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PILE FABRIC AND METHOD OF MAKING
THE SAME

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This invention relates to the treatment of filaments, yarns, threads, etc. comprising the pile of a pile fabric and is a continuation-in-part of the invention described in our co-pending application Ser. No. 445,202, filed April 17, 1930. This invention specifically relates to the treatment of yarns, threads, etc. containing organic derivatives of cellulose, to adapt them to the formation of improved pile fabrics.

An object of the invention is the economic and expeditious production of pile fabrics such as velvets, imitation fur, transparent velvets, plushes, corduroys, etc. Another object of the invention is the production of pile fabrics containing yarns or filaments of organic derivatives of cellulose wherein the straightness and uniformity of the direction of the pile may be controlled. Other objects of the invention will appear from the following detailed description.

In the processing of textile yarns for the formation of pile fabrics of more or less suitable properties it has been necessary, prior to this invention, to employ special winding and/or twisting operations during which the yarns or filaments were treated with special finishes or the yarns were coated with protective or stiffening sizes, which operations not only involved added expense but also required exercise of great care to prevent damage to the yarn or filaments in such processing. We have found that these difficulties may be overcome and other advantages attained by application of certain wax-like bodies to yarns and filaments comprising organic derivatives of cellulose that are to be used as the pile of a pile fabric. For instance, the yarns treated according to this invention are more pliable and supple and are more uniform. They impart a heavier appearance and a softer handle to materials made therefrom. When used as the pile of a pile fabric, they readily lend themselves to control, such as standing erect in a non-bunched or tufted relation or they may be laid down in a uniform direction.

The pile of a transparent velvet fabric, made of yarn treated according to this invention, in both the greige and finished condition is in a much cleaner condition, standing up straighter and is less but evenly spread and is more transparent than similar fabrics made of yarn treated by former methods. The fabric is also susceptible to a cleaner and brighter dyeing.

The pile of the fabric made of yarns treated with the wax-like bodies is cut cleanly across each tuft of the pile and does not cut at a slight angle across the pile making one edge of each tuft

higher than the other edge. This adaptability to be evenly cut gives to a fabric a very even light reflection and removes therefrom a tufted or wave appearance caused by varying intensities of light reflection.

Prolonged or severe washing of pile fabrics usually results in damage to the uniformity of the pile and may cause undesired crush effects. This difficulty is overcome by this invention, as oil stains, oil stains contaminated with metal from the bearings of processing machines, dirt or any contamination met with in processing a fabric may be readily removed from the fabric during normal dyehouse processing to produce clean goods. The wax-like bodies on the yarn absorb the oil and other contaminating materials preventing same from attaching themselves to the fabric. These wax-like bodies are easily emulsified thus carrying the dirt and oil away from the fabric.

In accordance with our invention in any winding operation of a yarn or filament, we apply thereto a wax-like body which is emulsifiable in water, soap solution, solvents and like scouring baths. This yarn or filament is then processed as the pile of a pile fabric after which a part of the wax-like body may be scoured therefrom. The wax-like body contains at least a small proportion of one or more such emulsifiable wax-like bodies as the mono-stearate of diethylene glycol, the mono-stearate of ethylene glycol, the mono-stearate of triethylene glycol, the mono- or distearate of glycerol, triethanolamine stearate, diethanolamine stearate, monoethanolamine stearate, ethylene glycol oleate, diethylene glycol oleate, triethylene glycol oleate, the mono- or dioleate of glycerol, the mono-, di- or triethanolamine oleate and other like waxy bodies. In place of or with the stearates and oleates above specified, the palmitic or other higher mono-fatty acid esters of glycol, polyglycols, glycerols and higher polyhydric alcohols may be used. Other salts may be used such as the fatty acid salts of ethylene diamine and mono- and di-amylamines.

The wax-like bodies may be used alone or in combination with other bodies, such as cresylic acid, butyl acetate, polymerized fatty acids and glycerol or glycol boric acid or cetyl alcohol or esters or ethers of higher fatty alcohols.

For certain purposes it may be advisable to add to any or a mixture of the above readily removable wax-like bodies, a proportion of the so-called non-emulsifiable wax-like materials to act as siz-ers or hardeners such as ceresin wax, beeswax, stearic acid, stearin, palmitic acid, ozokerite wax,

carnauba wax, chlorinated naphthalene and like bodies, as these when mixed with the emulsifiable wax-like bodies emulsify also in water, soap solutions and the like. With or in place of the above non-emulsifiable wax-like materials there may be used the fatty acid esters of triamylamine and similar amines.

For purposes of plasticizing and softening these wax-like bodies, there may be applied to the yarn simultaneously with the application of the wax-like body or in a separate operation, softening materials such as olive oil, oleic acid glycols, diethylene glycol, glycerols and/or their esters and ethers and the sulphonated naphthalenes. With or in place of the plasticizers or softeners there may be applied lubricants such as cotton seed oil, olive oil, etc.

This invention is applicable to the treatment of yarns or filaments under which terms are included threads, assemblies or bundles of a number of continuous filaments which may be in parallel relationship or which may be twisted together. The yarns and filaments are preferably those containing organic esters and ethers of cellulose. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of organic ethers of cellulose are ethyl cellulose, methyl cellulose, butyl cellulose and benzyl cellulose.

The yarns and filaments may have, besides the organic derivative of cellulose, effect materials such as pigments, filling materials, dyes or lakes, fire retardants, plasticizers, sizes and lubricants. These effect materials may be incorporated with the yarns or filaments by adding same to the solution from which the yarns or filaments are to be spun or by treating yarns and filaments with swelling agents and contacting the swollen yarns or filaments with the effect materials. Examples of swelling agents are thiocyanates of ammonium, sodium, potassium and calcium, zinc chloride, dilute phenol, dilute acetone, pyridine, ethyl ether of ethylene glycol and other suitable ethers and esters of glycol.

The wax-like bodies may be applied to the yarn in any suitable manner. For example they may be applied by contacting the yarn with a wick, roller, disc or other furnishing device, feeding the wax-like body dissolved in a molten state in warm naphtha, xylene, olive oil, glycols, glycerols, triethanolamine esters and ethers or mixtures of same; diethylene glycol, ethylene glycol and glycerols, mineral oil, the monomethyl or diethyl ether of ethylene glycol or their acetates, cyclohexanol, ethyl oxybutyrate, butyl alcohol, butyl acetate, ethylene diamine or other suitable solvent or carrier depending on the constituents of the material forming the wax-like bodies. The solvent or carrier subsequently evaporates or dries by oxidation leaving the filaments coated with the wax-like body. The yarn may be dipped in hank form in such a molten solution. The solution may be forced through the windings of a bobbin, cheese or other package of yarn. Again, the yarn may be coated by spraying same with such a solution.

If desired, such wax-like bodies may be applied to the yarn in the form of aqueous emulsions by hank dipping or similar process or the emulsion may be applied by drawing a single yarn there-through during a winding operation or by a roller or other furnishing device.

The wax-like bodies may be applied to the yarn in the absence of a solvent or carrier but while

in a molten condition. This may be conveniently accomplished by melting the wax-like body in a heated trough and applying the same to the yarn during a winding operation by means of a roller or other furnishing device.

The wax-like bodies may be applied in any winding operation. For example, the wax-like body may be applied to artificial yarns immediately after they leave the spinning chambers or the wax-like bodies may be applied, for example, in unwinding a cap spun package for twisting and rewinding on to a cheese or other type package.

The amount of wax-like body applied to the yarn will depend upon the wax-like body employed and the type of pile fabric to be formed. The amounts of wax-like body applied to the yarn will thus vary between $\frac{1}{2}$ to 20% of the weight of the yarn that is treated. The solidity of the wax and its melting point also will vary somewhat according to the wax-like bodies used. For example, the processing of certain fabrics appears to be improved more by the employment of a 10% finish of diethylene glycol stearate while others are improved most by a finish of 5% olive oil in which has been melted 10% diethylene glycol stearate on the weight of the olive oil. By increasing the content in the wax of a non-emulsifiable wax and/or restricting the scouring, amounts of wax, such as 0.3 to 1%, may be left on the pile to give it a stiffer drape or handle, which, under some circumstances, is desirable and in no way detracts from the dyeing.

The yarns may have any amount of twist from practically no twist to twenty turns per inch depending upon the type of pile to be formed and method of forming same or for special fabrics the yarn may be twisted to 150 turns per inch. For the purpose of forming transparent velvets, a twist of about five turns per inch and a coating of from 5 to 10% of a wax-like body of the consistency of diethylene glycol stearate is found to be preferable.

The fabrics may be woven with any type of yarn as the base material and with an organic derivative of cellulose as the pile. For example silk, cotton or cellulose acetate yarns may form the base fabric while cellulose acetate or other organic derivatives of cellulose yarns form the pile. The pile may be made of extra warp yarns as in velvets and plushes or of extra filling yarns as in velveteens and corduroys. These fabrics are processed in a manner usually employed in the processing of such fabrics. It is not necessary, however, to wash them as strenuously as is customary nor to exercise as much care to prevent crush effects. The pile may be set in any desired position preferably by wetting out the material and then steaming same while brushing, combing or pressing the pile, depending upon the effect desired. Pile formed of yarn treated according to this invention can be easily set in a position at right angles to the fabric and the yarns therefore lend themselves exceptionally well to the manufacture of transparent velvets having a silk backing and a cellulose acetate pile.

For the purpose of further describing this invention without being limited thereto, the following example is given.

Example

Cellulose acetate yarn of about 5 turns per inch is coated with 5% of diethylene glycol stearate. This yarn is formed as the pile on a silk backing into a transparent velvet. The pile is

cut and brushed erect in the presence of steam. Before or after brushing the fabric is washed free of stains and a part of the wax-like body. The washing is performed in an aqueous soap bath of such a temperature that about 0.35%, based on the weight of the yarn, of the wax-like body remains on the pile yarn after dyeing and finishing.

Having described our invention, what we desire to secure by Letters Patent is:

1. In a process for the production of a pile fabric, the pile of which comprises organic derivative of cellulose yarns, of improved properties, the step which comprises coating with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol at least part of the organic derivative of cellulose yarns in the pile thereof.

2. In a process for the production of a pile fabric, the pile of which comprises cellulose acetate yarns, of improved properties, the step which comprises coating with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol at least part of the cellulose acetate yarns in the pile thereof.

3. Process for the production of pile fabrics having a pile comprising yarns of organic derivatives of cellulose, which comprises applying to organic derivative of cellulose yarns a medium containing a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, causing the ester to be deposited on the yarn and forming the pile of a fabric from said yarn.

4. Process for the production of pile fabrics having a pile comprising yarns of cellulose acetate, which comprises applying to cellulose acetate yarns a medium containing a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, causing the ester to be deposited on the yarn and forming the pile of a fabric from said yarn.

5. Process for the production of pile fabrics having a pile comprising yarns of organic derivatives of cellulose, which comprises applying to organic derivative of cellulose yarns an emulsion of a higher fatty acid ester of a polyhydric alcohol and a wax-like material which is also a higher fatty acid ester of a polyhydric alcohol, causing the ester and wax-like material to be deposited on the yarn and forming the pile of a fabric from said yarn.

6. Process for the production of pile fabrics having a pile comprising yarns of cellulose acetate, which comprises applying to cellulose acetate yarns an emulsion of a higher fatty acid ester of a polyhydric alcohol and a wax-like material which is also a higher fatty acid ester of a polyhydric alcohol, causing the ester and wax-

like material to be deposited on the yarn and forming the pile of a fabric from said yarn.

7. Process for the production of pile fabrics having a pile comprising yarns of organic derivatives of cellulose, which comprises inserting pile yarns containing organic derivatives of cellulose coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, cutting the so coated pile yarns to form the pile of the fabric, setting the pile and thereafter removing the said ester from the pile.

8. Process for the production of pile fabrics having a pile comprising yarns of cellulose acetate, which comprises inserting pile yarns containing cellulose acetate coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, cutting the so coated pile yarns to form the pile of the fabric, setting the pile and thereafter removing the said ester from the pile.

9. A pile fabric of improved properties comprising a backing of silk and a pile containing organic derivative of cellulose yarns, said pile yarns being individually coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol.

10. A pile fabric of improved properties comprising a backing of silk and a pile containing cellulose acetate, said pile yarns being individually coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol.

11. A pile fabric of improved properties comprising a backing of cotton and a pile containing organic derivative of cellulose yarns, said pile yarns being individually coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol.

12. A pile fabric of improved properties comprising a backing of cotton and a pile containing cellulose acetate yarns, said pile yarns being individually coated with a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol.

13. In a process for the production of pile fabric having a pile comprising yarns of organic derivatives of cellulose, the steps of applying to the yarns a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, and then cutting the pile yarns.

14. In a process for the production of pile fabric having a pile comprising yarns of cellulose acetate, the steps of applying to the yarns a wax-like substance which is a higher fatty acid ester of a polyhydric alcohol, and then cutting the pile yarns.

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