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CREPE FABRIC

Cyril M. Croft and William J. Cramer, Jr., Cumberland, Md., assignors to Celanese Corporation of America, a corporation of Delaware

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This invention relates to crepe fabrics, and more particularly to crepe fabrics containing organic derivatives of cellulose.

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 gummied 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.

An object of our invention is the economic production of crepe fabrics containing organic derivative of cellulose yarns or threads.

A further object of our invention is the production of improved crepe effects upon fabrics containing crepe yarns or threads of an organic derivative of cellulose which shrink and buckle when treated in a creping bath.

Other objects of our invention will appear from the following detailed description.

It has been previously found that if yarns of cellulose acetate or other organic derivative of cellulose have a high twist imparted thereto in the presence of hot aqueous media, such as steam or hot water, they produce crepe effects in fabrics containing them when the fabrics are given treatment in hot scouring baths. It has also been found that if certain crepe promoting agents are incorporated in these yarns as a separate treatment before or after twisting or incorporated as a separate treatment into fabrics woven from these yarns before said fabrics are subjected to the action of a hot scouring bath, even more advantageous results may be obtained. The disadvantage inherent in these processes is that they involve an additional step with the consequent increase in handling and labor cost and a need for additional equipment.

We have now found that if fabrics containing filaments, yarns or threads of an organic derivative of cellulose which have been highly twisted in the presence of hot aqueous media are treated in an aqueous creping or boil-off bath which has a crepe promoting agent already incorporated therein, notably improved results may be ob-

tained in the appearance of the crepe effect. Moreover, not only may the time necessary for the treatment of the fabric in the boil-off bath to obtain the desired crepe effect be shortened as much as 50% in employing creping baths prepared in accordance with our invention, but the temperature at which the boil-off is carried out may likewise be reduced.

The crepe promoting agents which may be incorporated in the aqueous creping or boil-off bath in accordance with our invention comprise colloidal substances which are not freely soluble in water, but which, when treated with water, especially at the temperature of the creping bath, absorb water and swell. Examples of crepe promoting agents that may be employed in the creping bath are proteins, whether of animal or vegetable origin such as proteins derived from soya beans, gelatin or modified gelatin, or other albumens such as egg albumen, casein and sericin; proteins which have been treated with formaldehyde or other aldehydes; gums, such as gum tragacanth; methyl cellulose that swells in hot water, alkali soluble cellulose ethers such as ethyl cellulose and hydroxy ethyl cellulose, etc.

In carrying out our invention, the fabric may be entered in any appropriate manner into the aqueous creping or boil-off bath and the fabric treated therein in the open width or in skein form. The bath employed in accordance with our invention contains such a concentration of the crepe promoting agent as to impart thereto a consistency which is convenient, which concentration may be from 2 to 5%. In addition to the crepe promoting agent, the aqueous boil-off bath may contain various other beneficial agents which not only aid in yielding a crepe fabric of the desired hand but likewise serve to stabilize the crepe promoting agent in the bath and to inhibit any decomposition or deterioration thereof due to bacterial action. Such agents comprise penetrants which have a softening and swelling action on the organic derivative of cellulose filaments, yarns and threads, such as, for example, tetralin, pine oil and, less advantageously, dibutyl phthalate, diethylene glycol and the mono-methyl ether of ethylene glycol; scouring agents, such as sulfonated castor oil and sulphonated fatty alcohols; as well as

varying amounts of alkaline agents such as soap. While the penetrants may be used individually, better results are achieved when mixtures of these agents are employed. Thus, for example, the best results are obtained where a mixture of pine oil and tetralin is used.

The boil-off or creping bath may be maintained at temperatures ranging from 90° C. to 99° C. and the desired crepe effect in the fabric may be obtained by maintaining the fabric in the bath for from ½ to 2 hours. Thus, for example, when a protein derived from soya beans is employed, the concentration in the bath is preferably from 2 to 5%, while the bath may be maintained from about 90° C. to 99° C. and the fabric subjected to the action thereof for from ½ to 2 hours.

As stated above, the fabric treated by this invention contains filaments, yarns or thread which have been twisted in the presence of hot aqueous fluids such as steam or hot water; for instance as is described in U. S. Patents Nos. 2,088,628 and 2,089,191. This twisting may be effected on a device of the kind in which the thread is drawn off over the head of a rotating package through a guide fixed substantially in line with the axis of rotation of the package and is thereafter wound on a bobbin or the like, the thread being passed through hot aqueous fluid on its way from the guide to the bobbin. In this way the yarn is subjected to the action of the hot aqueous fluid during the actual application of twist. The twisting spindle, the guide fixed in line with the axis of the spindle and the device for applying the hot aqueous fluid to the filaments, yarns or threads should be so arranged that the twisting resulting from the rotation of the package is at least partially inserted while the thread is in contact with the hot aqueous fluid.

Where steam is employed as the hot aqueous fluid, steaming may conveniently be effected by allowing the threads to pass through a suitable chamber supplied with steam, preferably provided with small holes, top and bottom, to permit passage of the thread, and also with a steam inlet. If desired, a single steam chamber may be arranged to serve a number of twisting devices, being provided with inlet and outlet holes for the threads of each twisting device. Such an apparatus may conveniently consist of a horizontal pipe mounted over a row of twisting devices and provided with eyes of porcelain, stainless steel, or other suitable material at appropriate points on top and bottom for the entrance and exit of the threads. The diameter of the pipe should be such as to afford the thread the requisite length of travel in the steam. Alternatively, a pipe having a smaller diameter may be used, in which case the pipe may be provided with hollow nipples communicating therewith and through which the yarn passes, the nipples being of sufficient length to provide, together with the diameter of the pipe, the requisite length of travel in the steam.

The presence of the desired moisture may be assured by supplying wet steam to the steaming device and/or by arranging for the condensation of steam to supply the requisite amount of moisture. For instance, small traps for condensed water may be provided at suitable intervals in the steaming chamber and steam injected there-through by means of small pipes or orifices. Another method of insuring the presence of moisture is to wet the thread with water. For exam-

ple, the bobbins of thread may be wetted before the twisting operation or, better, water may be applied to the thread by means of a wick or other device after the thread leaves the spindle and prior to its entering the steaming device.

Steam at slightly above atmospheric pressure, or at a pressure of 1 to 2 centimeters of water, is most conveniently employed. If desired, however, the steaming may be effected with steam at any desired super-atmospheric pressures, e. g. steam at 10 to 25 lbs. per square inch.

A steaming treatment of relatively short duration, such as may be secured by causing the yarn to pass through steam in a path of about 1 to 6 inches at a speed of from 2 to 10 meters per minute has been found to give satisfactory results. Longer treatments may, however, be employed. For example, the yarn may be passed at the said speeds through 6 inches to 12 inches or more of steam.

The treatment of the thread with hot water during twisting may be effected by drawing the thread off from a twisting spindle and passing it upwardly through a small hole in a suitable receptacle containing hot water, the thread then passing to a winding devices. The hole may be, for example, about ⅜ of an inch in diameter and may be provided with means adapted to lead away and prevent from reaching the twisting spindle any liquid issuing from the hole. If desired, the hole may take the form of a short tube of fine bore, fixed in the receptacle, whereby the flow of liquid from the receptacle at the point of entrance of the thread may be reduced.

The duration of the treatment with hot water may be relatively short, such as may be secured when the thread is travelling at a speed of 2 to 10 meters per minute and is in contact with hot water for 1 to 3 inches of its travel. More prolonged treatments may, however, be employed.

Very good results may be obtained by using hot water at temperatures of 85 to 100° C. Preferably the water should be as hot as possible and temperatures of, for instance, 95 to 100° C. are to be recommended. If desired, the hot water may be employed under pressure, for example, 2 to 10 or 15 pounds or more per square inch enabling the water to be employed at higher temperatures than is possible under atmospheric pressure, that is at temperatures up to the boiling point thereof at the pressure employed. Water may be employed under pressure, however, even when the temperature is below 100° C.

The crepe twisting may be applied in a single stage. If desired, however, the crepe twist may be applied in two or more stages, at least the final stage of twisting being effected while treating the thread with hot aqueous fluid, as described in U. S. Patent No. 2,088,587.

When the crepe twist is applied in two or more stages the advantage of the process may be obtained when not only the final stage of the crepe twisting but the earlier stage or stages of twisting are also effected while treating the thread with hot aqueous fluid. In fact, it is of great advantage to effect, while treating the thread with hot aqueous fluid, any application of twist beyond the point at which the twisting would result in weakening of the thread if the said twisting were effected without the hot aqueous fluid treatment.

The total twist applied in accordance with the process of the present invention may vary within wide limits, and the crepe figure in the fabric may be regulated according to requirements. The total twist desirable in any particular case

depends upon a number of factors, including the precise effects required, the number of filaments and the denier of the thread.

An important advantage of our process is that good crepe effects may be obtained with fabrics containing cellulose acetate yarn of lower degree of twist than has been attainable heretofore. The number of turns to be employed may be from 55 to 90 turns per inch, depending on the effects desired, but for a given number of turns, lower temperature and/or shorter time of treatment are required in the creping bath of our invention.

While the process of our invention enables production of threads which yield satisfactory crepe effects without a special treatment, other than the twisting and hot aqueous fluid treatment characteristic of the process, other treatments may, if desired, be employed further to improve the properties of the crepe threads and/or fabrics produced therefrom. Thus enhanced crepe effects may be obtained by treating the fabrics containing the crepe threads with aqueous solutions of saponifying agents such as the hydroxide or carbonates of sodium, potassium or ammonium to superficially saponify the cellulose acetate yarns, prior to treatment with the creping bath. A convenient and effective method of doing this is to pad the fabric with an aqueous solution of an alkaline material, say a solution containing 15 to 40 grams per liter of sodium hydroxide and then drying the fabrics on heated cans.

The highly twisted crepe threads may be incorporated in the fabrics in various ways, for example, the weft alone may be wholly or partially composed of such threads or the warp may also contain them. Valuable fabrics may be produced by employing warp threads of relatively low twist and in the weft both crepe threads having a left hand twist and crepe threads having a right hand twist, pairs of threads of left hand twist alternating with pairs of threads of right hand twist.

If desired, the cellulose acetate crepe threads may be associated in the fabrics with highly twisted crepe threads of other materials, e. g. of natural silk or regenerated cellulose, or with highly twisted threads produced by other processes. Where the fabrics contain threads of low twist these may be wholly of cellulose acetate or wholly or in part of other materials, e. g. natural silk or regenerated cellulose. The cellulose acetate crepe threads may be doubled with ordinary cellulose acetate yarns or yarns of other materials prior to incorporation in the fabric.

In carrying our invention into effect, fabrics containing filaments, yarns or threads of any organic derivative of cellulose may be employed in the manufacture of the new crepe threads, for example, filaments, yarns or threads containing cellulose esters such as cellulose acetate, cellulose butyrate and benzyl cellulose. The invention, however, is of especial value and will be described more particularly in connection with the production of crepe fabrics containing yarns or threads of cellulose acetate.

In order further to illustrate our invention, the following examples are given:

Example I

A fabric having a warp of 120 ends per inch of cellulose acetate yarn of 100 denier having 5 turns per inch, and a weft of 74 picks per inch of cellulose acetate yarn of 120 denier having 77 turns per inch, which twist has been inserted in

the presence of steam, is given a boil-off treatment.

The fabric while in hank or skein form is entered into an aqueous creping or boil-off bath of the following composition:

	Parts by weight
Isolated soya bean protein-----	2.0
Pine oil -----	0.15
Tetralin -----	0.15
Turkey red oil-----	0.15
Soap -----	0.50
Water -----	97.05

which bath is maintained at 99° C. and said fabric is maintained in the bath for 1½ hours.

The fabric which had an original width of 45 inches shrinks to a width of 38 inches which is a considerably greater shrinkage than that experienced in a like period of time with creping baths which do not contain a crepe promoting agent and the resulting fabric has an excellent crepe effect and a soft hand.

Example II

A cellulose acetate fabric of similar construction to the fabric of Example I is given a boil-off treatment in an aqueous creping or boil-off bath of the following composition:

	Parts by weight
Isolated soya bean protein-----	4.00
Pine oil -----	0.20
Tetralin -----	0.20
Turkey red oil-----	0.20
Soap -----	0.50
Water -----	94.90

The bath is maintained at 98° C. and the fabric is maintained in the bath for one hour.

The fabric is shrunk by this treatment yielding a crepe effect which is excellent and the time necessary to obtain this effect is less than one-half the time usually necessary to obtain a like effect in a bath not containing a crepe promoting agent.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

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

1. Process for the production of crepe effects on fabrics comprising yarns of filaments of an organic derivative of cellulose which have been crepe twisted while being subjected to the action of a hot aqueous fluid, which comprises treating said fabrics with a hot aqueous creping bath containing a crepe promoting agent comprising a protein derived from soya beans.

2. Process for the production of crepe effects on fabrics comprising yarns of filaments of cellulose acetate which have been crepe twisted while being subjected to the action of a hot aqueous fluid, which comprises treating said fabrics with a hot aqueous creping bath containing a crepe promoting agent comprising a protein derived from soya beans.

3. Process for the production of crepe effects on fabrics comprising yarns of filaments of an organic derivative of cellulose which have been crepe twisted while being subjected to the action of a hot aqueous fluid, which comprises treating said fabrics with a hot aqueous creping bath containing from 2 to 5% of a crepe promoting

agent comprising a protein derived from soya beans for from $\frac{1}{2}$ to 2 hours at a temperature of from 90° to 99° C.

4. Process for the production of crepe effects on fabrics comprising yarns of filaments of cellulose acetate which have been crepe twisted while being subjected to the action of a hot aqueous fluid, which comprises treating said fabrics with a hot aqueous creping bath containing from 2 to 5% of a crepe promoting agent comprising a protein derived from soya beans for from $\frac{1}{2}$ to 2 hours at a temperature of from 90° to 99° C.

5. Process for the production of crepe effects on fabrics comprising yarns of filaments of cellu-

lose acetate which have been crepe twisted while being subjected to the action of a hot aqueous fluid, which comprises treating said fabrics with a hot aqueous creping bath containing 2% of a crepe promoting agent comprising a protein derived from soya beans, 0.15 part by weight of tetralin, 0.15 part by weight of Turkey red oil, 0.15 part by weight of pine oil, and 0.50 part by weight of soap, and subjecting said fabric to the action of said bath maintained at 99° C. for $1\frac{1}{2}$ hours.

CYRIL M. CROFT.
WILLIAM J. CRAMER, JR.