Patented Jan. 24, 1939

2,144,677

UNITED STATES PATENT OFFICE

2,144,677

CREPE THREAD AND FABRIC

Henry Dreyfus, London, and William Alexander Dickie, Spondon, near Derby, England, assignors to Celanese Corporation of America, a corporation of Delaware

No Drawing. Application November 26, 1937, Serial No. 176,663. In Great Britain December 10, 1936

10 Claims. (Cl. 28—1)

This invention relates to the manufacture of crepe threads and fabrics and particularly to the manufacture of crepe threads and fabrics having a basis of regenerated cellulose filaments.

In British Patent No. 457,538, processes are described whereby it is possible to produce highly twisted crepe threads of regenerated cellulose filaments from which fabrics exhibiting very good crepe effects may be produced. According to the said specification the threads of regenerated cellulose filaments are twisted under such conditions that during the insertion of at least the last part of the twist the threads are under the influence of steam or hot water. The threads obtained in this way not only yields fabrics exhibiting very good crepe effects but are stronger than similar threads which have been highly twisted without the steam or hot water treatment.

It has now been discovered that very valuable crepe threads and fabrics may be obtained by processes in which threads of regenerated cellulose filaments are twisted under conditions such that at least the last part of the twist is inserted while the thread is in a softened condition and the threads are subsequently subjected, preferably in fabric form, to an embossing treatment adapted to bring about a displacement of the threads or the filaments or fibres of the threads from which they are woven. The embossing may be such as to bring about the displacement of either weft or warp threads or both. Instead of subjecting the threads to the embossing treatment when they are in fabric form, the treatment may be applied to the threads themselves before they are woven into fabric, the embossing treatment then resulting in a displacement of the fibres or filaments comprising the threads. Fabrics produced according to this invention exhibit, on being subjected to the action of aqueous scouring media or other creping liquors, extremely valuable crepe effects, and it has been found that these crepe effects are produced with threads which have been twisted to a substantially lower degree than is necessary to give an equal crepe effect or even a crepe effect at all if the embossing treatment is not applied. The insertion of high twists in threads results, in general, in a reduction in the tensile strength and elasticity of the threads, so that the present invention presents the additional advantage that, since it is possible to employ threads twisted to a lower extent than is necessary to obtain similar results in the absence of the embossing treatment, the tensile strength and extensibility of the threads is better preserved.

According to the present invention, therefore, in the production of crepe effects on fabrics, a fabric containing highly twisted regenerated cellulose threads which have been produced by a process in which at least the last part of the high twist is inserted while the threads are in a softened condition is embossed, so as to bring about a displacement of the threads or of the filaments or fibres composing the threads, prior to subjecting the fabric to the action of a creping liquid, or the highly twisted regenerated cellulose threads are embossed, so as to bring about a displacement of the filaments or fibres composing them, prior to the conversion of the threads into fabric form.

As stated above, the twisted threads are produced according to this invention by processes wherein at least the last part of the twist is inserted while the threads are in a softened condition. The softening may be effected by the aid of any suitable softening agent but is preferably effected by the action of steam, preferably wet steam, or hot water. However, other softening means may be employed, e. g., treatment with cuprammonium solution, solutions of thiocyanates and of zinc chloride and the like or treatment with cold water, and such softening treatments may be carried out prior to or during the twisting operation, it being essential that the treatment is effected so that during the insertion of at least the last part of the twist the threads are in a softened condition.

Where steam or hot water are employed to soften the threads the processes and apparatus described in the British Patent No. 457,538 referred to above, may be employed. Thus the twisting of the regenerated cellulose threads according to this invention may conveniently be conducted so that at least a portion of that part of the track of the running thread in which twisting actually takes place, lies through a body of steam or water. For example, the thread may be twisted on a device of the kind in which the thread is drawn off over the end of a rotating package and allowed to pass through steam or hot water on its way to a winding device.

The treads may consist of substantially continuous filaments of regenerated cellulose or they may consist of discontinuous filaments, the length of which may vary within wide limits. For example the threads may be those spun from a mass of discontinuous filaments or those prepared in the manner described in U. S. Patents Nos. 2,077,078 and 2,077,079.

The initial thread may already be twisted to

a small degree, for example up to 10 turns per inch, e. g., to 2–5 turns per inch or to such small degree as is commonly applied to artificial silk continuously with its spinning.

The twisting of the threads is very advantageously effected on a device of the kind in which the thread is drawn off over the end 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. On the other hand, any other suitable crepe twisting device may be employed. For example a ring twister may be used for the crepe twisting of thread consisting of discontinuous filaments.

Where steam or hot water is employed, the twisting spindle, the guide fixed in line with the axis of the spindle, and the steam or hot water treatment device, should be so arranged that at least the last part of the twist resulting from the rotation of the package is inserted while the thread is under the influence of the steam or hot water. If the freedom of the thread to rotate within the balloon guide or other guide preceding or forming part of the steam or hot water treatment device is unduly restricted, e. g., by causing the thread to change direction materially at the guides, the insertion of twist while the thread is under the influence of the steam or hot water may be restricted to an undesirable extent or substantially prevented and the resulting crepe threads may not have the valuable properties which may otherwise be secured. Using a twisting device of the kind in which thread is drawn off over the end of a rotating package, it is advantageous to arrange that the path of the thread after leaving the balloon guide and through the steam or hot water treatment device, is substantially in line with the axis of the spindle.

If desired, the above-mentioned twisting devices, in which the thread is drawn off over the end of a rotating package, may be provided with a device which restricts the ballooning of the thread or the tendency of twist to run back to the package. As examples of such devices may be mentioned flyers and the floating ring device described in U. S. Patent No. 1,784,581. The latter device is of particular value when the thread to be twisted is of very low twist, for example less than about 1 turn per inch.

The treatment of the thread with steam or 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 steam or hot water, the thread then passing to a winding device. The duration of the treatment with steam or hot water may be relatively short, such as may be secured when the thread is travelling at a speed of 2–10 metres per minute and is in contact with steam for about 1 or 3 to 6 inches of its travel or with hot water for 1–3 inches of its travel. Lengthier treatments may however be employed. Preferably the steam or water should be as hot as possible and temperatures of, for instance, 95–100° C. and particularly 98–100° C. are to be recommended. If desired, the steam or hot water may be employed under pressure.

In carrying out the new process the crepe twist 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 whilst the thread is under the influence of steam or hot water or is otherwise in a softened condition. When the crepe twist is applied in two or more stages the advantages of the process may be obtained when not only the final stage of the crepe twisting but an earlier stage or stages of twisting are also effected while the thread is in a softened condition.

The regenerated cellulose filaments of the threads may undergo stretching while the threads are being twisted. The amount of stretch may be measured by comparing the original thread denier with the final thread denier (after untwisting). The amount of stretching which takes place may be controlled by controlling the tension acting on the thread during the twisting operation. To obtain relatively high degrees of stretch, the method of twisting in which the thread is drawn downwards from a bobbin is preferred.

The total twist applied in accordance with the new process will in general be less than the twists necessary to give a satisfactory crepe effect if the embossing treatment is not applied. Thus, for example, where in the absence of the embossing treatment of this invention a twist of 50–55 turns per inch is necessary to give satisfactory results, a twist of only 45 turns per inch or less may be sufficient for the process of the present invention.

If desired, the twisted threads may be sized at any suitable stage of their manufacture, for example in the course of winding on to the bobbin from which twisting is effected. In this connection, particular mention may be made of sizing materials selected in accordance with the considerations laid down in U. S. Patent No. 2,007,182. For example a casein, egg-albumen, or other size which is not very readily removed by aqueous treatments may be employed. Another size which may be employed is a drying oil, if desired one which has been partially oxidized, e. g., boiled or blown linseed oil.

The twisted 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 threads produced by the processes described above and having a left-hand twist and similar 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 regenerated cellulose threads produced by the process as described above may be associated in the fabrics with threads of other materials, e. g., of natural silk, wool, cotton or of cellulose derivatives such as cellulose acetate and such other threads may be of low twist or may be highly twisted crepe threads.

When the embossing treatment is applied to fabrics the pressure may be applied by an embossing roller or other rigid device having a raised surface corresponding in appearance to the surface of a crepe fabric, and adapted to displace the threads in the fabric, so that the enhanced effect is evident immediately on pressing. It is possible, however, to use pressing surfaces which consist of small geometrical figures, such as circles, squares, triangles, or lozenges, which may intersect each other and form small surfaces of varying prominence, for while the first result of pressing is to reproduce this series of figures on the fabric, the usual finishing treatment reduces the precision of the applied design and the final effect is very similar to the figured appearance of crepe fabric. Even where the pressing surface itself has a crepe figure, the finishing of the fabric serves to enhance the effect on the

fabric. Not only can geometrical figures be employed on the pressing surface, but almost any kind of rigid surface having a regular or irregular design small enough to give the required displacement of the threads in the fabric, the finishing treatment breaking up the design on the fibre to give the characteristic crepe appearance. After the slight modification of their displaced position undergone by the threads during finishing, the final crepe effect is exceedingly stable in character, and is not removed by such operations as dyeing and washing.

The pressing surface may very advantageously consist in a close pattern of continuous lines which are long compared with the distance between the adjacent lines. The pattern may for example comprise a number of closely spaced parallel lines, preferably running obliquely across the face of the fabric. Such lines may all be equally spaced or they may be arranged in pairs or in other ways, and they may be of constant or varying pitch. On the other hand, the pattern may comprise for example two mutually inclined and intersecting sets of parallel lines, or different areas on the fabric may be embossed with parallel lines in different directions.

Similar rigid pressing devices to those described above may be used on the warp threads or a number of weft threads before weaving. It is however sufficient to use pressing devices of simpler design, such as for example a series of regularly or irregularly disposed axial or diagonal ridges which flatten and/or corrugate the threads so that their filaments or fibres are displaced and remain so during the weaving of the warps. The pitch of the ridges should vary in accordance with the denier, higher denier requiring coarser pitch, and may be regular or may vary in different parts of the pressing device. As in the case of the embossed fabrics, the finishing of fabrics woven from already embossed thread enhances the crepe effect on the fabric by breaking up the definition of the embossed portions.

It is important that the conditions during the embossing operation should not be such that the fabrics or threads under treatment suffer damage. A very convenient method of embossing is to pass the fabric between two rollers, one of which carries the desired embossing pattern and the other of which has a resilient surface or is mounted so that it can yield under the embossing pressure. Another convenient method is to pass the material between a roller carrying the desired embossing pattern and a blanket which in turn is pressed against a roller having a resilient surface or mounted so that it can yield. Again, the material may be passed between two rollers having patterned surfaces, the patterns being such as to intermesh without actual contact of the rollers, but in this case the rollers should be positively, and preferably adjustably, spaced apart and synchronously driven, since by this means the clearance between the rollers may be adjusted so as to be small enough to apply a distinct pressure to the fabric or threads while avoiding any risk of damage thereto. It is not necessary that the embossing operation should effect a heavy embossing of the fabric and it may be sufficient, for example, to impress a pattern of lines on the fabric so lightly that they are scarcely visible to the naked eye.

If desired, the fabric or threads may be softened in order to facilitate the embossing operation. Thus the fabric or threads may be treated with water or a dilute solution of a thiocyanate or zinc chloride prior to the embossing operation, or the embossing operation may be carried out while the fabric or threads are under the influence of steam.

The fabrics prepared in accordance with the processes described above, may be subjected to the action of any suitable creping liquid, e. g., a hot aqueous liquid, in the manner commonly adopted in connection with fabrics comprising highly twisted yarns of natural silk. Such treatment, may be, for example, a treatment with an aqueous soap bath at a temperature of 75–85° C. or at higher temperatures, e. g., at the boil.

The threads of regenerated cellulose filaments employed according to this invention may be produced by any process, e. g. the viscose, cuprammonium or nitrocellulose processes, or may be produced by the saponification of cellulose ester yarns.

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

1. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are subjected to the action of steam, weaving a fabric containing such threads, embossing such fabric in a pattern resembling a crepe pattern so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

2. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are softened by means of hot water, weaving a fabric containing such threads, embossing such fabric in a pattern resembling a crepe pattern so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

3. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are subjected to the action of steam, weaving a fabric containing such threads, delineating a close pattern of lines on such fabric, and thereafter subjecting such fabric to the action of a creping liquid.

4. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are softened by means of hot water, weaving a fabric containing such threads, delineating a close pattern of lines on such fabric, and thereafter subjecting such fabric to the action of a creping liquid.

5. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are subjected to the action of steam, weaving a fabric containing such threads, delineating a close pattern of intersecting sets of parallel lines on such fabric, and thereafter subjecting such fabric to the action of a creping liquid.

6. Process for the production of fabrics exhibiting crepe effects, which comprises imparting

a high degree of twist to regenerated cellulose threads by a process in which at least part of the high twist is inserted while the threads are softened by means of hot water, weaving a fabric containing such threads, delineating a close pattern of intersecting sets of parallel lines on such fabric, and thereafter subjecting such fabric to the action of a creping liquid.

7. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least the last part of the high twist is inserted while the threads are subjected to the action of steam, weaving a fabric containing such threads, softening such fabric and embossing the softened fabric so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

8. Process for the production of fabrics exhibiting crepe effects, which comprises imparting a high degree of twist to regenerated cellulose threads by a process in which at least the last part of the high twist is inserted while the threads are softened by means of hot water, weaving a fabric containing such threads, softening such fabric and embossing the softened fabric so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

9. Process for the production of fabrics exhibiting crepe effects, which comprises imparting to regenerated cellulose threads a degree of twist less than crepe twist by a process in which at least the last part of the twist is inserted while the threads are subjected to the action of steam, weaving a fabric containing such threads, embossing such fabric so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

10. Process for the production of fabrics exhibiting crepe effects, which comprises imparting to regenerated cellulose threads a degree of twist less than crepe twist by a process in which at least the last part of the twist is inserted while the threads are softened by means of hot water, weaving a fabric containing such threads, embossing such fabric so as to bring about displacement of the filaments of the threads, and thereafter subjecting such fabric to the action of a creping liquid.

HENRY DREYFUS,
WILLIAM ALEXANDER DICKIE.