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YARN CONDITIONING PROCESS

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This invention relates to the conditioning of textile yarns and more particularly to the conditioning of filaments and yarns composed of organic derivatives of cellulose such as cellulose acetate, cellulose propionate, cellulose acetate propionate, and cellulose acetate butyrate, to render them more amenable to textile operations such as knitting and the like.

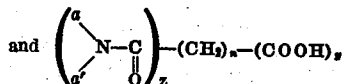
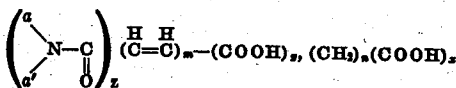
As is well known in the manufacture of yarns, particularly those composed of or containing cellulose organic derivatives, it is necessary to treat the yarn in order to reduce the tendency toward breakage of the individual filaments or fibers when they are subjected to various mechanical strains and to lubricate the yarn in order to facilitate handling in such operations as spinning, twisting, winding and reeling. It is also necessary to treat yarn to adapt it for use as warp or filling or for the manufacture of various types of knitted fabrics. In knitting, it is particularly important that the yarn be soft and pliable in order that it may conform readily to the contour of the needles and thus produce a closely knit fabric free from such defects as "stitch distortion," "pin holes," "laddering," and the like.

Heretofore it has been proposed to employ softening agents such as polyhydric alcohols and similar agents as ingredients of yarn conditioning or lubricating formulas, generally in connection with mineral, animal or vegetable oils. It has been found, however, that most of the known softening agents and the various formulas containing them have certain drawbacks, one of the most serious of which is high vapor pressure, and in some cases too drastic a solvent action on the yarn. Many of such agents possess slight or insufficient solvent power for the lubricants with which they are used, and it is accordingly necessary to employ blending agents or emulsifying agents in order to obtain operable yarn treating formulas. In addition, many of the known softening and lubricating agents are insufficiently soluble in water to permit satisfactory removal by aqueous scour baths.

This invention has as its principal object to provide an entirely new class of yarn conditioning agents which are particularly adapted for the treatment of yarns composed of or containing organic derivatives of cellulose and capable of lubricating, softening, deelectrifying and otherwise rendering such yarns more amenable to knitting and other textile operations. A further and specific object is to provide a class of con-

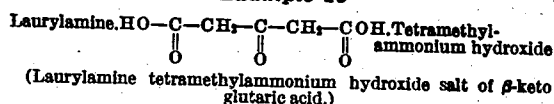
ditioning agents which augment or assist the lubricating action of various lubricants when applied to such yarns. A still further object is to provide yarn softening and lubricating formulas which can be readily removed from the yarns by the usual scour baths. A still further object is to provide an improved method for the conditioning of yarns, particularly those composed of or containing organic derivatives of cellulose such as cellulose acetate, whereby the yarn is rendered soft and pliable and capable of employment in a variety of textile operations where complicated designs or stitches are employed. Another object is to provide an improved type of yarn which is especially amenable to textile operations including circular knitting, weaving, spinning, the manufacture of cut staple fibers, and the like. Other objects will appear hereinafter.

These objects are accomplished by the following invention which, in its broader aspects, comprises the discovery that organic amine and mixed organic amine and metallic salts of organic acids and organic acid amides having the general formulas:



where m is 1, 2, etc.; y is 1 or more; z is 1 or more; a and a' are substituents selected from the group consisting of hydrogen, substituted and unsubstituted alkyl, cycloalkyl, alkylene, aryl and heterocyclic groups, and the system $(CH_2)_n$ where n is 0, 1 or more and may be substituted with any substituent other than hydroxy—may be used as yarn conditioning agents and particularly as softening agents, with or without the addition of animal, mineral, or vegetable oils, in the treatment of yarns composed of or containing organic derivatives of cellulose. I have found that these compounds when employed as described in the detailed examples set forth below have a slight solvent and/or softening action on cellulose organic derivative yarns which renders such yarns soft and pliable without at the same time having too drastic an action thereon.

In order to prepare the salts indicated above, I may employ any suitable inorganic hydroxide and any primary, secondary, tertiary or quater-

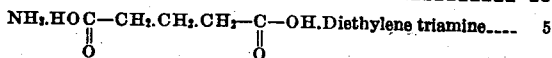
Example 13

Soya bean oil 99-90

Example 14

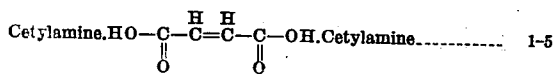
Water 70

10 Water soluble cellulose ester 15



(Glutaric acid ammonium diethylene triamine salt.)

15 Sulfonated castor oil 10

Example 15

(Maleic acid dicetylamine salt.)

20 Light mineral oil 99-55

Any of the above compositions may be applied to the yarn intended for use in circular knitting by means of a bath, wick, spray, roller, pad or any suitable means. The amount of conditioning liquid applied may vary between 5-25% by weight of the yarn. Usually, however, the amount of conditioning liquid applied is about 10-15% by weight of the yarn. Yarn composed of cellulose acetate conditioned as described above gives excellent results when used in the circular knitting process.

As will be apparent from the above examples and description the conditioning agents of my invention may be applied by a wide variety of methods. For example, I may employ the agent as an ingredient of the spinning dope from which the filaments are formed, the amount of the agent so employed depending upon a number of factors, such as the particular cellulose derivative used in making the yarn, the solvent or solvent combination used in making up the spinning solution, and the degree of softness or pliability desired in the yarn, etc.

If the conditioning agent is to be applied to the yarn after spinning, this may be done by bringing the yarn in contact with a wick, roll, or felt wet therewith, or the liquid may be applied by immersion, spray, or otherwise. The particular point at which the liquid is applied may vary. It may, for example, be applied to the yarn inside or outside the spinning cabinet, between the guide and godet roll, between the godet or other roll or guide and the point of winding and/or twisting. In some cases, the liquid may even be applied to the yarn after winding onto cones, spools, bobbins, or the like or by the so-called "bobbin to bobbin" method. In the case of staple fiber manufacture, the liquid may be applied to the yarn prior to, or after cutting into staple lengths.

The amount of the agent so employed will vary widely depending upon the results desired, the specific nature of the material to which the agent is applied, the use to which the yarn is eventually to be put and other factors. For example, in a given case where a cellulose organic acid ester yarn such as a yarn composed of cellulose acetate, is intended for knitting, about 4 to 25% or more by weight, based on the weight of the dry yarn, may be satisfactory, while if the yarn is intended for weaving, the amount may vary between about 1 and 5%.

Although in the above examples I have referred

primarily to yarn treating compositions containing only the conditioning agent and an oil, other ingredients such as solvents, non-solvents, emulsifying agents, blending agents and the like, may be added within the scope of my invention. Likewise, various dyes or other coloring matter may be included in case it is desired to permanently or fugitively tint or dye the material undergoing treatment.

Although I have found it convenient to illustrate my invention by reference to compositions containing specific percentages of the various ingredients, these percentages may vary widely depending upon the particular purpose for which the composition is intended. For example, if it is desired to control the solvent or softening action of the conditioning agent, the amount of the agent may be adjusted as, for example, by reducing the amount of the agent and correspondingly increasing the amount of oil or other ingredient.

While I have described my invention with particular reference to the treatment of yarns composed of organic derivatives of cellulose such as cellulose acetate, the conditioning agents and formulas described herein are applicable to the conditioning of many other types of cellulose derivative yarns such as those composed of or containing cellulose propionate, cellulose butyrate, cellulose acetate propionate, cellulose acetate butyrate, ethyl cellulose, methyl cellulose, benzyl cellulose and others, as well as to the conditioning of silk, wool, cotton, viscose, and other natural or artificial materials.

The term "yarn" as used herein and in the claims is to be understood as including a single filament, a plurality of filaments associated into the form of a thread, either of high or low twist, single or multiple threads associated or twisted together, composite threads composed of a mixture of natural and artificial filaments or a composite thread formed by twisting together individual strands of natural or artificial materials, as well as cut staple fibers produced from natural and/or artificial filaments or threads and spun yarn produced from such staple fibers.

As indicated above, the yarn conditioning agents of my invention are exceptionally good solvents for a wide variety of mineral, blown and unblown, drying and semi-drying animal and vegetable oils such as cottonseed, olive, castor, neat's-foot, sperm, and other oils. This enables them to be used with any of such oils in making up a variety of yarn treating formulas of varying composition.

The yarn conditioning method and compositions of my invention possess many outstanding advantages. The fundamental and outstanding characteristic of the agents employed in accordance with the invention is their ability to de-electrify yarns, especially those composed of or containing organic derivatives of cellulose such as cellulose acetate and render them soft and pliable and amenable to various textile operations, especially operations such as those involved in the manufacture of cut staple fibers and in weaving and knitting where complicated designs or stitches are employed, without too drastic an action on the yarn material. Another outstanding characteristic of these compounds is their exceptional solvent power for a wide variety of mineral, animal, and vegetable oils and their ability to act as lubricating assistants in conjunction with these oils when applied to such yarns. In addition, due to their solubility in water, they may be readily

removed from yarns and fabrics by means of the usual aqueous scour baths. By employing the yarn conditioning agents and method of my invention as herein described, one is enabled to obtain highly satisfactory results in the manufacture of yarns and woven fabrics and especially the production from these yarns of closely knit fabrics free from defects such as pin holes, stitch distortion, laddering and the like.

10 What I claim is:

1. The process of conditioning yarn composed of or containing organic derivatives of cellulose to render it amenable to textile operations, including knitting, weaving, spinning, and the manufacture and use of staple fibers, which comprises applying to the yarn a lubricating and anti-static composition containing as its essential lubricating and anti-static component a salt selected from the group consisting of the inorganic and organic base salts of alkyl carboxylic acids and of carboxylic acids containing at least one carboxy amide group.

2. The process of conditioning yarn composed of or containing cellulose acetate to render it amenable to textile operations, including knitting, weaving, spinning, and the manufacture and use of staple fibers, which comprises apply-

ing to the yarn a lubricating and anti-static composition containing as its essential lubricating and anti-static component a salt selected from the group consisting of the inorganic and organic base salts of alkyl carboxylic acids and of carboxylic acids containing at least one carboxy amide group.

3. Textile yarns composed of or containing organic derivatives of cellulose, amenable to textile operations, including knitting, weaving, spinning and the manufacture of staple fibers, said yarns being impregnated with a lubricating and anti-static agent comprising a salt selected from the group of inorganic and organic base salts of alkyl carboxylic acids and of carboxylic acids containing at least one carboxy amide group.

4. Textile yarns composed of or containing cellulose acetate amenable to textile operations, including knitting, weaving, spinning, and the manufacture of staple fibers, said yarns being impregnated with a lubricating and anti-static agent comprising a salt selected from the group of inorganic and organic base salts of alkyl carboxylic acids and of carboxylic acids containing at least one carboxy amide group.

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