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NYLON CARPET YARN FINISH

Neil Lamar Finch, Sr., Kinston, N.C., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del.

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ABSTRACT OF THE DISCLOSURE

A nylon fiber finish which includes a soft paraffin wax, a hard microcrystalline wax, a salt of a partial phosphate ester, a polyoxyalkylene derivative of a fatty alcohol and potassium hydroxide, provides nylon fibers, filamens, tows and yarns with highly satisfactory antistatic properties and filament to filament frictional characteristics.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a new composition of matter having exceptional properties as a textile treating agent, particularly for nylon fibers and the products made therefrom.

Description of the prior art

As synthetic continuous fibers are repeatedly subjected to mechanical stress during their manufacture, it is of common practice to apply a treating composition to the freshly spun fibers to improve their processability in any further processing steps. During this processing, the rapidly moving fibers may contact metal surfaces, such as thread-guides and heated draw-rolls and may be subjected to a bulking operation connected with a heat treatment. The fiber treating composition serves here as a lubricant to protect the fibers against friction deterioration or uneven processing and avoids the accumulation of static charges. Subjecting the fibers to high temperatures during drawing or bulking usually entails a certain degradation or vaporization of the fiber treating agent applied to the freshly spun fibers. If the bulked yarn has to withstand additional mechanical strains during its manufacture into final products, such as a carpet yarn in tufting, the primarily applied treating agent may not be sufficient. An additional lubricating composition will be necessary to improve the yarn's performance in all customers' operations.

SUMMARY OF THE INVENTION

Highly satisfactory antistatic properties and interfilament frictional characteristics, excellent bundle cohesion, and yarns exhibiting a soft hand are provided by compositions for treatment of linear synthetic polycarbonamide fibers which comprise (a) from 27% to 33% of a soft, refined, paraffin wax having a melting temperature in the range of from 50° C. to 60° C., (b) from 27% to 33% of a partially oxidized, microcrystalline wax having a melting temperature in the range of from 90° C. to 100° C., (c) from 25% to 31% of a polyoxyalkylene derivative of a fatty alcohol, (d) from 9% to 11% of a salt of a partial phosphate ester, and (e) from 0.55% to 1.75% of potassium hydroxide. A preferred composition is about 30% (a), about 30% (b), about 28.5% (c), about 10% (d) and about 1.5% (e).

EXAMPLES

The following examples are included to exemplify the preferred embodiments of the disclosed invention. They are not, however, intended to delimit the scope of the invention. All parts expressed in the examples are by weight.

Example I

Freshly spun polyhexamethylene adipamide fibers are converged into a yarn bundle, the yarn bundle is passed over a finish roll rotating in a commercially available finish composition. This finish is prepared by mixing together 2,420 parts of No. 50 mineral oil, 1,130 parts of the sodium salt of sulfated peanut oil (a commercial product containing about 23% of water), 100 parts of diethylene glycol, 100 parts of a 45%, by weight aqueous potassium hydroxide solution, 550 parts of oleic acid, 2,210 parts of triethanol amine, 210 parts of a solution containing 40% of the sodium salt of o-phenylphenol, and 150 parts of water. This mixture is heated to 60° C., stirred 30 minutes and cooled to room temperature. This material is then used in the preparation of an aqueous emulsion by slowly adding it at a ratio of 110 parts to 380 parts of water, with vigorous agitation, to give an emulsion having about 20% "solids." The fibers are cold drawn at a draw ratio of 3.6 and subjected to steam bulking.

A second finish is applied to the highly crimped fiber bundle of 204 single filaments having a denier of about 3,700 by a spray nozzle directed at the yarn bundle on the bulking drum screen.

The second finish composition is prepared by mixing at room temperature 30 parts of a hard, partially oxidized microcrystalline wax, 30 parts of a soft paraffin wax, 28.5 parts of stearyl nona(ethyleneoxy)ethanol, and 10 parts of a mixture of the monosodium and disodium salts of oleyl hexa(ethyleneoxy)ethanol phosphate. The mixture is maintained at a temperature of 110° C., while 1.5 parts of a 45% KOH solution are added slowly during agitation. After the melt clears, it is poured into 398.2 parts of water, which has been heated to 95° C. with agitation to bring about emulsification. The emulsion is cooled to room temperature while kept under moderate agitation. The yarn treated in this manner is used for making tufted carpets and shows excellent tufting performance, good bundle cohesion, a high static protection, and a soft hand in the carpet.

Example II

Nylon yarn is spun, finished, drawn and crimped as described in Example I.

A secondary finish is prepared in the above-described manner and added to a dye-bath used for dyeing a carpet made from this nylon yarn. The solids content of the finish in the dye-bath amounts to 0.00107%.

The dried carpet is compared with a carpet made exactly in the same manner, but dyed in a dye-bath without additive.

Judges examined the softness of both carpets. In 36 judgments out of 37, the carpet dyed in the dye-bath containing the additive was declared as having definitely a softer hand.

DESCRIPTION OF PREFERRED EMBODIMENTS

The waxes used in this invention are a soft fully refined paraffin wax derived from petroleum and melting at about 50° C.–60° C. and a hard, partially oxidized microcrystalline wax made from oxides of carbon and hydrogen by the Fischer-Tropsch synthesis and melting at about 90° C. to 100° C. These and similar waxes are well known. Details on the Fischer-Tropsch synthesis are available, for example, in "Organic Chemistry" by Fieser and Fieser, 3rd edition (1956), at pages 108 and 109 and in the patent literature. These waxes generally are used in substantially equal amounts in the present finish composition.

The salt of a partial phosphate ester used in this invention is obtained by neutralizing the partial esters obtained by reacting phosphorous pentoxide with an aliphatic al-

cohol compound. Preferably, the salt will be a mixture of the monosodium and disodium salts of the partial ester of phosphoric acid with an ether of oleyl alcohol and polyoxylene glycol containing seven ethylene oxide units as the aliphatic alcohol compound.

The fourth essential component of this invention is a polyoxyalkylene derivative of a fatty alcohol, which is preferably an ether of one mol of stearyl alcohol and one mol of polyoxyethylene glycol containing ten ethylene oxide units. This is a relatively water soluble nonionic surfactant.

An aqueous emulsion of the fiber treating composition is preparyed by mixing proper amounts of the soft paraffin wax, the Fischer-Tropsch wax, a mixture of mono- and di- salts of oleyl ether(polyoxyethylene)phosphate and poly(ethyleneoxy)stearyl ether at room temperature. The mixture is heated and maintained at a temperature between 100° C. and 120° C. while a solution of potassium hydroxide is slowly added. After clearing, the melt is poured into water under sufficient agitation to insure mixing, but prevent entrainment of air. The fiber treating composition retains its effectiveness as a finish within the proportions stated above. None of the finished fiber characteristics, such as antistatic properties, interfilament friction, bundle cohesion and yarn exhibiting a soft hand, are significantly altered by varying the proportions in the stated ranges.

The fiber treating agent is applied to nylon yarn preferably in the form of an aqueous emulsion. The emulsion contains about 8 to 20 percent, by weight, of nonaqueous components, or "solids," so as to deposit from about 0.04 to 1.50 percent "solids" on the fiber based on the weight of the dry fiber. As is known in the art, the amount of composition carried by a fiber or yarn lies within a relatively narrow optimum range. However, it was noted that a finish level of 0.2–1.0% based on the fiber weight, produces as of carpet hand, excellent bundle cohesion, and good static protection.

Preferably, the emulsion will be deposited on the fibers by spraying. If desired, the application may be made by immersion or roller application and the like as known to those skilled in the art. The emulsion is applied to the filaments of the yarn after the bulking operation. It can be used over a primarily applied spin finish, which may or may not have been partially evaporated by previous processing steps. It is also preferably to use the finish composition of this invention as a dye bath additive.

In the practice of this invention, the yarns employed are of nylon polymers. Typical nylons include polyhexamethylene adipamide, polycaproamide, the reaction product of dodecanedioic acid and bis(p-aminocyclohexyl)

methane or their amide forming derivatives, other nylons, or melt blends and copolymers thereof.

What is claimed is:

1. A finish composition for treatment of synthetic polycarbonamide fibers which comprises:

(a) from 27% to 33% of a soft, refined, paraffin wax having a melting temperature in the range of from 50° C. to 60° C.,

(b) from 27% to 33% of a partially oxidized, microcrystalline wax having a melting temperature in the range of from 90° C. to 100° C.,

(c) from 25% to 31% of polyoxyethylene ether of stearyl alcohol having about 10 ethylene oxide units,

(d) from 9% to 11% of sodium salts of the esterification reaction product of phosphorous pentoxide with ethylene

a polyoxyethylated oleyl alcohol having about 7 ethylene oxide units, and

(e) from 0.55% to 1.75% of potassium hydroxide.

2. The finish composition of claim **1** wherein the relative proportions of the components comprise about 30 parts by weight of the said microcrystalline wax, about 30 parts by weight of the soft paraffin wax, about 28.5 parts by weight of the polyoxyethylene ether, about 10 parts by weight of said sodium salts and about 1.5 parts by weight of potassium hydroxide.

3. An aqueous emulsion containing from 8 to 20% of the composition of claim **1**.

4. A synthetic polycarbonamide filament having deposited thereon from about .04% to about 1.50% of the said finish composition of claim **1**.

5. The fiber of claim **4** having deposited thereon from about 0.2% to about 1.0% of the said finish composition.

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HERBERT B. GUYNN, Primary Examiner

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