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YARN CONDITIONING PROCESS AND
COMPOSITION THEREFOR

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This invention relates to the conditioning of textile yarns, and particularly to the conditioning of yarns, threads, filaments and fibers composed of or containing organic derivatives of cellulose such as cellulose acetate, cellulose acetate propionate, and cellulose acetate butyrate, to render such materials amenable to various textile operations such as knitting, weaving, carding, spinning, twisting and the like.

As is well known in the textile industry, the manufacture, processing and use of yarns composed of or containing organic derivatives of cellulose and similar synthetic materials give rise to numerous problems generally absent from the handling of natural yarns such as silk, wool, cotton and the like. One of the chief problems encountered in dealing with these synthetic materials is to so lubricate or soften and, in some instances, to both lubricate and soften, the yarn in question that it will have the correct frictional characteristics, or drag, and the required flexibility for the specific purpose in view. In the handling of continuous filament yarn, for example, it is necessary to condition the material to reduce the tendency toward breakage of individual filaments when the yarn is subjected to mechanical strains such as are involved in passage of the yarn over rolls, guides, and other parts of the yarn-producing mechanism and in twisting, winding, reeling and similar operations. In the case of yarns intended for use on commercial knitting machinery, it is particularly important that the yarn be soft and pliable in order that it may conform to the contour of the needles and give a closely knit fabric free from cuts, pin holes, stitch distortion, laddering, misplaits and other common defects.

Another problem of major proportions presented by these synthetic yarns is their extreme tendency to pick up charges of static electricity, especially in such operations as twisting, winding, warping, picking, carding, combing, drafting, spinning, and the like. This tendency is particularly aggravated in the case of cut staple fibers, since in the commercial use of such material, it is normally subjected to a number of extremely severe operations such as picking, carding, combing, etc., all of which tend to so charge the individual fibers as to make proper web formation difficult or impossible or to give the ultimate yarn an undesirable unevenness.

In some types of yarn, all three of the above-mentioned problems of lubrication, softening and anti-static treatment are present and in any case the matter of providing a yarn conditioning

composition, in which the several functions are properly coordinated to accomplish the desired result is often a matter of extreme difficulty. This is due to the fact that in any given yarn conditioning composition, whether primarily designed for use as a warp, filling or knitting lubricant, or as an anti-static, all of the various components and their functions must be delicately balanced one against the other so as to give a practical and commercially satisfactory yarn treatment.

Heretofore, many different conditioning agents such as polyhydric alcohols and similar compounds have been suggested as ingredients of yarn conditioning formulas, generally in conjunction with mineral, vegetable and animal oils. It has been found in practice, however, that most of these agents and the various formulas containing them have certain drawbacks, among which may be mentioned too drastic solvent action on the yarn, insufficient solvent power for the lubricants with which they are used and a tendency to form gummy deposits on the yarn after application. Furthermore, many of the known lubricating, softening and anti-static agents are insufficiently soluble in water to permit satisfactory removal from the yarn by aqueous scour baths.

The present invention has as its principal object to provide an improved process for the conditioning of textile yarns, threads, filaments, and fibers, particularly those composed of or containing organic derivatives of cellulose to render such materials amenable to various textile operations and processes, such as knitting, weaving, spinning and the like. A further object is to provide an improved process for the lubrication, softening and anti-static treatment of such yarn. A still further object is to provide a new class of yarn treating agents and compositions particularly adapted for the conditioning of yarns composed of or containing organic derivatives of cellulose and readily removable therefrom by the usual aqueous scour baths. A specific object is to provide an improved type of cellulose organic derivative cut staple fiber amenable to carding, drawing, spinning, and other processing steps customarily employed in the manufacture of spun yarn on the woolen, worsted, and cotton systems. Other objects will appear hereinafter.

These objects are accomplished by the following invention which, in its broader aspects, comprises treating yarns, particularly those composed of or containing organic derivatives of

$$\begin{array}{c} \text{R}-\text{N}-\text{R}_2\cdot\text{X} \\ | \\ \text{R}_1 \end{array}$$

Example 1

Example 2

	Parts by weight
5 Dioleyl amine naphthenate-----	30
Glycerol acetone oleate-----	70

Other examples of conditioning compositions which may be applied in accordance with my invention to yarns intended for a variety of purposes such as knitting, weaving, spinning and the like, and especially the anti-static treatment of cut staple fibers and other yarns composed of or containing organic derivatives of cellulose, such as cellulose acetate, cellulose acetate propionate, and cellulose acetate butyrate and similar derivatives are the following:

Example 3

	Parts by weight
Decylamine acetate -----	2-5
35 Olive oil -----	60
Beta-methoxyethyl succinate -----	38-35

Example 4

	Parts by weight
40 Lauryl-beta-hydroxyethylamino butoxy- acetate -----	1-10
Olive oil -----	65
Tetrahydrofurfuryl formal -----	34-25

Example 5

	Parts by weight
45 Dimethyl laurylamine tetrahydrofuroate	1-10
Blown olive oil	99-90

Example 6

	Parts by weight
50 Dimyristylamine phosphate -----	1-10
Neat's-foot oil -----	99-90

Example 7

		Parts by weight
	Tetrahydrofurfuryl cetylamine borate----	1-10
55	Neat's-foot oil -----	85
	Tetrahydrofurfuryl tetrahydrofuroate----	14-5

Example 8

	Parts by weight
Cetylamine naphthenate-----	1-15
Naphthenic acid -----	15
Blown neat's-foot oil-----	84-70

Example 9

		Parts by weight
65	$\begin{array}{c} \text{C}_{20}\text{H}_{41}\text{N}-\text{C}_{17}\text{H}_{35}\text{Sulfate} \\ \\ \text{C}_6\text{H}_4\text{OH} \end{array}$	
	(cyclohexyl-beta-hydroxy ethyl cosyl	
	amine) -----	1-5
	Oleylamine -----	2
70	Blown neat's-foot oil -----	97-93

Example 10

	Parts by weight
C ₂₂ H ₄₃ NH ₂ -oleate (docosyl amine oleate)----	5
75 Teaseed oil-----	95

Example 11

	Parts by weight
$C_{26}H_{53}NH_2$ cerotate (cerylamine cerotate).....	2
Palmitic acid.....	10
Sodium sulfate.....	2
Teaseed oil.....	86

Example 12

	Parts by weight
$C_{30}H_{61}NH_2$ succinate (tricontyl amine succinate).....	1-20
Glycerol methyl ethyl ketone.....	25
Blown teaseed oil.....	74-65

Example 13

	Parts by weight
$\left(\begin{array}{c} CH_3 \\ \\ C_{12}H_{25}N \\ \\ CH_2-C=CH_2 \end{array} \right) \begin{array}{c} H \\ \\ HO-P-OC_6H_5 \\ \\ HO \end{array}$ (methyl allyl dotricontyl amine).....	1-10
Sperm oil.....	99-90

Example 14

	Parts by weight
$Laurylamine \cdot HO-S(=O)_2-OC_6H_{13}$ (lauryl amine cetyl sulfate).....	1-10
Blown sperm oil.....	99-90

Example 15

	Parts by weight
Mineral oil.....	99-95
Oleylamine oleate.....	1-5

Example 16

	Parts by weight
Dioleylamine oleate.....	5
Olive oil.....	25
Mineral oil.....	70

Example 17

	Parts by weight
Cetylaniline phosphate.....	5
Blown olive oil.....	68
Stearic acid.....	5
Di-potassium phosphate.....	2
β,β' -Tetrahydrofurfuryl ether.....	20

Example 18

	Parts by weight
Water.....	80
Gelatin.....	5
Decylamine acetate.....	5
Tetrahydrofurfuryl lactate.....	10

Example 19

	Parts by weight
Water.....	70
Water soluble cellulose ester.....	5
Sulfonated olive oil.....	5
Phosphated blown olive oil oleylamine salt.....	20

Example 20

In a 20 percent acetone solution of cellulose acetate are dissolved 1-5% by weight of oleyl amine oleate. The acetone solution is then extruded into an evaporative atmosphere and the filaments thus produced are wound or twisted and wound. Filaments thus prepared are of particular value in the preparation of cut staple fibers.

The particular method of application of the yarn treating compositions of my invention to the yarn will depend largely upon the nature of the yarn and the use for which it is intended. In general, the compositions may be applied by any

of the standard procedures such as roll, wick, bath, or spray application. If the yarn is in continuous filament form, compositions may be applied just as the yarn emerges from the spinning cabinet, or while passing from package to package. Likewise, the lubricant may be applied during twisting, winding, crepeing or similar operations. In the case of cut staple fibers, the compositions may be conveniently applied in the form of an emulsion bath or spray, preferably after any desired special treatment of the yarn such as crimping or the like. In some cases, the lubricating, softening and anti-static agent may be added to the spinning solution from which the yarn is to be spun.

The amount of the compositions applied will, in general, depend upon the purpose for which the yarn is to be used. For example, if the yarn is to be employed for knitting, anywhere from 5-25%, based on the dry weight of the yarn, may be applied. On the other hand, if the yarn is intended for weaving, the amount will generally run from about 1-5%.

In each of the compositions given, the essential lubricating, softening and anti-static component is a compound of the type indicated above. However, as illustrated by the specific examples, such compositions may contain other lubricating, softening, or anti-static agents to augment or supplement the effect of the primary ingredient and thus give the compositions added or improved properties. Likewise, solvents, non-solvents, blending agents, co-solvents, emulsifying agents, dispersing agents and similar ingredients may be added as circumstances may require to adapt the compositions for specific uses. Similarly, various dyes or other coloring matter may be added to the compositions in case it is desired to permanently or fugitively tint the yarn undergoing treatment.

Although in the above examples, I have referred to compositions containing specific proportions of the various ingredients, the amounts employed in any given case may vary widely depending upon the particular purpose for which the composition is intended. For example, if it is desired to control the solvent, softening, or other specific action of the conditioning agent per se or of any other ingredient, the amount thereof may be adjusted in accordance with the desired action.

While I have found it convenient to describe my invention with particular reference to the treatment of yarns composed of or containing organic derivatives of cellulose, particularly cellulose acetate, the conditioning agent and compositions described herein are also 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, the cellulose ethers such as ethyl, methyl and benzyl celluloses, viscose and cuprammonium cellulose, silk, wool, cotton and other natural and artificial materials.

The term "yarn" as used herein and in the claims is to be understood as covering single filaments, a plurality of filaments associated in the form of roving, threads and the like, either of high or low twist, composite threads or yarns composed of a mixture of natural and artificial filaments, composite threads formed by twisting together individual threads or strands of the same or different natural or artificial materials of the same or different deniers, creped or

crimped yarns, and crimped or uncrimped cut staple fibers produced from natural or artificial filaments, and spun yarn produced from such staple fibers.

The yarn conditioning methods and compositions of my invention possess many outstanding advantages. The fundamental and distinguishing characteristic of the agents described herein is their ability to lubricate, soften and give valuable anti-static properties to yarns, particularly those composed of or containing organic derivatives of cellulose such as cellulose acetate, and to render them amenable to various textile operations. These agents are especially valuable in the anti-static treatment of cellulose derivative cut staple fibers.

As indicated above, these compounds are distinguished by the fact that they have an especial solvent power for a wide variety of mineral, blown and unblown, drying and semi-drying animal and vegetable oils. Furthermore, due to their ready solubility in water, they may be removed from yarns and fabrics by means of the usual aqueous scour baths. In addition, their ability to emulsify various oils customarily used for yarn treatment makes them especially valuable for the preparation of emulsions designed for use in the anti-static treatment of cut staple fibers.

Of the above compounds, I have found that dioleyl amine naphthenate, dimyristylamine

phosphate, and lauryl amine cetyl sulfate give outstanding results in the lubrication, softening and anti-static treatment of yarns, especially those composed of or containing cellulose organic acid derivatives such as cellulose acetate, cellulose propionate, cellulose acetate propionate, cellulose acetate butyrate, and the like.

What I claim is:

1. The process of conditioning yarn composed of or containing cellulose acetate to render it amenable to textile operations including knitting, weaving, spinning, carding, drawing and the like which comprises applying thereto a lubricating and anti-static composition containing as its essential lubricating and anti-static component dimyristylamine phosphate.

2. Textile yarns composed of or containing cellulose acetate amenable to textile operations including knitting, weaving, spinning, carding, drawing and the like, impregnated with a lubricating and anti-static composition containing as its essential lubricating and anti-static component dimyristylamine phosphate.

3. A conditioning agent for rendering yarns composed of or containing an organic derivative of cellulose more amenable to textile operations including knitting, weaving, spinning, carding, drawing and the like, containing as its essential lubricating and anti-static component dimyristylamine phosphate.

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