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FINISHING OF TEXTILE FABRICS

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This invention relates to the finishing of textile fabrics, particularly fabrics containing both animal fibres and fibres of cellulose acetate or other cellulose ester or ether.

As is well known textile fabrics of wool are rarely utilised in the form in which they leave the loom or knitting machine. Almost invariably they are subjected to treatment, particularly scouring in soap solutions, milling, raising, and so on, and by these treatments it is possible to modify profoundly the initial character of the fabric. Such profound modification is rendered possible by the unique properties of wool, and similar modification is much less easy to effect when the fabrics contain a substantial proportion of other fibres. Thus a fabric composed of yarns of a mixture of wool fibres and cellulose acetate staple fibres (say in equal parts) is much less amenable to modification by finishing than is a fabric composed wholly of wool.

We have found that in the case of fabrics composed of both wool and cellulose acetate staple fibres very valuable results can be obtained, for example in the direction of consolidation of the fabric and of increasing the proportion of wool in the surface of the fabric, by subjecting the fabric to the action of aqueous acetic acid or other lower fatty acid of from 30 to 50 per cent strength.

While this acid treatment alone is capable of effecting the desirable modification of the fabric indicated above, it may be utilised in conjunction with other treatments such as milling, raising and so forth. For example the material may be milled while wetted with an aqueous soap solution or dilute acid (e. g. dilute sulphuric acid) either before or after the treatment with aqueous lower fatty acid. On the other hand if the latter treatment is omitted the same degree of compacting and shrinkage of the material cannot be attained even with much prolonged periods of milling; moreover the surface of the fabric is less even and considerable "balling" may be in evidence. Again the material may be milled while wetted with the aqueous lower fatty acid, whereby modification of the material similar to that resulting from the milling of all-wool fabrics can be secured in shorter time or to a greater degree than is otherwise possible.

As mentioned above the aqueous lower fatty acid should be of 30 to 50% strength by volume and may be employed at ordinary temperatures of say 20 to 25° C. In the case of acetic acid concentrations of 35 to 40% strength and particularly about 40% strength (by volume) are to be recommended. In the case of formic acid

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the strength (by volume) is advantageously rather lower, for example 32 to 40% and particularly about 36%. Propionic acid can be employed as the acid and in general fatty acids of up to 4 carbon atoms. Acetic acid and formic acid are, however, preferred.

It appears that the aqueous lower fatty acid softens substantially and shrinks the cellulose acetate fibres of the fabric but in addition we have observed that it has a pronounced action on the wool fibres, possibly softening them substantially. We have in fact found that if the aqueous lower fatty acid is replaced by other liquid capable of softening the cellulose acetate the same excellent results are not attained even though the said liquid is one which softens or shinks the cellulose acetate fibres to about the same degree.

Nevertheless when the fabrics are milled while wet with such other softening liquids the milling operation is more effective than milling as ordinarily practised, both from the point of view of the final result and the speed with which the latter is obtained. In effecting such milling in the presence of a softening agent for the cellulose acetate fibres various softening liquids can be employed but it is much preferred that they should be such as to soften the cellulose acetate fibres to an extent within the range of softening effected by aqueous solutions of acetic acid of 30 to 50% strength by volume at 20 to 25° C. and preferably to an extent within the range of softening effected by aqueous solutions of acetic acid of 35 to 45% strength at 20 to 25° C. For example aqueous diacetone alcohol of 50 to 65% strength, especially about 60% strength, aqueous dioxane of about 45% strength, or aqueous glycol monomethyl ether acetate of about 40% strength, may be employed at 20 to 25° C. Other softening agents which may be used are mixtures of water with acetone, ethylene-methylene ether, ethyl lactate, or phenol or a cresol; or inorganic softening agents, for example ammonium, alkali metal, or alkaline-earth metal thiocyanates can be used in the form of aqueous solutions. As mentioned above, however, none of these softening agents seem to be capable of yielding the results attainable with aqueous lower fatty acid of 30 to 50% strength.

The treatment of the invention can be applied to woven or knitted fabrics and is of especial value in the case of producing fabrics of the kind suitable for use as suiting materials. Both warp and weft may be composed of yarns comprising both wool fibres and cellulose acetate fibres.

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Again yarns consisting wholly of wool fibres, cellulose acetate fibres, cotton or other fibres, may be used in conjunction with 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 yarns of cellulose acetate fibres. In general the most useful results are obtained with yarns spun from a mixture of wool fibres and cellulose acetate staple fibres and which therefore comprise a substantially uniform mixture of the two fibres. The proportion of wool in the yarns may be from 30 to 75% or more (by weight) and very good results may be obtained using yarns containing from 50 to 70% of wool.

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 yarns by carding, spinning, etc., or they may be those made directly from continuous filament yarn by cutting or breaking the filaments at intervals along the length of the yarn.

The cellulose acetate 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.

The invention is illustrated by the following examples:

Example I

A fabric knitted from a yarn spun from a mixture of equal parts of wool fibres and cellulose acetate fibres is scoured and soaked for 15 minutes in 10 times its weight of aqueous acetic acid of 40% strength (by volume). The material is then well rinsed in cold water, centrifuged, dried and ironed. The treatment results in shrinkage of the area of the fabric by about 20%. If, before drying, the material is neutralised in weak ammonia solution and again rinsed, the shrinkage is slightly greater.

Upon dyeing the material with Coomassie Brilliant Blue F. F. S. (a wool dye) and 1-methylamino-anthraquinone (a red dye for cellulose acetate) from a neutral bath the resulting fabric is predominantly blue, due to the high wool content of the surface of the material.

The treated material shrinks comparatively little when subjected to washing. For example if subjected to three hand millings of 15 minutes each in a 7.5% soap solution (with rinsing and drying between each milling) the reduction in area is only about 10% compared with about 25% for the untreated material and about 40% for a similar fabric made entirely of wool. Further, this hand milling of the treated fabric does not spoil the surface uniformity, e. g. by causing "balling" of the surface fibres.

A similar good result is obtained if aqueous formic acid of 36% strength (by volume) is used in place of the aqueous acetic acid.

If the aqueous acids are replaced by aqueous dioxane (45% strength by volume) or aqueous glycol monomethylether acetate (40% strength by volume) the wool surface effect is likewise shown but to a considerably less degree.

Example II

A suiting material woven from yarns spun from a mixture, in equal parts, of wool fibres and

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cellulose acetate staple fibres is scoured, soaked for 15 minutes in 10 times its weight of aqueous acetic acid of 40% strength (by volume) at 20 to 25° C., and is then well rinsed in water and dried. The surface of the resulting fabric contains a higher proportion of wool than does the fabric as a whole, as can readily be revealed by dyeing the material with a wool dye or with both a wool dye and a cellulose acetate dye of contrasting shade. Further the surface uniformity is very good and is retained when the material is subsequently milled in soap solution or in acid, for example for 15 minutes with 20 times its weight of 0.2% aqueous sulphuric acid (i. e. 4% of sulphuric acid on the weight of the material). If the same material is milled without the acetic acid treatment there is a tendency to production of an uneven surface, very apparent upon dyeing, due to "balling" of the surface fibres.

The acetic acid treatment can also be applied with advantage after the material has been milled or even after it has been both milled and dyed, whereby the uniformity of the surface can be greatly improved.

In this example the 40% aqueous acetic acid can be replaced by aqueous formic acid of 36% strength (by volume) with similar results.

Example III

A woven fabric of a twill construction, having a worsted warp and a woollen weft, both consisting of yarn spun from a mixture of equal parts of wool fibres and cellulose acetate staple fibres, is scoured, air dried, and steeped in 5 times its weight of aqueous acetic acid of 40% strength (by volume) for 15 minutes at 20 to 25° C. It is then drained, milled for 3 hours in a Williams-Peace type milling machine, well rinsed in cold or lukewarm water, and dried. Shrinkage of the fabric occurs to an extent which requires about 6½ hours milling in a soap solution. At the same time the material is consolidated and the surface contains a higher proportion of wool than does the material as a whole.

Example IV

A light-weight fabric of the following structure is prepared:

Weave: 3/1 reversible.

Warp: 2/60's cotton yarn.

Weft: 20's Y. S. yarn spung from a mixture of equal weights of wool fibres and cellulose acetate staple fibres.

The material is scoured, air dried, and steeped in 5 times its weight of aqueous acetic acid of 40% strength (by volume) at 20 to 25° C. for 15 minutes. It is then centrifuged lightly and milled in a Williams-Peace type milling machine for 30 minutes. The shrinkage in width is about 44% compared with 29% for a similar piece of material which has been soap milled for 90 minutes.

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

1. Process of finishing a textile fabric made from yarns of a mixture of wool fibres and cellulose acetate staple fibres so as to consolidate the fabric and to increase the proportion of wool in the surface of the fabric, which comprises milling the fabric while wet with an aqueous solution of a lower saturated fatty acid containing up to 4 carbon atoms of 30-50% strength by volume.

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2. Process of finishing a textile fabric made from yarns of a mixture of wool fibres and cellulose acetate staple fibres so as to consolidate the fabric and to increase the proportion of wool in the surface of the fabric, which comprises milling the fabric while wet with aqueous acetic acid of about 40% strength by volume.

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