliant, as distinguished from dressing compositions which are applied to threads to overcome the action of friction and electrostatic forces.

Certain operations in the production of textiles, particularly knitted materials, have presented serious difficulties to the use of threads made of organic derivatives of cellulose due to lack of pliability or flexibility of such threads. In the production of closely knit fabrics, at the speed at which the thread is drawn around small turns and sharp corners, this lack of pliability of organic cellulose derivative threads has given rise to objectionable distortions and irregularities in the stitch formation, and cutting or breaking of filaments of the thread. Organic cellulose derivative threads taken from knitted fabrics, both before and after finishing, have been shown to have severely degraded tenacity and elongation characteristics, and stress-strain curves of thread removed from unfinished fabric, which was knit from organic cellulose derivative thread at 55 courses per inch, showed very material yarn degradation. This degradation of the yarn becomes rapidly more pronounced when subjected to knitting at slightly higher stitch count. It was furthermore found that the above enumerated disadvantages cannot be satisfactorily eliminated by the treatment of organic cellulose threads with lubricating compositions.

It is therefore an object of the present invention to provide a method for the preparation of threads of organic derivatives of cellulose which have improved flexibility and pliability.

It is another object of the invention to provide a method for the preparation of threads of organic derivatives of cellulose which will substantially eliminate the above enumerated disadvantages.

It is a further object of the invention to provide a thread treating composition which will impart improved flexibility and pliability to threads composed of organic derivatives of cellulose.

Other objects of the invention will appear hereinafter.

It has been discovered that the objects of the invention may be achieved, in general, by applying to such threads, by incorporation or external treatment, a flexibilizing composition containing a suitable solvent for said thread, and preferably also containing water, a hygroscopic liquid non-solvent, a stabilizer, a lubricant, an anti-oxidant, and a wetting agent.

As a solvent suitable for use in the flexibilizing composition, formamide has been found to give exceptionally desirable results and is therefore the preferred species of the present invention. Other solvents which may displace formamide, in whole or in part, in the flexibilizing composition include diacetone alcohol, diacetone alcohol lactate, ethyl lactate, mono-acetin, diacetin, triacetin, glycerin formal and the like.

Among the hygroscopic liquid non-solvents which may be used in the flexibilizing composition may be mentioned glycerin, ethylene glycol, diethylene glycol and similar non-solvents.

The stabilizers suitable for use in the flexibilizing composition include alkylol amines, for example, triethanolamine, urea and similar compounds. The stabilizer functions in the composition to stabilize the emulsion formed and also to prevent material corrosion of weaving or knitting machine elements. Urea also acts as a softening agent and may be used to replace a part of the formamide.

Any of the well known thread lubricants, such as sulfonated animal and vegetable oils may be added to the composition as the lubricant constituent thereof.

The wetting agent constituent of the composition may comprise soap or some of the recently developed soap substitutes, for example, organic sulfur containing compounds having at least 14 carbon atoms. These compounds are for the most part organic derivatives of sulfuric acid in the form of water soluble salts, for example, the sodium salt of an alkylol sulfuric acid (RSO_4Na in which R contains at least 14 carbon atoms) and obtainable by reacting a normal primary aliphatic alcohol having at least 14 carbon atoms, e. g., lauryl, cetyl, oleyl and myristyl alcohols, with a concentrated sulfuric acid (specific gravity 1.84), fuming sulfuric acid, or chloro-sulfonic acid, at a temperature of about 30° to 50° C., followed by neutralization with sodium hydroxide to form the sodium salt.

The wetting agent constituent or the stabilizer constituent in combination with the lubricating agent will additionally function as emulsifying agents to maintain the solution in the form of a stable emulsion. Triethanolamine, for example, will form a slight amount of triethanolamine soap with any sulfonated vegetable or animal oil present. The triethanolamine soap so formed will function as an emulsifying agent. An emulsifying agent such as triethanolamine oleate may also be added to the composition if desired.

Anti-oxidants suitable for use in the emulsion include hydroquinone, dextrine, glucose or the like. The use of an anti-oxidant in the composition functions to retard or eliminate any corrosive action of the emulsion and to prevent oils in the composition from becoming viscous or gummy upon standing. The use of an anti-oxidant in the composition is entirely optional.

In the preferred embodiment of the invention the threads are treated in a flexibilizing composition comprising formamide, glycerin, a sulfonated animal or vegetable oil, triethanolamine, water, soap and optionally dextrin. Since the glycerin and formamide are hygroscopic, I prefer to add substantial quantities of water to the flexibilizing composition in order to prevent appreciable changes in viscosity and concentration during subsequent exposure to the atmosphere.

The following specific examples illustrate the various flexibilizing compositions useful in improving the flexibility and pliability of organic cellulose derivative threads, yarns or filaments, it being understood, however, that these examples shall not be considered as limitative of the invention:

Example 1

Composition constituents	Parts by weight
Formamide	25
Glycerin	25
Sulfonated animal or vegetable oil	25
Triethanolamine	1
Water	23
Dextrin	2
Soap	1

Example 2

Composition constituents	Parts by weight
Ethyl lactate	30
Water	18
Sulfonated animal or vegetable oil	25
Triethanolamine	1

Example 3

Composition constituents	Parts by weight
Formamide	40
Water	20
Glycerin	25

Example 4

Composition constituents	Parts by weight
Triacetin	30
Water	20
Triethanolamine oleate	4
Glycerin	20

Example 5

Composition constituents	Parts by weight
Formamide	25
Water	23
Ethylene glycol	25
Sulfonated animal or vegetable oil	25

Example 6

Composition constituents	Parts by weight
Diacetone alcohol	30
Water	18
Glycerin	25
Triethanolamine	1

The flexibilizing compositions of the above examples are preferably applied to the cellulose derivative threads by passing them over a roller which is immersed in said composition and which is rotated at such a peripheral speed in respect to the linear speed of the thread that the amount of flexibilizing composition uniformly applied thereto is about 10 to 30% of the weight of the thread. The resulting treated thread may be satisfactorily and uniformly knitted into circular knit fabrics having more than 60 courses per inch without substantial degradation of the thread.

The various individual constituents of the flexibilizing composition may be varied in the following manner to produce material improvement in the pliability and flexibility of the thread:

	Parts
Formamide or other solvent	5 to 50
Stabilizer	1 to 15
Soap or other wetting agent	1 to 15
Lubricant	5 to 40
Anti-oxidant	1 to 5
Hygroscopic liquid non-solvent	10 to 50

The flexibilizing composition may be applied to the yarn in any other suitable manner. Thus it may be applied by immersing hanks of yarn in a bath containing the fluid composition. If desired, the 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 flexibilizing composition. The fluid composition may be dipped upon the threads while they are in transit, and also the threads may be caused to dip into a bath containing the flexibilizing composition while they are in transit prior to being wound on a suitable package. It is furthermore possible to apply the liquid composition as a spray onto cones, pirns, bobbins, spools or other packages when the same are being wound so that the spray is continuously applied during the formation of the package.

One or more of the ingredients, in whole or in part, of the flexibilizing composition may alternatively be incorporated into the spinning solution and the remaining ingredients subsequently applied to the formed threads. Preferably in the exercise of this phase of the invention the solvent constituent of the flexibilizing composition is added to the spinning solution, and the finished thread after-treated with the remaining constituents of the composition.

The following specific example, which is not to be taken as limitative of the invention, will illustrate this alternative form of the invention.

Example 7

Formamide in quantities of 5 to 15%, and preferably 10%, based on the weight of the cellulose acetate, is incorporated into a solution containing 22% by weight of cellulose acetate in acetone, and the modified solution extruded through a spinneret into a suitable evaporative or coagulative medium to form filaments which are wound into threads. The thread thus obtained is dressed continuously, upon its formation or with subsequent winding or other textile operations, with the following liquid composition:

	Parts by weight
Glycerin	25
Sulfonated oil	25
Triethanolamine	1
Water	23
Dextrin	2
Soap	1

The thread produced and dressed in this manner is pliable and flexible and suitable for close knitting operations.

Organic cellulose derivative threads which may be improved by treatment in accordance with the present invention include organic ester thread, for example, cellulose acetate, cellulose formate, cellulose propionate, cellulose acetopropionate, cellulose butyrate, cellulose nitrate, and organic ether threads, for exampe, ethyl cellulose, methyl cellulose and benzyl cellulose.

The threads need not consist only of threads of organic derivatives of cellulose but may also contain fibers of other materials such as natural silk, rayon, wool, cotton, etc. The threads of organic derivatives of cellulose may be formed from continuous filaments of the same or be spun from short staple or short lengths of such filaments, and such spun thread may also contain fibers of cotton, wool and the like.

Organic cellulose derivative threads treated in accordance with this invention will have sufficiently improved flexibility and pliability to permit their use in knitting fabrics having a very close construction, for example, 50 to 70 courses per inch, without exhibiting distortions or irregularities in the knitted fabric. Such treated threads are furthermore suitable for the production of all types of closely woven fabrics and special fabrics in which the thread is drawn around sharp corners and bends in the production thereof and in which it is desired to avoid noticeable degradation of the thread.

The flexibilizing composition will remain in a stable emulsified condition and will therefore produce continuous, uniform results over long periods of time. Furthermore the combination of ingredients in the composition will prevent the exeration of any corrosive action by any of the constituents thereof.

Since it is obvious that various changes and modifications may be made in the above description without departing from the nature and spirit thereof, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. The method of obtaining a substantially undegraded fabric which comprises treating with formamide a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

2. The method of obtaining a substantially undegraded fabric which comprises treating with an aqueous composition containing formamide a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

3. The method of obtaining a substantially undegraded fabric which comprises treating a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers with an aqueous composition containing formamide and a substantially non-volatile, hygroscopic, liquid nonsolvent for said cellulose derivative whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

4. The method of obtaining a substantially undegraded fabric which comprises treating with an aqueous emulsion containing formamide and an emulsion stabilizing agent a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

5. The method of obtaining a substantially undegraded fabric which comprises treating with an aqueous emulsion containing formamide, a lubricant and an emulsion stabilizing agent a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

6. The method of obtaining a substantially undegraded fabric which comprises treating with an aqueous composition containing formamide and glycerin a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

7. The method of obtaining a substantially undegraded fabric which comprises treating with an aqueous composition containing formamide and urea a previously formed thread, yarn or filament composed of an organic solvent-soluble cellulose derivative taken from the group consisting of cellulose esters and cellulose ethers whereby to render the same more flexible and pliant, and working said thread, yarn or filament into a fabric.

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