Patented June 3, 1941 2,243,843

UNITED STATES PATENT OFFICE

2,243,843

MANUFACTURE AND TREATMENT OF TEXTILE FABRICS

Donald Finlayson, Ernest Leslie Greenwood, and Thomas Pride Dee, Spondon, near Derby, England, assignors to Celanese Corporation of America, a corporation of Delaware

No Drawing. Application October 1, 1938, Serial No. 232,898. In Great Britain October 12, 1937

3 Claims. (Cl. 28—1)

This invention relates to the manufacture and treatment of textile fabrics and especially to the manufacture and treatment of crepe fabrics.

Fabrics exhibiting crepe effects may be produced by weaving together yarns which have been twisted to a high degree and yarns which have only a relatively low degree of twist, and thereafter subjecting the fabrics obtained to treatment with a liquid medium, e. g. a hot aqueous medium, which causes the high twist yarns to cockle. A typical fabric of this kind, is, for example, one in which the whole of the warp yarns are yarns of ordinary low twist and the whole of the weft yarns are yarns of high twist, pairs of yarns of left-hand twist alternating in the weft with pairs of yarns of right-hand twist. The cockling is apparently due to the slight swelling effect of the liquid medium on the high-twist yarns. If the liquid medium has too strong a swelling effect on the high twist yarns these appear to yield instead of cockling and the crepe effect is not obtained. Crepe effects on fabrics composed entirely of high-twist yarns can be obtained in a similar way, the liquid medium producing cockling of both weft and warp.

According to the present invention, crepe effects are produced on woven fabrics containing a weft of high twist artificial yarns which after spinning have been stretched, by causing the weft yarns to cockle by treatment of the fabric in a liquid medium adapted to exert a specific softening action on the warp yarns under the conditions of treatment. The softening effect may be produced by the use of an agent which merely softens the material of the warp yarns physically, or the softening may be accompanied by chemical action, e. g., saponification. Thus, for example, where the warp yarns are composed of an organic ester of cellulose, the softening may be effected by the use of a swelling agent for the ester, for example a lower aliphatic alcohol, or by the use of a plasticiser for the ester, or a saponifying agent may be used.

In the case of fabrics in which the weft is of high twist yarn and the warp of low twist yarn, it is preferable that the specific swelling action of the liquid medium should be exerted upon the warp yarns only. To facilitate this, it is of advantage for the weft and warp yarns to be of different material. Thus, for example, the fabric treated may have a warp of low twist cellulose acetate or other organic ester of cellulose filled with a weft of high twist regenerated cellulosic yarn which has been stretched at some stage after spinning. With such a fabric no difficulty is experienced in selecting a liquid medium adapted to exert the desired softening effect on the warp yarns without substantially softening the weft yarns. Whatever the nature of the fabric treated, the liquid medium must have, in addition to its specific softening action on the warp yarns, a swelling action on the weft yarns sufficient to cause the desired cockling. As indicated above, this cockling is not obtained if the swelling action of the liquid medium on the weft yarns is too great.

Various methods are available for producing the stretched yarn for the weft. A yarn having a basis of an organic derivative of cellulose may, for example, be stretched in a softening condition and subsequently highly twisted. The stretching may be effected under the influence of hot water or moist steam, as described in U. S. Applications S. Nos. 121,150, 121,151 and 121,152, all filed on January 18, 1937, and 123,104, 123,105 and 123,106, all filed on January 30, 1937. Alternatively, a cellulose derivative yarn may be highly twisted under the influence of hot water or moist steam, as described in U. S. Patents Nos. 2,088,628, 2,088,587, 2,089,191 and 2,127,554. In such a twisting process, stretching of the yarn naturally occurs. The weft yarn may, as indicated above, be composed of regenerated cellulose. Thus, a suitable yarn for the weft may be made, for example, by stretching a yarn of cellulose acetate or other organic ester of cellulose, for instance under the influence of hot water or moist steam, saponifying the stretched yarn, and subsequently inserting the high twist. According to a modification of the invention, there may be used for the weft, instead of a yarn which has been stretched after spinning, a yarn which has been wet spun under such conditions that it has a high tenacity. Thus, for example, a yarn may be spun from a solution of cellulose acetate or other organic derivative of cellulose into a bath containing a softening agent for the cellulose derivative and may be stretched to a considerable extent during spinning, as a result of which the yarn has a high tenacity. The desired weft may be made from such a yarn by highly twisting with or without previous saponification. Or regenerated cellulosic yarns may be made directly by a wet spinning process carried out under such conditions as to produce a yarn of high tenacity. Yarns which at some stage in their production have been stretched to a considerable extent are in general more resistant to softening agents

than yarns of the same chemical nature which have not been so stretched. Thus, the use of such stretched yarns in the weft affords the possibility of employing a warp of the same chemical nature but so much more susceptible to the action of the softening agent that softening of the warp without unduly softening the weft presents no difficulty.

The warp preferably consists of a low twist cellulose acetate yarn. Other materials, however, can be used in the warp, for example natural silk, natural or regenerated cellulose and organic derivatives of cellulose other than cellulose acetate, for example simple organic esters such as cellulose propionate and butyrate, mixed organic esters such as cellulose acetate-propionate and cellulose acetate-butyrate, organic-inorganic esters, for example cellulose nitrate-acetate, cellulose ethers, for example methyl, ethyl and benzyl celluloses, and cellulose ether-esters, for instance ethyl cellulose acetate and oxyethyl cellulose acetate.

The softening agent employed will depend on the nature of the warp and weft yarns. Where the warp yarns have a basis of cellulose acetate or other organic derivatives of cellulose, suitable softening agents without chemical action on the materials are plasticisers and other mild softening agents for the cellulose derivatives, e. g. p-toluene sulphonamide and diethylene glycol. Suitable softening agents which also saponify organic esters of cellulose are caustic soda, trisodium phosphate, sodium silicate and sodium carbonate, organic bases such as methylamine, ethylamine, ethylene diamine and benzylamine. Many of such bases have a stronger softening action on organic esters of cellulose than have mineral saponifying agents, and this must be borne in mind when selecting a suitable softening agent for a fabric the weft as well as the warp of which is composed of an organic ester of cellulose. The liquid medium employed to produce the cockling of the weft yarns and softening of the weft yarns is preferably a hot aqueous solution of the softening agent.

The following examples illustrate the invention:

Example 1

A fabric of the following construction

Warp—100 denier low twist cellulose acetate yarn,

Weft—55 denier completely saponified, 10 times stretched cellulose acetate yarn, 85 turns per inch

is boiled for 1 hour in an aqueous bath containing 5 grams per litre of sodium phosphate. A fine regular crepe twist results.

Example 2

The process is carried out as in Example 1, except that the bath contains instead of sodium phosphate 1 gram per litre of paratoluene sulphonamide.

Example 3

The process is carried out as in Example 1, except that the bath contains instead of sodium phosphate 1 gram per litre of soda ash.

Example 4

The process is carried out as in Example 1, except that the fabric has the following structure:

Warp—75 denier low cellulose acetate yarn,

Weft—55 denier completely saponified, 10 times stretched cellulose acetate yarn, 78 turns per inch,

and the bath contains instead of sodium phosphate 2 grams per litre of triethanolamine oleate.

Example 5

The process is carried out as in Example 4, except that the bath contains instead of triethanolamine oleate 5 grams per litre of paratoluene sulphonamide.

The process of the invention has been described with particular reference to the treatment of fabrics containing a weft of high twist artificial yarns which after spinning have been stretched, and a warp of low twist yarns. It is obvious, however, that similar effects could be obtained on fabrics having the low twist yarns in the weft and the stretched high twist yarns in the warp. Such fabrics are not commonly made since it is more convenient to employ the high twist yarn as the weft in making a fabric in which only one of the components is desired to be of high twist. To apply the process of the invention to a fabric having a warp of high twist stretched yarn filled with a weft of low twist yarn would, however, be an obvious equivalent of the process claimed.

"High tenacity" in this specification means at least 1.75 grams per denier. The tenacity of yarns stretched during or after spinning may be much higher than this, e. g. 2–3 or 4 grams per denier or even higher.

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

1. Process for the production of crepe fabrics which comprises subjecting a woven fabric containing a weft made by highly twisting a regenerated cellulosic yarn of high tenacity and a warp of low twist yarn of an organic ester of cellulose to a liquid treatment adapted to cause said weft to cockle, said treatment comprising subjecting the fabric to the action of a hot aqueous alkaline solution having at the temperature of application a slight swelling effect on the weft and a substantially greater swelling effect on the warp, said solution having an alkalinity at least as high as that of an aqueous solution containing one gram per liter of soda ash.

2. Process for the production of crepe fabrics which comprises subjecting a woven fabric containing a weft made by highly twisting a regenerated cellulosic yarn of high tenacity and a warp of low twist yarn of cellulose acetate to a liquid treatment adapted to cause said weft to cockle, said treatment comprising subjecting the fabric to the action of a hot aqueous alkaline solution having at the temperature of application a slight swelling effect on the weft and a substantially greater swelling effect on the warp, said solution having an alkalinity at least as high as that of an aqueous solution containing one gram per liter of soda ash.

3. Process for the production of crepe effects on fabrics having a weft of regenerated cellulosic yarn produced by highly twisting yarn made by the complete saponification of cellulose acetate yarn of high tenacity and a warp of low twist cellulose acetate yarn of normal tenacity, which comprises causing the weft yarns to cockle by treatment of the fabric in a hot aqueous solution of trisodium phosphate.

DONALD FINLAYSON.
ERNEST LESLIE GREENWOOD.
THOMAS I RIDE DEE.