

UNITED STATES PATENT OFFICE

1,993,922

TEXTILE MATERIAL

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No Drawing. Application May 5, 1931, Serial No. 535,287. In Great Britain May 16, 1930

3 Claims. (Cl. 28—1)

This invention relates to the manufacture of textile fabrics exhibiting crepe effects.

Textile fabrics exhibiting crepe effects have long been obtained by employing in their construction highly twisted yarns, hereinafter referred to as crepe yarns or crepe threads, made of natural silk in the gummed state, the crepe effects appearing when the gum is subsequently removed by scouring or like treatment. The production of crepe effects by the employment of highly twisted crepe threads made of cellulose acetate or other organic derivatives of cellulose is however accomplished with considerable difficulty.

We have now found that highly twisted yarns containing filaments of cellulose acetate or other organic derivatives of cellulose may successfully be utilized as crepe threads in the production of crepe fabrics, if the filaments are provided with a coating or outer layer of cellulose. On treating with an aqueous scouring bath a fabric comprising crepe threads made of or containing such cellulose coated filaments, valuable crepe effects may be produced.

It appears probable that the scouring treatment causes a swelling of the cellulose coatings of the crepe thread filaments and that the crepe threads, in consequence of the high twist, are constrained to shrink in length and so give rise to the desired effects. Indeed we have found that crepe effects are produced if the scouring treatment is replaced by any other treatment capable of swelling cellulose coatings. Further, we have observed that the cellulosic coatings may be replaced by coatings of cellulose derivatives capable of being swollen by an aqueous scouring bath or other treatment.

Crepe threads composed of filaments of other non-cellulosic materials may be utilized in an analogous manner, if the filaments are provided with a coating of cellulose or of a cellulose derivative capable of being swollen. The term "non cellulosic material" is used in this specification to connote materials other than celluloses or regenerated celluloses; it includes substitution derivatives of cellulose for example cellulose acetate or other cellulose esters, or cellulose ethers.

Broadly, therefore, our invention consists in a manufacture of fabrics exhibiting crepe effects which comprises incorporating in the fabrics highly twisted crepe threads made of or containing non-cellulosic filaments which are provided with coatings or outer layers of a cellulose or a cellulose derivative which may be caused to

swell by an aqueous or other suitable treatment.

The coatings of the crepe thread filaments may comprise any desired cellulose, for example a cellulose which has been regenerated from viscose or solutions of cellulose in ammoniacal copper solutions or metallic salt solutions. Special mention may be made of those celluloses which, as compared with α -cellulose, e. g. cotton cellulose, or other substantially undegraded cellulose, may be swollen to a substantial degree by the action of water or other aqueous or other agents. For example β -cellulose, γ -cellulose, or other degraded celluloses which are more or less soluble in aqueous alkalies or even in water may be used for the purposes of the present invention. A cellulose of a degree of degradation intermediate between that of β -cellulose and that of γ -cellulose may for instance be employed. Such soluble celluloses are advantageous both from the point of view of ease of application, ease of swelling and ease with which they may be removed from the non-cellulosic fibres or filaments to which they have been applied.

Celluloses suitable for use in preparing coated crepe thread filaments utilized in accordance with the invention may be prepared, for instance, by the direct degradation of cellulose, for example by treatment with alkalies or acids, e. g. by heating with dilute or concentrated caustic soda if necessary under pressure, or by the action of sulphuric acid, the acid, if necessary, being eliminated from the product by dialysis for instance.

The production of a cellulose having the desired properties is however in general most conveniently accomplished by degrading a suitable cellulose derivative and subsequently regenerating cellulose from the degraded product. For instance, cellulose may be regenerated from a viscose solution which has been ripened to a degree considerably beyond that of the viscose solutions normally used for spinning artificial filaments. Again, cellulose may be regenerated from other degraded cellulose derivatives, for example degraded cellulose acetate or other degraded esters. A cellulose acetate may for instance be ripened until soluble in dilute alcohol, and saponified with caustic alkali or steam.

As indicated previously, cellulose derivatives, especially such as may readily be swollen by the action of water or other aqueous agents, may also be employed. As examples of such cellulose derivatives may be mentioned cellulose esters

and cellulose ethers which have been so far degraded as to render them soluble in dilute acetone, dilute alcohol or even in water itself. Other cellulose derivatives which may be employed are esters or ethers of cellulose or degraded cellulose in which esterifying or etherifying radicles contain groups, e. g. hydroxyl or carboxyl groups, conferring increased solubility or dispersibility in water, dilute alkalies, or other liquids. There may be utilized for instance cellulose esters obtainable by esterifying cellulose e. g. in the presence of chloroacetic anhydride with di-carboxylic acids, for example oxalic acid or maleic acid, or obtainable by subjecting cellulose acetate to the action of a hydroxy carboxylic acid e. g. glycolic acid, lactic acid, malic acid, mandelic acid, tartaric acid, or a glyceric acid, so as to replace acetic acid residues by hydroxy-acidyl or carboxy-acidyl residues. Again, there may be utilized cellulose ethers in which the cellulose is etherified so as to contain residues of glycols or other polyhydric alcohols, for example in the manner described in U. S. Patent No. 1,502,379, or in which the cellulose is etherified with carboxy-alkyl groups, for example by treating alkali cellulose with chloroacetic acid, in the manner described in U. S. Pat. No. 1,884,629 of Oct. 25, 1932, so as to produce cellulose derivatives containing $1\frac{1}{2}$ -2 or more carboxy methyl ether groups per $C_6H_{10}O_5$ molecules.

Any desired means may be utilized for producing the cellulose or cellulose derivative coatings upon the non-cellulosic filaments of the crepe threads, for example the filaments may be coated with solutions of a suitable cellulose or they may be coated with solutions of suitable cellulose derivatives and the cellulose regenerated therefrom in situ. Thus for instance the filaments may be coated with a solution of a highly degraded cellulose and dried. Again, they may be coated with a viscose solution ripened to any desired degree and subsequently treated with an acid to regenerate cellulose, or they may be coated with nitro-cellulose, applied in solution in an organic solvent, and treated with sodium hydrogen sulphide to regenerate cellulose from the nitro compound. If desired the coatings of cellulose or cellulose derivatives capable of being swollen may be obtained with the aid of aqueous or other dispersions of suitable cellulose or cellulose derivatives. Such dispersions may be prepared with the aid of any convenient dispersing agents with or without the addition of other colloids, for example gelatin or casein.

Where aqueous solutions of celluloses or derivatives of celluloses are utilized for the sizing of the crepe thread filaments, such solutions may if desired or requisite be alkaline to facilitate solution of the cellulose or cellulose derivative or to facilitate the adhesion of the size to the filaments. In the case of cellulose ester filaments for instance the sizing solutions may be of such alkalinity and applied under such conditions that a slight surface saponification of the material occurs, whereby the adhesion of the sizing coatings may be improved.

Another method of preparing non-cellulosic filaments having a coating of a cellulose thereon is to take filaments of cellulose derivatives and to reconvert the surface layer into cellulose. In the case of filaments of cellulose esters, for instance, they may be subjected to a surface saponification. This saponification may be carried out as described in U. S. Patents Nos. 1,884,620, 1,884,621, 1,884,622, and 1,884,823 all of

October 25, 1932. The degree of saponification may vary within wide limits, and in the case of crepe threads composed of cellulose acetate filaments of about 2-4 denier, very good results may be obtained by saponifying the filaments on the surface until they have lost 15-30 per cent., e. g. 20 per cent. of their weight.

The production of the cellulosic coatings on the non-cellulosic filaments of the crepe threads may be effected at any convenient stage of the manufacture either of the crepe threads or of the fabrics. The best results are however obtained when the individual filaments composing the crepe threads are coated with cellulose. For this reason it is preferred to apply or produce the cellulosic coatings prior to twisting or at least prior to the application of any substantial degree of twist. The filaments may, for example, be coated with cellulose either singly or in comparatively small groups prior to their being brought together to form a thread. In the case of yarns of cellulose acetate filaments the cellulosic coating may for instance be formed in the manner described in U. S. Pat. No. 1,920,188 of August 1, 1933, namely, by surface saponification as the filaments leave the spinning cell in which they are produced and prior to their being wound or twisted and wound.

After weaving the crepe threads into fabrics, the latter may be subjected to a scouring or other aqueous or other treatment capable of swelling the cellulose or cellulose derivative coatings. Such treatment may, for instance, comprise scouring in a soap bath such as is commonly utilized in the treatment of textile materials or it may be any other treatment designed to effect swelling of the coatings. As an example of such other treatment may be mentioned treatment in a bath of a metallic salt, for example a thiocyanate, capable of swelling cellulose. The precise nature of the treatment will depend in any particular case upon the type of cellulose or cellulose derivative constituting the coating of the filaments of the crepe threads. It should be capable of swelling the coatings of the crepe thread filaments without causing them to become unduly soft or yielding. To this end, when swelling with water for instance the latter may be applied in restricted quantities, e. g. as vapour, or in liquid form as a spray, in cases where an excess of water would dissolve the coatings or render them undesirably soft.

The crepe fabrics may, if desired, be subjected to a treatment for the removal of the cellulose or cellulose derivative from the filaments of the crepe threads. As indicated previously substantially degraded celluloses or derivatives may be employed in the coating of the filaments. In such cases, for example in the case of coatings of a cellulose soluble or dispersible in water, removal may be accomplished by a vigorous scouring treatment. If desired, the removal of the cellulose or cellulose derivative may be effected in the same bath as the swelling, for example the fabric may be treated in a bath under such conditions as are required to effect swelling of the cellulosic coatings and the temperature and/or composition of the bath subsequently modified so as to effect removal of the cellulose.

If desired the subsequent treatment of the fabrics containing highly twisted crepe threads having filaments coated with cellulose or cellulose derivatives may be adapted to swell not only the coatings, but also the filaments themselves. To this end the scouring or other baths

may include swelling agents for the filaments themselves, for example thiocyanates, organic acids, e. g. acetic acid, lactic acid or aromatic sulphonic acids, phenols, alcohols, e. g. methyl or ethyl alcohol, ketones, e. g. acetone or methyl-ethyl ketone, esters, e. g. methyl acetate, or ethyl lactate, and amines, e. g. aniline. It will be appreciated of course that the swelling agent should be selected in any particular case according to the nature of the filaments. For example, in the case of filaments of cellulose acetate or other cellulose esters, swelling may be accomplished by including acetic acid or other organic acids, or alcohols, phenols, esters or the like in the bath. In some cases, the agent employed to swell the coatings of the crepe thread filaments may simultaneously swell the filaments themselves. For example, in the case of a cellulose acetate filament having a coating of cellulose thereon, swelling of both the filament itself and the coating may be accomplished by means of aqueous solutions of thiocyanates.

In order that the finished fabrics may exhibit the desired crepe effects in the maximum degree it is preferred to effect the final drying in the absence of any substantial tension.

The degree of twist imparted to the crepe yarns or threads used according to the present invention may be similar to that commonly employed in the case of crepe threads of natural silk in the gum. For example a twist of from 50-75 turns per inch may be utilized. In general, a twist of about 60 turns per inch has been found to give highly satisfactory results. Any other suitable degree of twist may however be employed according to the effects it is desired to produce. If desired a highly twisted yarn may be doubled with another yarn or yarns of the same or different twist or of the same or different direction of twist, whereby still more varied effects may be obtained.

Crepe threads may also be employed composed of filaments of two or more different kinds, whether in respect of material or size or both. Thus, there may be used threads containing both filaments of cellulose esters or ethers and filaments of natural silk or threads containing cellulose ester or ether filaments of two or more different deniers.

The highly twisted crepe threads may be incorporated in the fabrics in any suitable manner, for example the weft alone may be wholly or partially composed of such threads or the warp may also contain them. In the former case, on swelling the cellulose or cellulose derivative coatings of the crepe thread filaments, the fabrics exhibit chiefly shrinkage in the direction of the weft. It is found convenient in general, however, to employ threads of relatively low twist in the warp and to employ in the weft both crepe threads having a left-hand twist and crepe threads having a right-hand twist. Threads having left and right-hand twist respectively, may be disposed in the fabric in any convenient manner. For example pairs of threads of left-hand twist may alternate with pairs of threads of right-hand twist.

The crepe threads used in producing fabrics in accordance with the present invention may

contain any desired non-cellulosic filaments, whether natural or artificial, for example there may be utilized filaments of silk or filaments of organic derivatives of cellulose, for example cellulose esters, e. g. cellulose acetate, formate, propionate, or butyrate or cellulose ethers, e. g. methyl, ethyl or benzyl cellulose or analogous condensation products derived from cellulose and glycols or other polyhydric alcohols.

Fabrics may be composed wholly of yarns or threads of non-cellulosic filaments, or they may comprise also yarns or threads of other materials, for example cotton, or other natural or artificial cellulosic fibres. If desired the crepe threads themselves may contain cellulosic filaments in addition to the non-cellulosic filaments having thereon coatings of cellulose.

The invention is illustrated but not limited by the following examples:—

Example 1

Cellulose acetate yarn of 70 denier and of low twist is saponified with 20 per cent. of its weight of caustic soda. The dried saponified yarn is then twisted to 65 turns per inch and is then woven into a warp of cellulose acetate yarns of low twist. The resulting fabric is scoured in a soap bath, rinsed and dried without tension.

Example 2

Cellulose acetate yarn of 140 denier and of low twist is sized by passing through a 25 per cent. aqueous solution of a cellulose acetate tartrate made by heating cellulose acetate with tartaric acid and a little water for several hours. After drying the sized yarn is twisted to 60 turns per inch and woven into a warp of cellulose acetate yarns of low twist. The fabric is then scoured in a soap bath, rinsed and dried without tension.

What we claim and desire to secure by Letters Patent is:—

1. Process for the production of crepe fabrics which comprises subjecting yarns containing filaments of cellulose esters to surface saponification, highly twisting said surface saponified yarn to form crepe threads, incorporating said crepe threads in a fabric and subjecting said fabric to an aqueous treatment.

2. Process for the production of crepe fabrics which comprises subjecting yarns containing filaments of cellulose acetate to surface saponification until a 15 to 30% loss of weight results, highly twisting said surface saponified yarn to form crepe threads, incorporating said crepe threads in a fabric and subjecting said fabric to an aqueous treatment.

3. Process for the production of crepe fabrics which comprises subjecting yarns containing filaments of cellulose acetate to surface saponification until a 20% loss in weight results, highly twisting said surface saponified yarn to form crepe threads, incorporating said crepe threads in a fabric and subjecting said fabric to an aqueous treatment.

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CERTIFICATE OF CORRECTION.

Patent No. 1,993,922.

March 12, 1935.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 75, for the Patent number "1,884,823" read 1,884,623; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of March, A. D. 1935.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)