

UNITED STATES PATENT OFFICE

2,622,045

PROCESS OF CONDITIONING CELLULOSE
ACETATE YARN AND PRODUCT RESULT-
ING THEREFROMVirginia C. Ester, Kingsport, Tenn., assignor to
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corporation of New JerseyNo Drawing. Application July 30, 1948,
Serial No. 41,710

5 Claims. (Cl. 117—139.5)

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This invention relates to the lubrication and conditioning of textile yarns and filaments, and more particularly to the lubrication and conditioning of textile yarns and filaments composed of organic derivatives of cellulose such as cellulose acetate, cellulose propionate, cellulose acetate propionate, and cellulose acetate butyrate, to render them amenable to a variety of textile operations such as warping, weaving, knitting, spinning, 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, reeling, warping, carding, drafting, combing, weaving, and other operations.

The lubrication of derivatives of cellulose, such as the cellulose esters, is a complex problem, and a diversity of materials has been employed to meet the stringent demands of such lubrication. To those skilled in the art, it is well known that while certain problems are common to the lubrication of continuous filament yarn and of staple fibers, each has its own peculiar problems. For this reason it is difficult to find materials, other than the common mineral oils and soaps, which will function for the lubrication of both continuous filament yarn and staple fibers.

Because of the extreme importance of lubrication and conditioning of yarns and filaments of derivatives of cellulose, the problems involved are discussed here at some length. These may be grouped under certain headings.

1. *Static electrification.*—Cellulose acetate and other cellulosic esters are excellent insulators, as attested by their wide use for this purpose in the electrical industry. For processing into textile yarns and fabrics, however, this is a great disadvantage. If the naturally high resistance of yarns and filaments of cellulose acetate and related esters is not overcome, they will acquire an electrical charge as they come into contact with guides, wires, and other machine parts. This charge is equal in magnitude and opposite in sign to the charge acquired by the contacting sur-

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face, in accordance with well-known principles of electrical phenomena. Since all fibers under such circumstances bear a similar electrical charge, they will repel each other. In the case of continuous filament yarn this effect can easily be observed by gently stroking a length of yarn composed of several filaments with a wooden pencil while the yarn is held under some tension. If the yarn is free from oil or is lubricated with an oil of high resistance, when the tension is released the individual filaments will repel each other, and in their effort to get as far away from each other as possible will balloon out into a rigid sphere which defies compression.

It is not uncommon for a sphere of sixteen or eighteen inches in diameter to be formed from a cellulose acetate yarn which has been spun without lubrication or with poor lubrication. This tendency of the filaments to repel each other is manifest whenever the yarn moves across any surface, and unless it is corrected by proper lubrication and conditioning, results in an inferior product, since the separated filaments tend to be broken and to cling to the surfaces with which they are in contact.

On the other hand, a well-lubricated yarn under tension can be stroked with a wooden pencil, and when the tension is released the yarn remains limp, with only the spreading of filaments into a narrow band induced by the mechanical action of the wood. This is the ideal situation and can be attained through selection of proper anti-static agents.

For cut staple fibers the problem of static electrification also exists, but it is manifested in a somewhat different fashion. The short fibers, when electrically charged, also repel each other, but since they are not attached at any point, are not confined to a circle in their effort to escape the hostile electrical field, but billow out independently in all directions.

It can readily be seen that when such a condition exists it will not be possible to process these fibers into a web (as in carding, for example) in which the fibers are aligned parallel to each other and are immobile, for in addition to their tendency to repel each other, they will be attracted to machine parts and will deposit there until they build up to such an extent that the machine cannot be operated.

On the other hand, if the cut staple fibers are lubricated with a good anti-static agent, they will not develop an electrical charge, and it will be possible to process them with no trouble from this source. The problem of static electrification is thus far more acute for cut staple fibers than for continuous filament yarn, and the lubrication of cut staple fibers generally requires a more powerful anti-static agent, or more of a less powerful one, than does continuous filament yarn.

2. *Kinetic friction.*—The kinetic friction of a yarn is a measure of its drag or tendency to remain at rest when the yarn is drawn over a surface. It is a well recognized fact that the lubricant used for metal bearings affects the friction between those bearings to a very great extent, and it is equally well known to those skilled in the art of processing textile fibers, that the lubricant and its components will affect the friction of yarn to an equal extent. For example, a given 150 denier bright cellulose acetate yarn lubricated with 2% of butyl stearate will have a friction value of 13 arbitrary units when run over porcelain guides, but a similar yarn lubricated with 2% of an alkyl amine phosphate will have a friction value of 60 or more arbitrary units. These friction values are given on a scale whose ordinary operating range for continuous filament yarns intended for warping, weaving, and knitting is 12 to 35 units.

While it is true that the frictional characteristics desirable in a yarn or fiber will depend upon the end use of the yarn or fiber, it can be stated as a general rule that friction values should be low. Of course, in choosing the components of a lubricant, it is necessary to balance one property against another. In the example cited above, one might choose to use some of the alkyl amine phosphate in a lubricating mixture rather than butyl stearate because of the excellent anti-static properties of the former. In this case other components of the lubricating mixture might be chosen to offset the high kinetic friction of the phosphate. Or, one might use some of the alkyl amine phosphate for its good anti-static properties and some of the butyl stearate for its low kinetic friction properties. Thus, the blending of a lubricant for cellulose acetate fibers and filaments or fibers and filaments of related cellulose esters is an intricate matter of balancing the properties of one component against the properties of another or others to get the best possible combination.

3. *Softness.*—The property of softness is a complex one and involves several variables such as plasticity, pliability, compressibility, and surface friction. All of these properties are influenced to some extent by the lubrication of the yarn, filaments, or fibers. Pliability and compressibility are, to a great extent, influenced by plasticity. Surface friction is a term used to denote the amount of "scroop" or "chatter" developed when a yarn is drawn over another surface. Certain agents produce a very "chattery" yarn; butyl stearate is one of these. For example, if a length of continuous filament cellulose acetate yarn lubricated with butyl stearate is held fixed at one end while the thumb and forefinger are drawn slowly along its length, the yarn may actually be heard to "chatter" if it is held near the ear. On the other hand, some conditioning agents provide a finish which is essentially free from scroop. Certain types of cationic agents, such as the fatty acid alkylol amides are noteworthy in this respect. This property of "scroopiness" or high

surface friction is very difficult to overcome in most instances where an agent which causes "chatteriness" is present, even if a large amount of softening agent is added to the lubricant. If the "chatteriness" is overcome, it is usually at the expense of the desirable properties of the anti-scroop agents.

In the majority of textile operations it is necessary that a yarn, fiber, or filament be treated with a conditioning agent which is as free from scroop as possible. Here again, a balance must be brought about among the various factors to secure the best all-around lubrication. No perfect lubricant has yet been devised; each one is a compromise among the factors discussed so far and other factors or problems specific to some one textile operation. While it is possible to devise a number of lubricants and conditioning agents for each specific problem which will function fairly satisfactorily within its own limited sphere, such a practice is spendthrift, for it means each lubricant and each group of yarns, filaments, or fibers treated with each lubricant must be segregated from all others, since they will in no way be interchangeable. This adds greatly to the cost of producing such materials and textiles made from them. For purposes of reducing costs as much as possible it is desirable to find and use lubricating and conditioning agents of as broad application as possible.

4. *Corrosion of machine parts.*—Some lubricants, which would otherwise be satisfactory, are corrosive to metals and corrode machine parts with which they come into contact. In such cases there is the additional problem of color produced on the yarns, fibers, or filaments by the products of corrosion. It is obvious that agents which cause such corrosion should be avoided.

5. *Undue wear of machine parts.*—Some lubricants function so poorly that there may be undue wear of machine parts. This may very well be due to the fact that the lubricant does not provide a protective film between the yarn and metal or other surface, thus bringing the two into actual contact so that the part which is exposed to the continued cutting action of thousands of yards of yarn will be badly worn.

6. *Deposit of gummy and sticky materials on machine parts.*—Materials which are subject to oxidation are particularly liable to deposit products of oxidation on guides, wires, and other machine parts. An accretion of such substances, which are usually somewhat gummy in character, will catch yarns as they pass, causing breakage of individual filaments. This will then result in a finished product which is fuzzy due to the projection of these broken filaments.

In addition to the foregoing common problems, there are a host of problems which are specific to various forms of textile materials, such as continuous filament yarn or cut staple fiber, or to one stage of processing such materials. Typical are the problems incident to the use of cut staple and continuous filament yarns.

7. *Cut staple fiber.*—In converting cut staple fibers to yarn, many operations are involved. For example, in the cotton spinning system the steps are essentially these: The fibers are first blended and then processed into a lap; the lap next passes to the card, where the fibers are oriented and rendered parallel to form a continuous thin web of fibers which is then drawn into strands of untwisted fibers, called sliver. The sliver is next drafted to roving, which is

further drafted and twisted until it becomes fine enough to be processed as yarn or thread.

In the successful prosecution of these operations the nature of the lubricant is of extreme importance in ways other than have already been pointed out. Although "scoop" must be avoided, the fibers must not possess too low surface friction, for if they do, they will tend to slip past each other. This will result in such operational defects as weak webs, sliver which does not hold together, and roving so weak that it can only be drafted by adding a large amount of twist, which is an expensive operation.

The forces which govern the relationships between surface friction and interfiber friction are not clearly understood. For example, it is possible to have a fiber which is of low static electrification in processing, good kinetic friction, and satisfactory surface friction, and yet to have uneven drafting. Uniform drafting of sliver and roving demands that the fibers shall pull past each other evenly, without alternate sticking and slipping, and yet they shall not slip past each other so easily that there is insufficient adherence to hold the fibers into a coherent bundle.

8. *Continuous filament yarn for warping.*—In addition to the general properties previously discussed, a yarn intended for warping and weaving must size well. Cellulose acetate yarns and related cellulosic ester yarns require special consideration in this operation, for not only are certain sizing agents, as starch, completely unsuited for preparing warps of these materials, but other sizes, such as gelatin, casein, and glue, which function very well under ordinary circumstances, may offer no protection to the yarn if the lubricant contains no size-bonding agent or if it contains an agent which is destructive to size-bonding.

For example, the petroleum sulfonates are extremely good agents for providing bonding between gelatin size solutions and cellulose acetate yarns. A yarn lubricated with a composition which contains twenty per cent of petroleum sulfonate blended into mineral oil will bond so firmly with gelatin size that the yarn will undergo a considerable amount (up to 200 strokes) of abrasion before the film breaks sufficiently to detect the individual filaments of which the yarn is composed. If now an equal amount of a size-bond destroying agent, such as the polyhydroxy compounds or their derivatives, is added to the lubricant, yarn treated with this lubricant and sized under conditions identical with sizing of the first yarn, will have a size film with so little resistance to abrasion that only ten or twelve strokes will allow the individual filaments to be discerned. The second yarn will not withstand the chafing and abrasion to which a warp yarn is subjected in the process of weaving, and consequent filament breakage will result in a fuzzy cloth of low quality.

It can thus be seen that the selection of a lubricating mixture for warp yarns is very critical. The problem is complicated by the facts that there are very few good size-bonding agents, and that the majority of softening, anti-static, and low friction agents are of the class which destroy size-bonding. There are relatively few compounds which, while not size-bonding in themselves, are also not destructive of size-bonding.

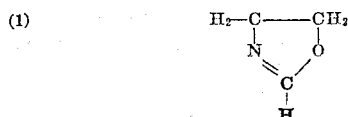
It will thus be seen that the problems involved in the treatment of cellulose acetate and other cellulose organic acid ester filaments, fibers and yarns, to give them the properties requisite for

successful use in textile operations, are of enormous complexity and that the solution of a given problem requires the application thereto of a high degree of technical ingenuity.

This invention has as its principal object to provide lubricating and conditioning compositions for yarns, filaments, and fibers intended for a greater variety of textile operations than has been possible heretofore. Another object is to decrease the cost of producing textile filaments, fibers, and yarns, by the use of lubricants which are more universally applicable than any which have been satisfactory before and which reduce handling costs of lubricants and yarns. A further object is to provide lubricants which are applicable to lubrication of both continuous filament yarn and cut staple fibers. A still further object is to provide lubricants which are suitable for treatment of continuous filament yarn intended for warping, filling, and knitting. Another object is to provide lubricating and conditioning compositions which have good anti-static characteristics, low kinetic friction, low surface friction, and low interfiber friction. Further objects of this invention will become evident hereinafter.

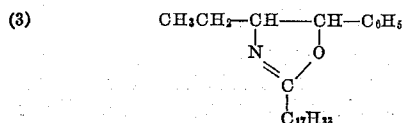
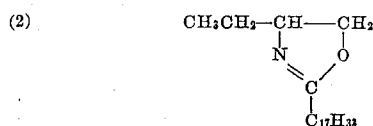
I have discovered that the substituted 2-oxazolines have unique properties which make it possible to employ them in lubricants which are more universally useful for treating yarns, fibers, and filaments of cellulose acetate and related esters than any other compositions known in the past. The fact that the same lubricants can be employed for continuous filament yarn and cut staple fibers results in a saving in handling costs with no loss of efficiency in processing or of quality in the finished products.

By substituted 2-oxazolines are meant those compounds derived from 2-oxazoline, the graphic formula of which is

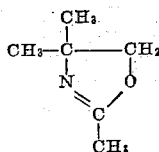


by the substitution of organic radicals for one or more of the hydrogen atoms, up to complete substitution. These compounds are derived from aminohydroxy compounds through their fatty acid amides.

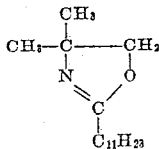
The organic radicals which may be substituted for the hydrogen atoms may be the same or they may be different. They may include alkyl radicals, as methyl, ethyl, n-propyl, iso-propyl, butyl, and so on up to a chain length of twenty carbon atoms; they may include alkenyl radicals as oleyl, hydroxyalkyl and hydroxyalkenyl compounds such as hydroxymethyl, hydroxyethyl, ricinoleyl, etc. Other substituents for hydrogen may include aryl radicals as phenyl, tolyl, xylyl, naphthyl, etc.; aralkyl, as benzyl, phenylethyl, and naphthenyl. Typical examples of compounds of the type which can be used are:



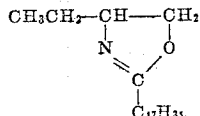
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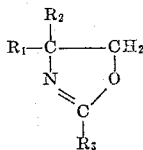


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Although I have indicated that a wide variety of compounds may be employed in my invention, I prefer to use compounds of the general formula:

(7)



where R₁ is a substituent selected from methyl and ethyl groups, R₂ is a substituent selected from hydrogen and the methyl group, and R₃ is a substituent selected from the alkyl and alkenyl radicals of 12 to 20 carbon atoms, such as exemplified by formulas 2, 5 and 6.

A commercial product of this type is manufactured and sold by Commercial Solvents Corporation under the trade name "Alkaterge C." I have found that this compound, which is an oil-soluble substituted 2-oxazoline, when used in lubricating compositions, results in the production of yarns and filaments of exceptional versatility for various textile operations.

My invention will be more readily understood by reference to the following examples in which typical applications of the invention are set forth.

Example 1.—Cellulose acetate cut staple fiber was prepared by spinning tow which was lubricated with 1.83% oil by passing the yarn over an applicator roll wet with the lubricant as the filaments emerged from the spinning cabinet, and by chopping the tow into suitable lengths. The composition of the lubricant is as follows:

	Parts
White oil	60
Alkaterge C	15
Oleic-lactic acid amide	25

This cut staple fiber was carded and spun into yarn and was found to process well in all operations. In the form of roving this sample was evaluated for uniformity of drafting (interfiber friction) and was ranked 54 on an arbitrary scale in which another lubricant, which does not contain Alkaterge C, but which is commonly used in the textile industry, ranks 100 when 1.53% oil was applied.

Example 2.—The lubricating composition described in Example 1 was applied to 150 denier 38 filament dull cellulose acetate yarn and was tested for its electrical resistance, static electrification, and kinetic friction over porcelain and steel surfaces and surface friction over a steel surface. These values were compared with those

for a similar yarn lubricated with the identical lubricant mentioned in Example 1, with the following results:

	Experimental lubricant	Example 1 lubricant
5 Electrical resistance, ohms/cm.....	8.3×10 ¹²	0.79×10 ¹²
10 Static electrification:		
Porcelain surface.....	+1	0
Steel surface.....	+3	0
Kinetic friction:		
Porcelain surface.....	28	28
Steel surface.....	29	36
15 Surface friction: Steel surface.....	30	37

Unless otherwise indicated, units are arbitrary.

Although I have indicated in the above examples and the following examples, certain percentages of oil applied to filaments for use in the form of cut staple fibers or continuous filament yarns, my invention is in no way restricted to these values, nor are the electrical and physical properties given here changed greatly if the oil content of the filaments is altered over wide ranges. This may be illustrated by values for the lubricant given in Examples 1 and 2 when it is applied to 150 denier 38 filament dull pigmented cellulose acetate yarn, given in the following table:

	Test No.		
	1	2	3
Percent lubricant on yarn.....	1.06	2.95	4.48
Electrical resistance, ohms/cm.....	.528×10 ¹²	.462×10 ¹²	1.06×10 ¹²
Static electrification:			
Porcelain surface.....	-1.5	0	0
Steel surface.....	+2	0	0
Kinetic friction:			
Porcelain surface.....	23.6	24.2	23.8
Steel surface.....	35	35	35
Surface friction.....	34	26	30

Ordinarily operating ranges for electrical resistance are 10¹⁰ to 10¹³ ohms/cm.; static electrification, 0 to ±25 units; kinetic friction, 12 to 35 units; surface friction, 20 to 60 units.

In large-scale processing of yarns, too high oil content may cause loading, and too low oil content may cause static electrification because the paucity of oil does not permit uniform distribution of oil over the filaments, but for testing purposes we have found that oil contents of 1-5% will give essentially accurate information as to electrical and physical properties of fibers and filaments composed of cellulose acetate and related esters. For this reason, two yarns are comparable as to electrical and physical properties if their oil contents are within these values.

Example 3.—A lubricating composition of low interfiber friction was made up as follows:

	Parts
White oil	61
Alkaterge C	12.75
Oleic-lactic acid amide	21.25
Blown neat's-foot oil	15

When 1.44% of this composition was applied to filaments which were subsequently cut to staple lengths and spun into yarns, processing was highly satisfactory, and the uniformity of drafting was ranked as only three arbitrary units. The electrical and physical properties of continuous

filament yarn spun with 2.04% of this composition are:

Electrical resistance, ohms/cm	11.7×10 ¹²
Static electrification:	
Porcelain surface	+1
Steel surface	+4
Kinetic friction:	
Porcelain surface	28
Steel surface	30.7
Surface friction	23

In the examples cited above I have indicated that the lubricant was applied by means of an applicator roll as the filaments left the spinning cabinet. However, the composition may equally well be applied at other stages of processing and in other operations such as in twisting, winding, and reeling, or they may be applied to cut staple fibers during any of the processes which are normal to the preparation of such fibers. Although I have indicated that the lubricant may be applied by passing the filaments over a roll, other devices which serve to deposit oil on filaments or fibers uniformly, such as wick, spray, or bath, may be used. Also, although I have indicated only the lubricating components in these compositions, it may in some cases be desirable to dilute these compositions with a volatile organic solvent in order to reduce the viscosity of the lubricating composition and thus to obtain better distribution of the oil on the individual filaments.

Other examples of yarn conditioning compositions which may be applied to various types of yarns, particularly those composed of or containing cellulose acetate, cellulose acetate propionate, cellulose acetate butyrate, and similar cellulose organic acid esters in accordance with my invention and which render such yarns especially well adapted for various textile operations are as follows:

Example 4

	Parts
White oil	70
Alkaterge C	30

Example 5

White oil	70
Alkaterge C	15
Oleic-lactic acid amide	15

Example 6

White oil	45
Alkaterge C	12
Oleic-lactic acid amide	18
Blown neat's-foot oil	25

Example 7

White oil	53
Alkaterge C	12
Oleic-lactic acid amide	20
Lecithin	15

Example 8

White oil	45
Alkaterge C	11
Oleic-lactic acid amide	19
Polyethylene glycol 600 dioleate	25

Example 9

White oil	43
Alkaterge C	11
Oleic-lactic acid amide	18
Blown neat's-foot oil	13
Lecithin	15

Example 10

	Parts
White oil	45
Alkaterge C	11
Oleic-lactic acid amide	19
Lecithin	25

I have found that Alkaterge C, while not a size-bonding agent, is only mildly destructive of size bonding, so that it may be used in lubricating compositions useful for warp yarns if a suitable size-bonding agent is present.

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. In addition, compositions may be applied as oil, as solvent solutions, or as aqueous emulsion when a suitable emulsifying medium is used, such as colloid mill or other homogenizer. 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, creping 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.

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 3-25%, based on the dry weight of the yarn, may be applied. If the yarn is intended for weaving, the amount will generally run from about 1-5%. On the other hand, if the yarn is intended to be cut into staple lengths, the amount will generally run from 1-3%.

In each of the compositions given, the presence of the oxazoline compound, such as Alkaterge C, is essential to produce low static electrification, low surface friction, low kinetic friction, and low interfiber friction. However, as illustrated by the specific examples, compositions will ordinarily contain other lubricating, softening, anti-static, or size-bonding 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.

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

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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.

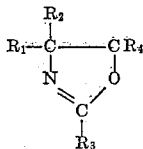
The term "yarn" as used herein and in the claims is to be understood as covering single filaments, a plurality of filaments associated in the form of roving, threads, and the like, either of high or low twist, composite threads or yarns composed of a mixture of natural and artificial filaments, composite 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 compositions of my invention possess many outstanding advantages. The fundamental and distinguishing characteristic of the compositions described herein is their ability to lubricate and condition yarns, particularly those composed of or containing organic derivatives of cellulose, such as cellulose acetate, to render them amenable to a greater variety of textile operations than has been possible in the past.

As indicated above, the substituted 2-oxazolines may be used with a wide variety of animal and vegetable products and their synthetic derivatives. In this way the compositions can be altered over a wide range in order to devise lubricating, softening, conditioning, and anti-static agents to meet the requirements of a wide variety of textile operations.

What I claim as my invention and desire to be secured by Letters Patent of the United States is:

1. A process of conditioning yarns, filaments and fibers composed of cellulose acetate to render the material amenable to textile operations which comprises applying to such materials as they emerge from the spinning cabinet a lubricating composition containing dissolved therein as an essential ingredient a substituted 2-oxazoline having the general formula:

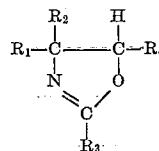


wherein R_1 is a substituent selected from the class consisting of methyl and ethyl groups, R_2 is a substituent selected from the class consisting of hydrogen and the methyl group, R_3 is a substituent selected from the group consisting of alkyl and alkenyl radicals of 12 to 20 carbon atoms, R_4 is a substituent selected from the class consisting of hydrogen and aryl groups and also containing white mineral oil, blown neat's-foot oil and oleic-lactic acid amide, the total amount of the latter three ingredients being the major portion of the entire composition.

2. The process of conditioning yarns, filaments and fibers composed of a cellulose organic acid ester to render the material amenable to textile operations which comprises applying thereto a lubricating and antistatic composition of white mineral oil, neat's-foot oil, and oleic-lactic acid amide containing dissolved therein as its es-

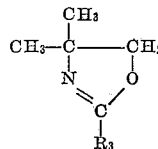
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ential antistatic component a substituted 2-oxazoline which is compatible with the aforesaid oils and other ingredients and which has the general formula:



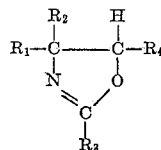
wherein R_1 is a substituent selected from the class consisting of methyl and ethyl groups, R_2 is a substituent selected from the class consisting of hydrogen and the methyl group, R_3 is a substituent selected from the class consisting of alkyl and alkenyl radicals of 12 to 20 carbon atoms, and R_4 is a substituent selected from the class consisting of hydrogen and aryl groups.

3. The process of conditioning yarns, filaments and fibers composed of a cellulose organic acid ester to render the material amenable to textile operations which comprises applying thereto a lubricating and antistatic composition of mineral oil, neat's-foot oil, oleic-lactic acid amide and also containing dissolved therein as its essential antistatic component a 2-oxazoline having the graphic formula:



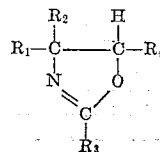
in which R_3 is a substituent selected from the group consisting of alkyl and alkenyl radicals of 12 to 20 carbon atoms.

4. The process of conditioning yarns, filaments and fibers composed of a cellulose acetate to render them amenable to textile operations which comprises applying thereto a lubricating and antistatic composition containing white mineral oil, neat's-foot oil, oleic lactic acid amide, and also containing dissolved therein as its essential antistatic component a substituted 2-oxazoline having the general formula:



wherein R_1 is a substituent selected from the class consisting of methyl and ethyl groups, R_2 is a substituent selected from the class consisting of hydrogen and the methyl group, R_3 is a substituent selected from the group consisting of alkyl and alkenyl radicals of 12 to 20 carbon atoms, and R_4 is a substituent selected from the class consisting of hydrogen and aryl groups.

5. Textile yarns composed of cellulose acetate which are amenable to textile operations such as knitting, weaving, spinning impregnated with a lubricating and antistatic composition of white mineral oil, neat's-foot oil and oleic-lactic acid amide and also containing dissolved therein as its essential antistatic component a substituted 2-oxazoline having the general formula:



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wherein R₁ is a substituent selected from the class consisting of methyl and ethyl groups, R₂ is a substituent selected from the class consisting of hydrogen and the methyl group, R₃ is a substituent selected from the group consisting of alkyl and alkenyl radicals of 12 to 20 carbon atoms, and R₄ is a substituent selected from the class consisting of hydrogen and aryl groups.

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