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2,286,792

YARN CONDITIONING PROCESS AND
COMPOSITION THEREFOR

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3 Claims. (Cl. 252—8.8)

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 scourbaths. 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.

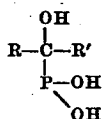
These objects are accomplished by the following invention which, in its broader aspects, comprises treating yarns, particularly those composed of or containing organic derivatives of cellulose, such as cellulose acetate, cellulose acetate propionate, cellulose acetate butyrate and similar organic acid esters with the phosphinous and phosphinic acids, especially those derived from aldehydes and ketones of the type represented by the formula:



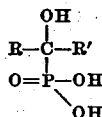
where R is a substituent selected from the group consisting of the alkyl and naphthenyl radicals and R' is a substituent selected from the group

consisting of the alkyl, aryl, naphthenyl radicals and hydrogen, and the inorganic and organic base salts of these acids.

The phosphinous acids may be represented by the structural formula:



while the phosphinic acids may be represented by the structural formula



wherein R and R' have the same meaning as indicated in the previous paragraph. The aryl group may be any group such as methyl, ethyl, propyl, butyl, amyl, or, in fact, any alkyl group, even including alkyl groups of 26 or more carbon atoms. The aryl substituent may likewise be any aryl group such as benzene, biphenyl, naphthalene, furan, thiophene, carbazole, anthracene, acenaphthene, fluorene, phenanthrene. By the term "naphthenyl" we refer to radicals of the general class described in Chapter 48 of the Chemistry of Petroleum Derivatives by Carlton Ellis.

The salts in question may be prepared by the interaction of the acids with any desired inorganic base such as sodium hydroxide, potassium hydroxide, calcium hydroxide, ammonium hydroxide, or with any organic base such as ethanolamine, diethanolamine, triethanolamine, triethylamine, butylamine, dibutylamine, tributylamine, tetrahydrofurfurylamine, ditetrahydrofurfurylamine, tritetrahydrofurfurylamine, amyl amine, cyclohexylamine, dicyclohexylamine, diethylcyclohexylamine, dimethyl cyclohexylamine, beta-hydroxyethyl cyclohexylamine, di-beta-hydroxyethylcyclohexylamine, glucose amine, ethylene diamine, tetramethyl ammonium hydroxide, trimethyl benzyl ammonium hydroxide and the like.

Under the broad class of phosphinous and phosphinic acids and their salts, we have found that the hydroxy alkyl aryl phosphinates and the naphthenyl phosphinic acids and their salts are especially valuable. The latter two classes of compounds, are, so far as we are aware new chemical compounds, the preparation of which will be described in detail hereinafter.

We have found that these compounds, when employed in accordance with the technique to be more fully described hereinafter, have a peculiar ability to lubricate and soften such yarns and at the same time give them anti-static properties. They also possess an unusual solvent power for mineral, blown and unblown, drying and semi-drying vegetable and animal oils, and accordingly may be used with or without such oils. These compounds are further characterized by their exceptional ability to reduce static charges on cellulose organic derivative cut staple fiber and thus to adapt them for carding, drawing, spinning and other operations customarily employed in the manufacture of spun yarn on the woolen, worsted, and cotton systems. The yarn conditioning agents of our invention also have exceptional value as surface-active compounds and as such may be employed as wetting, dispersing, and emulsifying agents, textile

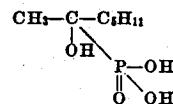
assistants, dye-dispersing agents and the like. These agents may also be used as substitutes for soaps because of their exceptional emulsifying power. These compounds are characterized by their stability to hard water and the fact that they are extremely stable chemically.

PREPARATION OF COMPOUNDS

PHOSPHINOUS AND PHOSPHINIC ACIDS

- 10 The phosphinous and phosphinic acids in general may be prepared in accordance with the method described in Friend's "Textbook of Inorganic Chemistry," vol. 11, part 3, chapter 1. The salts of these acids may be prepared by 15 the interaction of any inorganic or organic base with the acids in question in accordance with known technique and need not be described in detail here.

- A compound which we have found to be particularly valuable for the purposes of our invention is 2-hydroxyheptane phosphinate-2

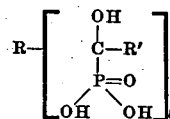


This compound may be prepared as follows:

- 150.7 g. (1.1 moles) of phosphorous trichloride is added with stirring to 114 g. of methyl n-amyl ketone, keeping the temperature at 30-35° (15 minutes). The reaction mixture is allowed to stand overnight and then added with stirring to 600 cc. of glacial acetic acid, and the temperature is kept at 30°. After standing overnight the acetyl chloride is distilled off and the acetic acid is removed under reduced pressure. The product is poured into water and washed with water until free of mineral acid. From this acid, any desired salt, such as the sodium, ammonium, trithanolamine, diethylcyclohexyl, etc., may be prepared. Similarly, the phosphinic acid from ethyl-n-amyl ketone, methyl n-butyl ketone, dibutyl ketone, methylpentadecyl ketone, methylheptadecyl ketone, etc., may be prepared.

HYDROXY ALKYL ARYL PHOSPHINATES

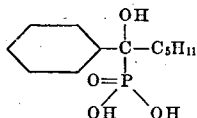
- These compounds may be prepared in accordance with the method described by Conant, Journal of the American Chemical Society, vol. 43, page 1928 (1921); Ibid 44, 2530 (1922). Falling within this broad class of compounds, we have prepared and found especially useful as anti-static agents in the treatment of yarns and cut staple fibers composed of cellulose acetate and other cellulose organic derivatives, a new series of phosphinic acid compounds having the general formula:



- wherein R is a substituted or unsubstituted aromatic group, R' is an alkyl group containing at least five carbon atoms, and b is a small whole number up to 4. The aromatic group may be substituted by a radical or group such as alkyl, aryl, alkoxy, alkylamino, hydroxy, carboxyl, and the sulfonic acid group. The alkyl group may be methyl, ethyl, propyl, butyl, amyl, and the like.

- A typical compound of this type, phenyl amyl hydroxy methane phosphinate, may be prepared as follows:

To 162 g. phenyl amyl ketone are added slowly with stirring 152 g. phosphorus trichloride, keeping the temperature below 35°. The mixture is allowed to stand one hour and about 200 g. acetic acid are added with stirring and cooling, keeping the temperature between 20–30°. The reaction mixture is allowed to stand 12 hours and then 50–60 g. ice are added. The mixture is then evaporated slowly on a steam bath. If the product crystallizes, it is filtered, washed with acetic acid, and dried. If the product separates as an oil, it is dissolved in a suitable solvent, such as ether, chloroform, etc., and washed with water to remove acetic and mineral acids. The product may be regarded as phenyl amyl hydroxy methane phosphinate and has the structural formula:



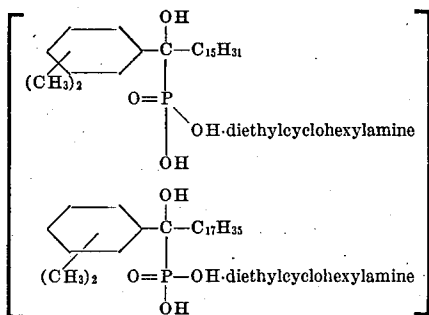
Another typical compound is anthracenyl amyl hydroxy methyl phosphinate and may be prepared as follows:

169 g. phosphorous trichloride is added to anthracenyl amyl ketone (350 g.) heated to 60–70°. The mixture is heated to 60–70° with stirring for 8 hours and then allowed to stand for 12 hours at room temperature. Then 240 g. acetic acid are added and the product is warmed to 60–70° for 8 hours. The acetyl chloride and acetic acid are removed and the product poured into water. The resulting waxy compound is worked free of mineral acid.

The preparation of the diethyl cyclohexylamine salt of phosphinated stearyl-palmityl xylol ketone and similar compounds we have found to be especially efficacious as textile anti-statics is illustrated by the following procedures:

169 g. of phosphorous trichloride is added to a mixture of ketones (310 g.) prepared from mixed xylenes and a mixture of stearic and palmitic acids heated to 60°. The mixture is heated to 60–70° with stirring for eight hours and then for 12 hours at room temperature. Then 240 g. of acetic acid is added and warmed to 60–70° for 8 hours. The acetyl chloride and acetic acid are removed, the product is poured into water and washed free of mineral acid. The resulting heavy, oily acid may be treated with any desired base to form a salt. The diethylcyclohexylamine salt, for example, may be considered to be a mixture of stearyl and palmityl xylol ketones. These compounds may be represented by the following structural formulae:

Mixture of



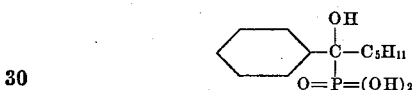
Preparation of a similar compound may be carried out as follows:

169 g. of phosphorous trichloride is added to a

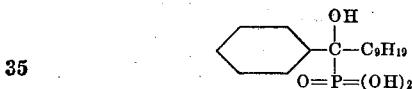
mixture of ketones (275 g.), prepared from a mixture of myristic and caprylic acids and mixed diethyl benzenes, heated to 60°. The mixture is heated to 60–70° with stirring for 8 hours and then for 12 hours at room temperature. Then 240 g. of acetic acid is added and the reaction mixture is warmed to 60–70° for 8 hours. The acetyl chloride and acetic acid are distilled over and the product is poured into water and washed free of mineral acids. Salts are prepared by reacting the acid with one or two equivalents of the desired base. More than one base may be used to give a mixture of salts.

Examples of suitable bases for the preparation of the salts are sodium hydroxide, potassium hydroxide, ammonia, triethylamine, pyridine, morpholine, ethylene diamine, dibutylamine, amylamine, tetramethyl ammonium hydroxide, triethylbenzyl ammonium hydroxide, mono, di- and tri-ethanolamine, ethyl cyclohexylamine, diethylcyclohexylamine, dimethylcyclohexylamine, di-beta-hydroxyethylcyclohexylamine, dicyclohexylamine, di- and tri-tetrahydrofurfurylamine, etc.

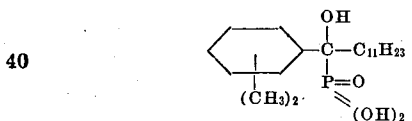
In a similar manner may be prepared the following illustrative compounds.



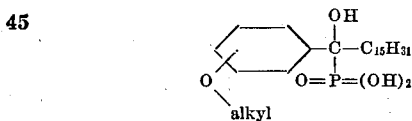
(Phenyl amyl hydroxymethane phosphinate)



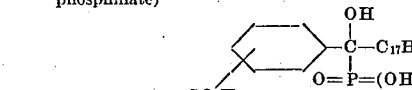
(Phenyl nonyl hydroxy methane phosphinate)



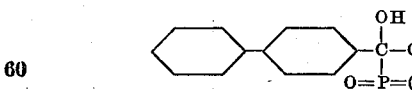
(Mixed xylol undecyl hydroxy methane phosphinate)



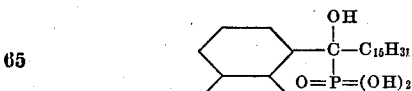
(Ortho, meta or para phenyl alkoxy pentadecyl hydroxy methane phosphinate)



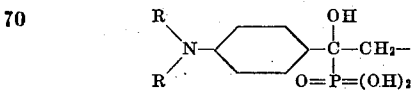
(Ortho, meta or para sulfophenyl heptadecyl hydroxy methane phosphinate)



(Para-xenyl heptadecyl hydroxy methane phosphinate)

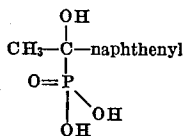


(Alpha naphthyl pentadecyl hydroxy methane phosphinate)

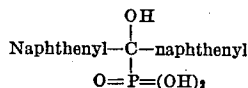


(Para-dialkylamino phenyl hexahydrobenzyl hydroxy methane phosphinate)

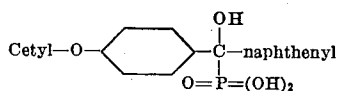
and the mixture is evaporated on a steam bath until no further crystallization takes place. The crystals are filtered off and dried. The product is methyl naphthenyl hydroxy methane phosphinic acid and has the formula:



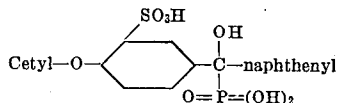
Likewise the following compounds may be prepared:



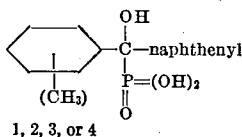
(Dinaphthenyl hydroxy methane phosphinate)



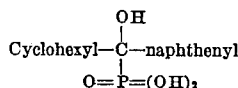
(p-cetoxy phenyl naphthenyl-hydroxy methane phosphinate)



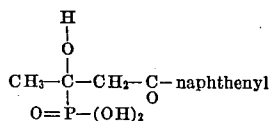
(p-cetoxy m-sulfo phenyl naphthenyl hydroxy methanephosphinate)



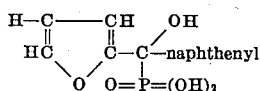
(Mono and poly methyl phenyl naphthenyl hydroxy methane phosphinate)



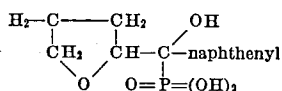
(Cyclohexyl naphthenyl hydroxy methane phosphinate)



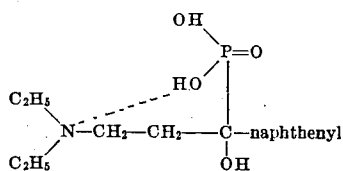
(2-hydroxy3-naphtheneoyl propane-2-phosphinate)



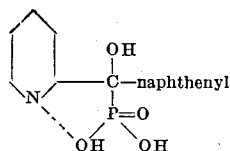
(alpha-furyl naphthenyl hydroxy methane phosphinate)



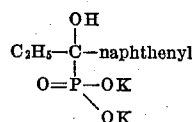
(alpha-tetrahydrofuryl naphthenyl hydroxy ethane phosphinate)



(3-diethylamino-1,1 hydroxy-naphthenyl propane phosphinate)

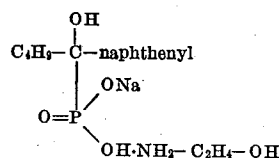


(alpha-pyridyl naphthenyl hydroxy methane phosphinate)



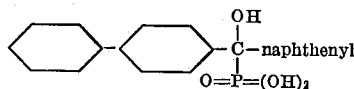
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(ethylnaphthenyl hydroxy methane phosphinate dipotassium salt)



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(naphthenyl butyl hydroxy methane phosphinate ethanolamine sodium salt)

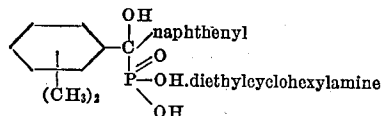


20 (p-phenyl phenyl naphthenyl-hydroxy methane phosphinate)

Another typical compound, the diethylcyclohexylamine salt of phosphinated naphthenyl xylol ketone may be prepared as follows:

170 g. of phosphorous trichloride is added with stirring to naphthenyl xylol ketone (300 g.) heated to 60°. Heating and stirring are continued at 60-70° for 8 hours. The reaction mixture is allowed to stand at room temperature for 12 hours and then 240 g. of acetic acid is added. The mixture is heated with stirring at 60-70° for 8 hours and the acetyl chloride and excess acetic acid are removed by distillation. The product is poured into water and washed free of mineral acids, separated, dried by evacuation, and then treated with one molecular equivalent of diethyl cyclohexylamine. The product is the diethylcyclohexylamine salt of phosphinated naphthenyl ketone and has the following formula:

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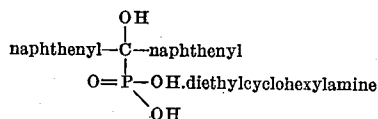


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Likewise, the preparation of the diethylcyclohexylamine salt of phosphinated dinaphthenyl hydroxy methane may be prepared as follows:

170 g. of phosphorous trichloride is added with stirring to 300 g. of dinaphthenyl ketone heated to 60°. After heating at 60-70° for 8 hours the reaction mixture is allowed to stand at room temperature for 12 hours. Then 240 g. of acetic acid is added and the mixture is heated at 60-70° for 8 hours. The acetyl chloride and excess acetic acid are removed and the product is poured into water. After washing free from mineral acid, the reaction product is reacted with diethylcyclohexylamine. The resulting compound, diethylcyclohexylamine salt of phosphinated dinaphthenyl hydroxy methane has the structural formula

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In a similar manner, any desired salt may be prepared.

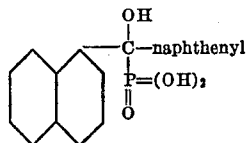
As indicated by the above examples, the salts of any of these compounds are prepared by treating the acids with the desired base or bases with or without a solvent. Any base such as sodium, potassium, lithium, or calcium hydroxide may be employed. Among the organic bases we may

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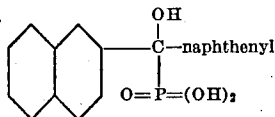
mention triethylamine, the ethanol amines, butylamines, mono-, di- and tri-cyclohexyl amine, diethyl cyclohexyl amine, pyridine tetrahydroquinoline, piperidine, morpholine, the mono-, and di-, and tri-furfuryl and tetrahydrofurfuryl amines, tetramethyl ammonium hydroxide, etc.

Likewise, alpha-naphthyl-naphthenyl hydroxy methane phosphinate may be prepared as follows:

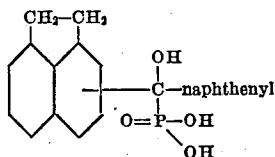


(alpha-naphthyl naphthenyl hydroxy methane phosphinate)

170 g. phosphorous trichloride is added with stirring to 350 g. naphthenyl-alpha-naphthylketone at 60°. Heating and stirring are continued at 60-70° for 8 hours. After standing for 12 hrs. 240 g. acetic acid are added. The mixture is heated with stirring for 8 hours and then the acetic acid and acetyl chloride are distilled off. The product is poured into water and washed free of mineral acid. The product is a heavy, viscous oil. In a similar manner the corresponding beta-acid is prepared



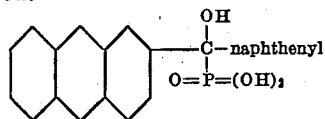
Similarly, acenaphthenyl naphthenyl hydroxy methane phosphinate may be prepared.



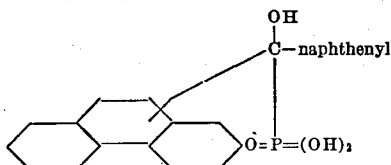
(acenaphthenyl naphthenyl hydroxy methane phosphinate)

170 g. phosphorous trichloride is added with stirring to 360 g. acenaphthenyl naphthenyl ketone heated to 60°. Heating and stirring are continued at 60-70° for 8 hours. After standing for 12 hours 240 g. acetic acid is added. The mixture is heated with stirring for 8 hours and the acetic acid and acetyl chloride are distilled off. The product is poured into water and worked free of mineral acid. The product is a heavy, viscous oil.

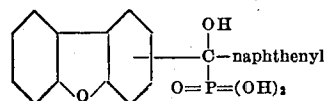
In like manner the following compounds may be prepared:



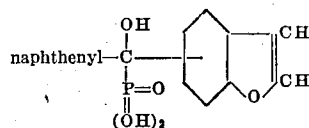
(Anthracene naphthenyl hydroxy methane phosphinate)



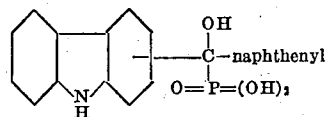
(Phenanthrene naphthenyl hydroxy methane phosphinate)



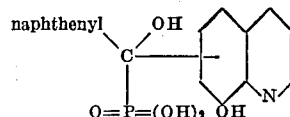
(Dibenzofuran naphthenyl hydroxy methane phosphinate)



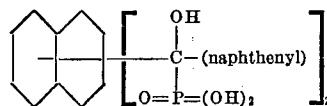
(Benzofurane naphthenyl hydroxy methane phosphinate)



(Carbazole naphthenyl hydroxy methane phosphinate)



(8-hydroxy quinolyl naphthenyl hydroxy methane phosphinate)



(naphthalene (bis-naphthenyl hydroxy methane phosphinate))

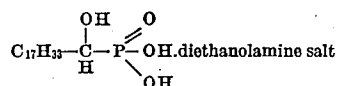
Any of the compounds previously described may be sulfonated in the aryl group by warming with sulfuric acid or chloro-sulfonic acid.

In the following examples and description we have set forth several of the preferred embodiments of our invention, but they are included merely for purposes of illustration and not as a limitation thereof.

Our invention will be more readily understood by reference to several specific examples of typical yarn treating procedures carried out in accordance therewith.

USE OF PHOSPHINOUS AND PHOSPHINIC ACIDS AND THEIR SALTS AS YARN CONDITIONING AGENTS

Example 1



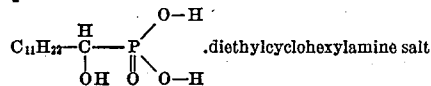
(1-hydroxy-octadecane phosphinate-1 diethanolamine salt)

is applied by means of an applicator roll to cellulose acetate continuous filament designed for knitting purposes in an amount corresponding to 5-25% of the dry weight of the yarn. The yarn so treated is found to be soft and pliable and well-adapted for knitting.

Example 2

A conditioning liquid having the following composition:

90-95 parts by weight butyl naphthenate
10-5 parts



(1-hydroxy dodecane phosphinate-1 diethylcyclohexylamine salt)

is applied to a cellulose acetate cut staple fiber designed for use on the woolen system in an amount corresponding to 1-5% of the dry weight of the staple fiber material. The yarn so treated is found to be substantially free from accumulations of static electricity and admirably adapted for the manufacture of spun yarn in accordance with standard commercial practice involving carding, drawing, spinning and the like.

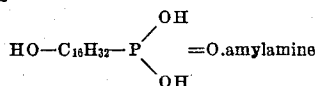
Other examples of conditioning compositions which may be applied in accordance with our in-

vention 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

A conditioning liquid particularly useful on cut staple fibers made of cellulose acetate and which may be used for other textile operations is made up as follows:

1-10 parts



(1-hydroxyhexadecane phosphinous acid amylamine salt)

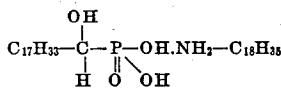
99-90 parts mineral oil

Example 4

10 parts butyl naphthenate

89-80 parts mineral oil

1-10 parts

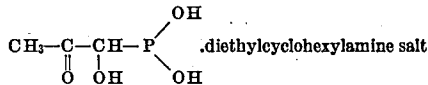


(1-hydroxy octadecene phosphinate-1-oleylamine salt)

Example 5

99-90 parts blown olive oil

1-10 parts

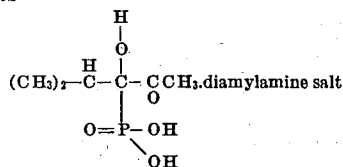


(α -hydroxy- β -keto propyl- α -phosphinous acid diethylcyclohexylamine salt)

Example 6

80-99 parts olive oil

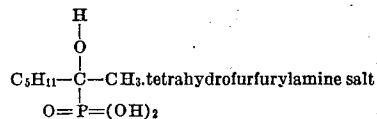
20-1 parts



(3-hydroxy-2-keto-isohexane-3-phosphinate di-amylamine salt)

Example 7

10-1 parts

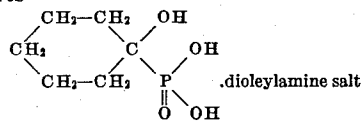


(2-hydroxy-heptane phosphinate tetrahydrofurfurylamine salt)

90-99 parts neat's-foot oil

Example 8

20-1 parts



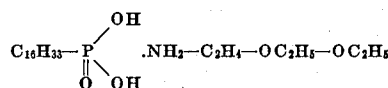
(1-hydroxy-cyclohexane phosphinate-1-dioleylamine salt)

80-99 parts blown neat's-foot oil

Example 9

55 parts sperm oil

5 parts



(Hexadecane phosphinate-1 β -ethoxy- β -ethoxy ethylamine salt)

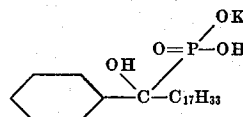
10 20 parts butyl naphthenate

20 parts mineral oil

Example 10

77-68 parts blown sperm oil

15 1-10 parts



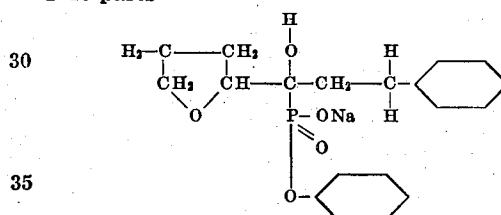
(1-hydroxy-1-phenyl octadecene phosphinate-1 potassium salt)

2 parts water

25 20 parts β -di-methoxy ethyl succinate

Example 11

1-10 parts



(1-tetrahydrofuryl-1-hydroxy propane-3-phenyl phenoxy phosphinate-3-sodium salt)

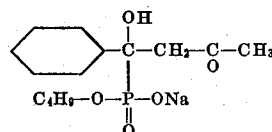
40 99-90 parts teaseed oil

Example 12

60-70 parts glycerolacetone acetate

39-20 parts blown teaseed oil

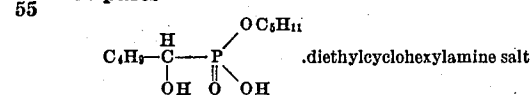
45 1-10 parts



(1-Hydroxy-1-phenyl-3-ketobutane butoxy phosphinate sodium salt)

Example 13

1-10 parts



60 (1-Hydroxy pentane pentoxy phosphinate diethylcyclohexylamine salt)

30 parts blown olive oil

69-60 parts blown neat's-foot oil

Example 14

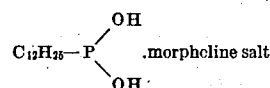
65 55-50 parts olive oil

10 parts sulfonated castor oil

20 parts mineral oil

10-15 parts oleic acid

70 5 parts



75 (Dodecane phosphinous acid morpholine salt)

The particular method of application of the yarn treating compositions of our 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 we 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 we have found it convenient to describe our 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 our 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.

What we 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 prior to any textile operation thereon a lubricating and anti-static composition containing as its essential lubricating and anti-static component diethylcyclohexylamine salt of phosphinated stearyl-palmyl xylol ketone.

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 diethylcyclohexylamine salt of phosphinated stearyl-palmyl xylol ketone.

3. A textile yarn 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 diethylcyclohexylamine salt of phosphinated stearyl-palmyl xylol ketone.

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JAMES G. McNALLY.