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FINISHING

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This invention relates to a process of producing finishing effects unaffected by washing, particularly in textiles like woven or knit fabrics as well as yarns which consist of or contain fibers of regenerated or native cellulose, oxycellulose behaving like cellulose in this respect.

For finishing material of this kind various substances are being used at present which are applied to or incorporated into the fiber, the term "finishing" excluding of course dyeing. Being foreign to the material to be treated these substances adhere only lightly thereto, and the usual preparations disclose not only very slight resistance to washing but in most instances are not even stable in water.

Finishing effects showing greater stability have successfully been produced only recently by the application of artificial resins to the fiber which as a rule are condensed thereon from components. It has further been proposed to form on the fiber condensation products with the cellulose itself after applying chemically active compounds, and according to another method certain dispersion agents obtained from metastable dispersions can be applied in a relatively firm manner. Although fastness to water is considerably increased in this way, resistance to washing unfortunately still remains quite low. The dispersing power of the usual washing agents is generally considerably greater than the adhesiveness of such substances. Furthermore, the application of these finishing processes is not simple, and it requires for instance extraordinary experience to keep damages to the fiber which occur in the course of these processes within reasonable limits.

To obtain certain effects another process has been suggested which consists in treating textiles containing cellulose with swelling media. In this process the cellulose is almost instantly fully converted into a transparent polysaccharide, and the goods produced are sold as glass batistes, organdies, etc., but these highly transparent effects are obtained at the expense of a thorogoing change of the fibrous structure. It is a peculiar fact that all known swelling agents can perform such swelling action only in certain concentrations while the reaction itself occurs at an extraordinary speed. The conditions prevailing in this respect are described for instance in German Patents Nos. 642,998 and 643,340. It is evident that owing to the change of the character of the goods the effect produced cannot be designated as finishing effect.

It is the object of the invention to produce in a similar manner a real finishing effect which resists washing and of course water and preserves the nature of the goods within wide limits, and the invention attains this object by providing for limited swelling, transparency developing either not at all or only to an insignificant extent.

Limited swelling can be produced in various ways, and the methods available for this purpose are briefly described below.

As in the known processes for obtaining transparent effects solutions may be used which per se are capable of causing extensive swelling and producing a transparent effect. These swelling agents, however, are applied to the fiber in quantities amounting only to 10% to 50% of the weight of the goods, so that it is necessary to thoroughly distribute this slight amount over the fiber. This can be done in a very simple manner by spraying the swelling solution in the form of mist or by employing a suitably adjusted squeezer.

Another method consists in applying the regular swelling agents in concentrations lower than those required for attaining transparent effects. It is not possible of course to use any low concentrations but those employed should have only slightly less strength than is required for producing transparent effects. This affords the advantage of working with baths.

Another possibility consists in using compounds which are capable of swelling only to a limited degree or which in any concentrations at the temperature employed yield only the desired limited swelling. Compounds of this type are therefore unable of producing transparent effects. They comprise chiefly mixtures of salts which per se do not produce a swelling effect but can do so in mixture with other salts or with each other, such as calcium and magnesium salts. More will be said about them below.

In the application of the three methods mentioned the agents in the bath or otherwise are permitted to act for a while, whereupon the goods are preliminarily dried if necessary and then rinsed and dried finally.

It has been found that the textile materials used for the tests were capable of reacting at different speeds, regenerated cellulose showing the quickest reaction and coarse native one the slowest.

When drying is effected after the slight, preferably superficial, swelling and removal of the swelling agent by rinsing, the surface of the fiber appears to be changed, as it is not smooth as before but seems to be covered with crater-shaped elevations and depressions. The mat surface thus produced is particularly desirable for goods

which previously had an unsightly luster, but the roughening of the surface increases also the apparent volume and owing to the reduction of the frequently excessive smoothness insures better workability and greater durability. Swelling further imparts a certain plasticity to the fiber or its surface with the result that the tensile and compressive stresses of the textile structure are extensively compensated whereby the fibers are adapted to one another. The fibers moreover approach one another and may even partially adhere to one another in a superficial way, so that the textile structure is stiffened and made more durable without any increase in weight as the finish is so to speak formed out of the fiber. This effect may be heightened still more by subjecting the plastic structure to pressure and/or heat. In this way tighter packing is obtained, the air spaces between the fibers and layers of fibers become smaller and the increase in the stiffness of the material after removal of the swelling agent is still greater. When yarns are treated in this manner and then defibered according to known methods, staples of single fibers will result which appear curly and can be made into woollike yarns and fabrics. As the matting of the surface has a similar effect as the scaly structure of wool fibers, material of this class may even be fulled when mixed with animal fiber.

Of the swelling media available salts are preferred, though acids and alkalies also produce good results. When acids are used, drying before rinsing should be omitted in view of saccharification. In case of alkalies a relatively strong formation of oxycellulose is often troublesome, so that lower concentrations should be given preference, which can easily be accomplished due to the wide scope of reaction of alkalies.

The following examples are intended to explain the process according to the invention without restricting the latter to the disclosures made.

Example 1

On a three roller foulard an artificial crêpe is passed between the second and third roller, the rollers being so adjusted that the fabric can take up 30% of 40° Baumé nitric acid. The goods that are only slightly moistened in this way are then permitted to lie for a while, whereupon they are thoroughly rinsed in flowing water and dried. The fabric has then acquired a full water-and wash-resisting feel.

Example 2

A zinc chloride solution of 67° Bé. is applied to garment material of cellulose wool to the extent of 30% of the weight of the fabric by means of a sprayer. The fabric is then rolled up and left in that condition for half an hour and afterwards thoroughly rinsed and dried. It will disclose a stable and fuller handle.

Example 3a

On a correspondingly adjusted squeezer an artificial silk tricot is passed in such manner that, by suitable squeezing, only 50% of phosphoric acid of 55° Bé. can be taken up. After approximately 15 minutes of this treatment the fabric is carefully rinsed with flowing water and then dried. The tricot has a fuller feel which is not harder, however, and possesses the desired stability.

Example 3b

If the tricot passes through phosphoric acid of the same strength at normal squeezing pressure while absorbing acid equal to 100%–130% of its weight and is then instantly rinsed in water and dried, the material will become very stiff and be greatly injured so as to be practically useless.

Example 4

On a spraying machine a lining material is moistened with a 40° Bé. solution of calcium thiocyanate, rolled up for half an hour, then well rinsed and dried. This treatment imparts a stronger feel to the lining, which resists washing.

Example 5

To produce a water resisting finishing effect on a mixed fabric of wool or cellulose wool the fabric is passed on a squeezer through a 55° Bé. solution of phosphoric acid, the rollers being adjusted so that the fabric can take up solution to the extent of 50% of its weight. Being rinsed and dried the fabric will show the desired stable and full feel.

Example 6

The procedure is similar to that outlined in Example 5, except that sulfuric acid of 49° Bé. is used which produces a similar effect upon the mixed material.

Example 7

A printed cotton fabric is sprayed up to 30% of its weight with a 55° Bé. solution of phosphoric acid, rolled up for half an hour, then thoroughly rinsed while adding some alkali and dried. The fabric shows a full stable feel.

Example 8

The printed cotton fabric of Example 7 is passed through a bath of 21° Bé. soda lye on a foulard machine, and is then treated as described in the example. The result is also a full and stable feel.

Example 9

On a gumming machine a garment material of cellulose wool is passed through a bath of 8° Bé. soda lye, then allowed to lie for half an hour, well rinsed and dried. It will acquire the desired full and wash-resisting feel.

Example 10

The material treated according to Example 2 is passed on a gumming machine through a bath containing a 48° Bé. solution of zinc chloride, squeezed and dried. It will then show a similar stable feel as the material of Example 2.

Example 11

A washing-tricot of artificial silk is sprayed on a machine with a 55° Bé. solution of zinc chloride until the weight of the fabric has increased 30%. The fabric is then rolled up and left so for 30 minutes when it is passed through an embossing calender one roller of which is heated to 160° C. The fabric is then thoroughly rinsed and dried and shows a wash-resisting pattern.

Example 12

While a solution of 30 g. zinc chloride in 50 ccm. water, acting for hours on artificial silk which is then rinsed and dried, produces only a slight stiffening effect, even if the fabric is pressed in wet condition through rollers, and a solution of 50 g. calcium chloride (anhydrous) in 50 ccm. water is equally ineffective, will a solution containing 50 g. calcium chloride and 30 g. zinc chloride in 50 ccm. water yield a practically satisfactory effect already after short treatment which

can be increased still more by adding 5% to 25% urea or glycerin to the solution. In this mixture calcium chloride may be wholly or partly replaced by magnesium chloride which per se will not produce any effect at all. It is possible to add slight quantities of wetting agents like sodium butylnaphthalenesulfonate or sodium dodecanolsulfate.

Example 13

An artificial silk tricot is shortly treated in a vat with a solution at 50° C. which contains in 50 parts of water 50 parts of anhydrous calcium chloride and 30 parts calcium thiocyanate in solution. The fabric is then subjected to hydroextraction, allowed to rest for half an hour and thoroughly rinsed in warm water. This is followed by hydroextraction and drying. The fabric has a substantial feel unaffected by washing, particularly desirable for top shirts, looks almost like woven goods and shows great resistance to friction.

Example 14

A printed cotton fabric is treated on a foulard machine at 40° C. in a solution containing in 50 ccm. water 50 g. anhydrous calcium chloride, 40 g. anhydrous zinc chloride and 10 g. urea. The urea aids in swelling as does glycerin in similar manner. After squeezing the fabric is left lying for 10 to 20 minutes, thoroughly rinsed in ample quantities of cold or warm water, hydroextracted and dried. The goods treated with the solutions may also be dried at once and rinsed afterwards if the fiber is not damaged thereby. The fabric discloses a clear stiffening effect as often desired for period dresses and costumes.

Example 15

A garment material of cellulose wool is passed on a gumming machine through a bath comprising 40 parts water, 40 parts anhydrous calcium chloride and 50 parts concentrated formic acid. The fabric is squeezed off, allowed to rest for 30 minutes, strongly rinsed with cold water and dried. The feel produced is stable and full.

Example 16

An artificial silk lining is treated on a foulard machine in a bath of 6.5° Bé. soda lye to which 3% sodium aluminate has been added, then squeezed, thoroughly rinsed and dried. It has a full feel and its density and resistance to internal displacement are considerably increased. The effects produced will withstand normal washing. Soda lye of 6.5° Bé. alone produces only a slight effect and 3% sodium aluminate per se none at all.

Example 17

A cotton garment fabric is briefly treated in a bath as in Example 16, the bath containing 21° Bé. soda lye in which 5% zinc oxide is dissolved. The fabric has a full feel and resists washing while the feel produced with a 21° Bé. soda lye alone is much weaker.

Example 18

An artificial silk material of uniform color is treated on a foulard machine in a bath comprising 50 parts calcium chloride, 50 parts water, 30 parts zinc chloride and 20 parts urea. The fabric is then squeezed, hydroextracted and preliminarily dried, passed through an embossing calender and finally dried. The embossed effects will resist water and, partly, washing. In the same manner bushels of fibers and individual fibers can be shaped.

Example 19

If the effects according to the invention are to be obtained by means of baths, the concentration of the swelling agent should be lower than that required for producing transparent or parchment-like effects. These concentrations are for instance for phosphoric acid 50° Bé., for hydrochloric acid 20° Bé, for nitric acid 35° Bé., alkali hydroxides 10° Bé., zinc chloride 50 Bé., calcium thiocyanate 25° Bé., ammonical copper oxide 0.3% copper content, sulfuric acid 49° Bé. at —10° C. and 46° Bé. at room temperature. Solutions falling slightly below these values should be used in treating, whereupon rinsing is resorted to which if saltlike swelling agents are used might be interrupted by preliminary drying to be completed after rinsing.

On the other hand, if the method of applying 10% to 50% of the agent to the fiber is employed, the concentrations stated in the preceding paragraph may be used and even exceeded.

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