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TREATMENT OF TEXTILE MATERIALS

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This invention relates to fabrics having a raised finish and more particularly to fabrics having such a finish and containing both animal fibres and fibres of cellulose acetate or other cellulose ester or ether.

It has long been a practice to subject woollen fabrics to the operation of "raising." This latter involves treating the fabrics so as to pull out the ends of a proportion of the wool fibres from the fabric in such a manner as to leave the other ends still anchored in the body of the fabric. The fabric thus acquires a pile such as is desirable on blankets and similar textile products intended for heat insulation purposes and particularly for bedding, articles of clothing, and the like. The pile so raised is often modified in various ways according to requirements. For example it may be brushed and cropped and if desired subjected to napping which usually involves agglomerating the cropped pile into a series of small tufts. The raising of fabrics is commonly effected on raising gigs in which the fabrics are subjected to the action of rotating cylinders having teazles (or wire teeth) mounted around their peripheries. ("Teazles" are the dried heads of a variety of thistle.)

In the case of raising fabrics containing both wool fibres and other fibres, for example fibres of cotton or staple fibres of regenerated cellulose or cellulose acetate, it is often desirable to raise the wool fibres preferentially so that the pile contains a greater proportion of wool fibres than does the fabric as a whole; in this way the wool content of the fabric is utilised to best advantage as regards its softness and warm feel.

We have discovered a method whereby it is possible to effect preferential raising of the wool or other animal fibres in a fabric containing both wool fibres and fibres of cellulose acetate or other cellulose ester or ether. In our new process we subject the fabric to an agency which softens the cellulose ester or ether and then, preferably after the cellulose ester or ether has been restored substantially to the unsoftened condition, we subject the fabric to a raising operation. The pile of the fabric so treated contains a considerably greater proportion of wool than does the pile when the softening treatment is omitted. The invention will be described more particularly in connection with fabrics containing cellulose acetate fibres.

The softening of the cellulose acetate can be effected most conveniently with the aid of organic softening agents therefor. Preferably the agent employed should be such as to shrink the cellulose acetate fibres but should not be such as

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to destroy the fibre form. Single organic substances can be employed but usually it is convenient to use mixtures of organic substances or mixtures of organic substances with water. Mixtures have the advantage that by adjusting the proportions of the constituents the softening or shrinking power can be adjusted within wide limits. In the case of cellulose acetate fibres mixtures of water with water-miscible solvents for cellulose acetate have been found very useful, for example mixtures of water with diacetone alcohol, acetone, ethylene-methylene-ether, dioxane, ethyl lactate, glycolmonomethyl ether acetate, propionic acid, acetic acid, formic acid, or other lower fatty acid of not more than four carbon atoms, or phenol or a cresol. Especially good results can be obtained by using, at 20–25° C., aqueous acetic acid of 30–45 or 50% strength (by volume) and particularly of about 40% strength, or aqueous formic acid of 30–45 or 50% strength by volume for example 36% strength. These aqueous lower fatty acids appear to have a softening action on the wool as well as on the cellulose acetate. Again diacetone alcohol of 50–65% strength, particularly about 60% strength at 20–25° C. can be used. Other softening agents of such nature and at such temperature that they have a similar softening effect on the cellulose acetate can also be used, for example aqueous glycol monomethyl ether acetate of about 40% strength at 20–25° C.

While the above aqueous softening mixtures have been found very useful, non-aqueous softening agents can be employed, for example methylene chloride, ethylene chloride, dichlorethylene, ethyl acetate and other latent solvents for cellulose acetate such as are referred to in U. S. Patent No. 2,070,583 for the shrinking of cellulose acetate fibres. These latent solvents can be used alone when they soften the cellulose acetate to the requisite degree, or mixed with one another or with inert diluents, e. g. hydrocarbons or carbon tetrachloride, in such proportions as to yield mixtures having the desired softening action on the cellulose acetate.

Again softening agents which are not sufficiently soluble in water to yield solutions capable of the desired degree of softening can be employed as aqueous dispersions. For example the methylene chloride, ethylene chloride, ethyl acetate or other latent solvents referred to above, or mixtures containing them, may be employed in this form.

If desired the organic softening agent can be wholly or in part replaced by inorganic soften-

ing agents, for example ammonium, alkali-metal, or alkaline-earth-metal thiocyanates. Thus an aqueous solution of one of these thiocyanates can be employed.

The treatment of the fabrics with the softening liquid is conveniently effected by soaking the fabrics therein for a sufficient time to ensure thorough wetting. Usually a soaking period of one to two hours is sufficient. If desired the fabrics may be milled while wet with softening liquid, for example by one or other of the methods used for milling woollen fabrics. The softening liquid may include a soap or other detergent or wetting agent. This milling results in a shrinkage of the fabric as a whole; further the resulting fabric tends to contain a greater proportion of wool in the surface fibres than in the fabric as a whole. In these respects the milling of the fabric while wet with softening liquid, particularly when a lower fatty acid is used, is more effective than milling while wet with a simple aqueous soap solution or other of the liquids commonly employed when milling woollen fabrics.

After the fabrics have been treated with the softening agents so as to soften the cellulose acetate and preferably so as to shrink the cellulose acetate fibres, the softening agents may be removed, for example by volatilisation or by washing with water (which may contain soap or other detergent or wetting agent) or other appropriate liquid. The fabrics are then subjected to a raising treatment, preferably while dry.

The raising treatment can be effected for instance with the aid of a raising gig in which teazles constitute the raising elements or with the aid of a raising gig in which wire teeth constitute the raising elements. The latter type of machine is commonly referred to as a Moser type machine. The fabric may be given a number of passes in contact with the raising elements and some of the passes may be in one direction and some in the opposite direction with respect to the fabric.

The treatment of the fabrics in accordance with the foregoing process involving softening and raising, may be carried out in conjunction with other treatments. For example the material may, before softening and raising, be subjected to milling, e. g. a milling in soap solution as commonly applied to woollen fabrics. Again the fabrics may be dyed in aqueous dye baths before the softening treatment, or after the softening treatment and before raising. Dyeing at the last-mentioned stage, that is after softening but before raising, often increases still further the wool content of the surface fibres. Further the fabrics may be subjected to a raising operation on one or both sides and either wet or dry before treatment in accordance with the invention. For example the fabrics may be subjected to raising on one side only while dry, whereby both fibres are raised, usually with a little preference in favour of the wool, and thereafter subjected to the softening treatment and this followed by raising of the other side. Again the fabric may be raised on one side while dry and on the other side while wet with water or other hydrophilic liquid, subjected to the softening treatment, and then raised on the side previously raised while dry. Further, the fabric may be raised on one side while wet, whereby the cellulose acetate fibres may be preferentially raised, subjected to the softening treatment, and then raised on the reverse side. By combinations involving the raising of one side followed by the raising of the other side after softening in accordance with the invention, it is possible to obtain raised fabrics in which the pile on one side contains a markedly greater proportion of wool than does the fabric as a whole while the pile on the other side contains about the same proportion of cellulose acetate fibres, or a rather greater proportion, than does the fabric as a whole.

The fabrics may be dyed before softening, or after softening and before raising as mentioned above, or they may be dyed after softening and raising. The dyeing may be effected so as to dye one fibre component only or so as to obtain a solid shade, or it may be effected so as to colour the wool fibres and the cellulose acetate fibres in contrasting shades. It is thus possible to obtain raised fabrics of which one side is of one colour while the other side is of a different colour. The wool fibres for instance may be dyed with acid dyes of a kind having little or no affinity for cellulose acetate and the cellulose acetate fibres with dispersions of water-insoluble dyes having little or no affinity for wool.

The treatment of the invention can be applied to woven or knitted fabrics of various constructions and particularly to those constructed after the manner of that adopted in the case of woolen fabrics to be given a raised finish, e. g. blanket fabrics. For example, a very suitable fabric is one consisting of a light warp of cotton yarns and a much heavier weft of yarns consisting of a mixture of wool fibres and cellulose acetate staple fibres, for instance in the ratio of about 1:2 by weight. Cotton yarns may also be present in the weft. Such fabrics may comprise from 5 to 25% of cotton, the balance being the above mixture of wool fibres and cellulose acetate fibres. Again both warp and weft may be composed of yarns comprising both wool fibres and cellulose acetate fibres or the warp may consist of yarns of cellulose acetate fibres and the weft of yarns comprising both wool fibres and cellulose acetate fibres. The yarns containing both wool fibres and cellulose acetate fibres may be made from a mixture of loose wool fibres and loose cellulose acetate staple fibres by carding, drawing, spinning, etc., or they may be made by doubling yarns of wool fibres with yarn of cellulose acetate fibres. Where yarns consisting of short lengths of cellulose acetate fibres are used they may be those made by cutting cellulose acetate filaments into short lengths and then forming them into a yarn by carding, spinning, etc., or they may be those made directly from a continuous filament yarn by cutting or breaking the filaments thereof at intervals along the length of the yarn.

The invention has been more particularly described in connection with fabrics containing cellulose acetate fibres. The fabrics may, however, comprise fibres of other cellulose esters or ethers, for example, cellulose propionate, cellulose butyrate, mixed esters, e. g. cellulose acetate-propionate or cellulose acetate-butyrate, ethyl cellulose, and benzyl cellulose. Further the cellulose acetate or other cellulose ester or ether fibres may be such as are obtained directly by dry spinning processes or they may be such as are obtained by dry spinning processes followed by stretching in the presence of a softening agent e. g. hot water or wet steam.

According to a modification of our invention the cellulose ester or ether fibres are replaced wholly or in part by other fibres which can be softened, and preferably shrunk, and the fabrics treated so as to soften the said fibres, the fabrics

being then raised as described above. Thus short lengths of fibres of natural or regenerated cellulose can be used (for example fibres of cellulose regenerated from viscose or cuprammonium solution or fibres made by completely saponifying stretched cellulose ester fibres) and softened with aqueous solutions of thiocyanates. Again fibres of polymerised vinylidene chloride or of a copolymer of vinyl chloride with vinyl acetate or fibres of linear superpolyamides, e. g. of a linear polyamide obtained from a dicarboxylic acid such as adipic acid and a diamine such as hexamethylene diamine, can be used. Some of these fibres can be softened by heating, e. g. in a liquid which is substantially inert towards the fibres.

The invention is illustrated by the following example:

A blanket fabric is prepared having a light cotton warp and a weft consisting of a heavy yarn (spun from a mixture of wool fibres and cellulose acetate staple fibres in the proportion of 1:2 by weight) doubled with a light cotton yarn. The fabric contains 20 to 25% of cotton, the remainder being the mixture of wool and cellulose acetate fibres. The fabric is scoured in soap solution, dried, and soaked for one hour at 20–25° C. in 10 times its weight either of aqueous acetic acid of 40% strength by volume, or of aqueous formic acid of 36% strength by volume. It is then hydro-extracted, rinsed in water, and dyed in an aqueous bath with a mixture of Coomassie Brilliant Blue F. F. S. and 1-methylamino-anthraquinone. The fabric is then dried and raised on both sides on a Moser raising machine. The predominating colour exhibited is blue due to the high proportion of wool in the pile.

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

1. Process for producing a pile upon textile fabrics made from yarns spun from a mixture of wool fibers and cellulose ester staple fibers, which comprises thoroughly wetting the fabric, milling the fabric while wet with an organic softening agent having a shrinking effect on the cellulose ester staple fibers alone so as to cause the shrinking of the cellulose ester staple fibers and the resulting fabric to contain a greater proportion of wool fibers in the surface fibers than in the fabric as a whole, removing the organic softening agent from the fabric, then subjecting the fabric to a raising treatment whereby there is produced upon the fabric a pile containing a greater proportion of wool than does the fabric as a whole.

2. Process for producing a pile upon textile fabrics made from yarns spun from a mixture of wool fibers and cellulose acetate staple fibers, which comprises thoroughly wetting the fabric, milling the fabric while wet with an organic softening agent having a shrinking effect on the cellulose acetate staple fibers alone so as to cause the shrinking of the cellulose acetate staple fibers and the resulting fabric to contain a greater proportion of wool fibers in the surface fibers than in the fabric as a whole, removing the organic softening agent from the fabric, then subjecting the fabric to a raising treatment whereby there is produced upon the fabric a pile containing a greater proportion of wool than does the fabric as a whole.

3. Process for producing a pile upon textile fabrics made from yarns spun from a mixture of wool fibers and cellulose acetate staple fibers, which comprises thoroughly wetting the fabric, milling the fabric while wet with an organic softening agent, which comprises aqueous acetic acid, having a shrinking effect on the cellulose acetate staple fibers alone so as to cause the shrinking of the cellulose acetate staple fibers and the resulting fabric to contain a greater proportion of wool fibers in the surface fibers than in the fabric as a whole, removing the organic softening agent, which comprises aqueous acetic acid, from the fabric, then subjecting the fabric to a raising treatment whereby there is produced upon the fabric a pile containing a greater proportion of wool than does the fabric as a whole.

4. Process for producing a pile upon textile fabrics made from yarns spun from a mixture of wool fibers and cellulose acetate staple fibers, which comprises thoroughly wetting the fabric, milling the fabric while wet with an organic softening agent, which comprises aqueous formic acid, having a shrinking effect on the cellulose acetate staple fibers alone so as to cause the shrinking of the cellulose acetate staple fibers and the resulting fabric to contain a greater proportion of wool fibers in the surface fibers than in the fabric as a whole, removing the organic softening agent, which comprises aqueous formic acid, from the fabric, then subjecting the fabric to a raising treatment whereby there is produced upon the fabric a pile containing a greater proportion of wool than does the fabric as a whole.

5. Process for producing a pile upon textile fabrics made from yarns spun from a mixture of wool fibers and cellulose acetate staple fibers, which comprises thoroughly wetting the fabric, milling the fabric while wet with an organic softening agent, which comprises aqueous diacetone alcohol, having a shrinking effect on the cellulose acetate staple fibers alone so as to cause the shrinking of the cellulose acetate staple fibers and the resulting fabric to contain a greater proportion of wool fibers in the surface fibers than in the fabric as a whole, removing the organic softening agent, which comprises aqueous diacetone alcohol, from the fabric, then subjecting the fabric to a raising treatment whereby there is produced upon the fabric a pile containing a greater proportion of wool than does the fabric as a whole.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,480,352	Suzuki	Jan 8, 1924
1,554,801	Dreyfus	Sept. 22, 1925
1,808,098	Briggs	June 2, 1931
2,035,641	Dickie	Mar. 31, 1936
2,163,674	Gentle	June 27, 1939
2,200,134	Schlack	May 7, 1940
2,296,329	Bell	Sept. 22, 1942
2,305,526	Hadley	Dec. 15, 1942
2,338,792	Whitehead	Jan. 11, 1944
2,352,245	Bell	June 27, 1944
2,459,236	McKee	Jan. 18, 1949

FOREIGN PATENTS

Number	Country	Date
547,886	Great Britain	Sept. 16, 1942