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2,857,653

PROCESS FOR MANUFACTURING CREPE FABRICS

Charles R. Ephland, Greensboro, N. C., assignor to Burlington Industries, Inc., Greensboro, N. C., a corporation of Delaware

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The present invention relates to textile products and methods of manufacturing same. More particularly, the invention is concerned with crepe yarns and fabrics comprising same.

Numerous types of yarns composed of artificial and/or natural fibers have previously been modified in order to form crepe woven fabrics. It has been difficult, however, to obtain true crepe effects with yarns composed of synthetic linear polyamides, polyesters and/or mixed polyester-amides.

Synthetic linear polyamides, polyesters and mixed polyester-amides do not form crepes when merely twisted to a high number of turns per inch. It has been proposed in the past to produce crepe fabrics containing threads of a synthetic linear polyamide condensation product by steaming the yarn made up of such threads at 93° C. and twisting said threads to 70 turns per inch while the threads are subjected to the action of steam. In the previously proposed process the shrinking and twisting are done in the same operation. Actually, the shrinking in such process probably occurs entirely, or is completed, after the twist has been inserted in the yarn. The process just mentioned suffers from several disadvantages. For instance, residual shrinkage is not completely eliminated, the yarn does not have a uniform creping action and specially designed machinery is required.

Accordingly, the principal object of the present invention is the provision of highly desirable crepe fabrics from synthetic linear polyamide, polyester and/or mixed polyester-amide yarns.

Another object of the invention is to obviate the above mentioned difficulties in producing crepe fabrics from synthetic linear polyamides, polyesters and the like.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention are given by way of illustration only since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Synthetic linear polyamide, polyester and polyester-amide yarns normally contain a residual shrinkage of about 6 to 16% and the foregoing objects are accomplished by virtue of the discovery that, if this residual shrinkage is removed, by the use of steam, hot water or the like, these yarns can be successfully twisted to form satisfactory crepes. In other words, it is essential to the success of the invention that the yarn be substantially completely shrunk prior to twisting as distinguished from procedures wherein the yarn is shrunk during or after the twisting step.

Briefly stated, the present process involves the following steps in the order recited:

(1) Substantially completely, or completely, shrinking the yarn.

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(2) Drying the shrunk yarn and highly twisting the same.

(3) Heat treating the twist in the yarn and then weaving or otherwise forming a fabric from said yarn.

5 More specifically, the operation employed is as follows:

(1) The yarns are skeined or wound to a suitable form (e. g. a collapsible bobbin) to allow for complete shrinkage.

(2) The packages obtained are then treated with steam at a pressure ranging from atmospheric to 50 lbs. per sq. in. for 3 to 10 minutes. Preferably the packages are autoclaved for 15 to 30 minutes at 225 to 265° F. and 8 to 30 lbs. per sq. in. steam pressure. However, any other operation known in the art for shrinking polyamide and like 10 yarns may also be used, e. g. treatment with hot water or molten metal.

(3) The yarn is then allowed to thoroughly dry to atmospheric conditions, e. g. 60 to 80° F. and 50 to 80% relative humidity.

(4) The yarn is thereafter twisted to a high number of turns per inch, e. g. from 20 to 120 turns per inch and preferably from 50 to 70 turns per inch.

(5) The yarn is then heat treated in conventional manner, e. g. using steam or water vapor. Typically suitable heat-treating operations involve subjecting the yarn to steam at a temperature within the range of 138°–168° F. wet and 145°–175° F. dry for from 3 minutes to 2 hours or hot water at 160° to 212° F. for 5 minutes to 2 hours.

(6) Finally, the heat treated yarn is conditioned, sized, 30 quilled and otherwise prepared for weaving. Conditioning of the yarn may be accomplished by subjecting same to air having a relative humidity of 50 to 80% at a temperature of 60° to 80° F. for about 8 to 72 hours.

It is possible to use the conditioned yarn without sizing. However, this yarn is normally very lively and it is generally preferred to apply size thereto. This can be accomplished using any of the known sizing machines and compositions. Examples of suitable sizing materials include polyvinyl alcohol (Elvanol), polyacrylic acid (Orthocryl or Acrysol) and carboxy methyl cellulose. Thus, an aqueous solution of from 1 to 25%, and preferably 2%, by weight of carboxy methyl cellulose may be applied to the yarn during quilling. The resulting package can then be handled in normal weaving operations without difficulty and with the attendant superior results.

The procedure outlined above forms a yarn of a polyamide, a polyester-amide or a polyester that will have a true creping characteristic when properly finished.

As synthetic linear polyamides, polyester-amides and polyesters, the polymers prepared in accordance with Carothers Patent 2,071,250, the entire disclosure of which is incorporated herein by reference can be used. As typical examples of synthetic linear polyamide fibers, there may be mentioned poly-hexamethylene adipamide, poly-tetramethylene adipamide, polydecamethylene adipamide, polyhexamethylene sebacamide and polydecamethylene superamide. Other polyamides can be prepared from the self-condensation of omega amino-carboxylic acids such as 6 amino-caproic acid, 9 amino-nonanoic acid or from lactams such as pyrrolidone and epsilon-caprolactam. The polyamides of this class are commonly termed "nylon."

As an example of a polyester-amide, there can be mentioned the polymer made from ethylene glycol, hexamethylene diamine and adipic acid. As polyesters, in addition to the esters disclosed in the Carothers patent, polymeric esters of the type shown in Whinfield Patent 2,465,319, i. e. esters of terephthalic acid with glycols, specifically ethylene terephthalate, decamethylene terephthalate, etc. are applicable. Such esters are sold under the name "Dacron."

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The preferred polymers for use in the present invention are polymeric hexamethylene adipamide and polymeric ethylene terephthalate.

The most desirable fabrics are obtained by twisting some of the yarn into an S direction and some in a Z direction, weaving alternately 2 picks of each in a normal twist warp, and then exposing the fabric to a subsequent boiling and scouring operation. Preferably the latter involves immersing the fabric in a bath of hot water or soap solution for about 5 to 30 minutes which is usually sufficient to effect the desired crepe transformation.

A more complete understanding of the new procedures of this invention, as described above, may be had by reference to the following specific examples of actual operations in accordance with this invention.

Example I

70/34 semi-dull nylon (polymeric hexamethylene adipamide) is skeined and placed in an autoclave at 8 pounds per sq. in. pressure for a period of 15 minutes. The skeins are then conditioned to room temperature (75-80° F.). The yarn is then wound to bobbins and placed on an up-twister where 65 turns per inch are inserted. Some of the yarn is twisted in an S direction and some of the yarn is twisted in the Z direction, no single yarn having both kinds of twist. The twisted yarn is then heat treated with hot water for a period of 4 hours at 196-205° F. After conditioning, the yarn is quilled, and during this operation, a 2% solution of carboxymethylcellulose is applied. After another conditioning time of 2 hours, the yarn is woven as filling into a fabric using a 70/34-7Z nylon (polymeric hexamethylene adipamide) warp, with 100 ends per inch; the filling being placed 2 x 2. The woven fabric is then boiled off in a aqueous bath at a temperature of 120-200° F.

This fabric is boiled off for a period of 20 minutes to 2 hours' time. The resulting crepe fabric can then be heat set so as to make it permanently stable.

Example II

The procedure in step 1 is followed using 70/34 semi-dull "Dacron" (the condensation polymer of ethylene glycol with terephthalic acid), polyester fiber, and a steam pressure of 30 pounds per sq. in. for 30 minutes. The yarn is subsequently woven as filling into a fabric using a warp composed of the same type fiber. This

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fabric when boiled off properly will result in a deep uniform crepe effect.

In place of the 70 denier yarn used in the above specific examples, yarns of any conventional denier, e. g. from 15 to 400, may be utilized. Yarn treated according to the procedures of the present invention can be woven as filling into a fabric using warps of the same yarn or warps of cellulose acetate, or viscose rayon or wool, or polyester when a polyamide is used to form the twisted yarn, etc. Furthermore, yarn treated according to the invention after being properly twisted to form crepe can then be combined with any other fiber so that the warp is composed partly of the product of the present invention and partly of conventional fibers.

It will be appreciated that various modifications can be made in the invention as described above without in any way deviating from the scope thereof as defined in the appended claims, wherein I claim:

1. A process of manufacturing crepe fabrics which comprises (1) at least substantially completely removing the residual shrinkage in a yarn consisting essentially of a material selected from the group consisting of synthetic linear polyamides, polyesters and mixed polyester-amides; (2) highly twisting the resulting yarn; (3) heating the twisted yarn with a member of the group consisting of steam at a temperature within the range of 138°-168° F., wet and 145°-175° F., dry, for from 3 minutes to 2 hours, and hot water at 160° to 212° F., for 5 minutes to 2 hours; (4) conditioning said yarn in an atmosphere having a relative humidity of 50-80% and a temperature of 60 to 80° F.; (5) sizing; (6) weaving a fabric from said yarn and then (7) subjecting same to a heated aqueous creping medium.

2. The process of claim 1 wherein said yarn is nylon.

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