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3,280,443

METHOD OF PRODUCING CREPE-LIKE FABRICS

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This invention relates to the manufacture of a textile fabric containing novelty effects. More particularly, the invention relates to a unique process for producing crepe-type, wash and wear polyester fabrics.

The method of producing crepe fabrics as ordinarily practised, consists in employing as weft or filling, or both filling and warp, two kinds of thread, each highly twisted, the twist of one being in the opposite direction to that of the other. In U.S. Patent 2,006,542, a process is described wherein crepe-like woven fabrics are produced from a composite thread of cellulose acetate consisting solely of two threads, at least one of which is highly twisted. In U.S. Patent 2,221,232, crepe-like fabrics made from acetate artificial silk were produced by chemically treating portions of threads and utilizing chemical shrinking agents to provide the desired effects. In U.S. Patent 2,602,285, a process was described to produce a crepe-like fabric from regenerated cellulose yarn containing two types of filaments, one of a high orientation and another of low orientation and wherein the yarn had twist level in the order of 20 turns per inch or more. In each of the above-described references, the fabric product obtained had crepe-like properties but did not have wash and wear characteristics.

It is the over-all object of this invention to provide a process for the manufacture of a wash and wear fabric having a crepe-like effect, from a low-twist level yarn. Other objects will become apparent to those skilled in the art from a consideration of the disclosure.

The over-all objective of this invention is accomplished in producing a wash and wear textile fabric having a crepe-like effect by incorporating a low-twist level, heat stabilized and a low-twist level, non-heat stabilized polyester yarn into both the weft and warp of the fabric in at least alternate lengths. After the fabric has been produced, it is subjected to elevated temperatures to produce the desired crepe-like effects.

The process of this invention is unique in the utilization of low-twist level polyester yarns to produce not only a uniform crepe-like fabric but also a wash and wear fabric. Heretofore, crepe-like fabrics were produced by utilization of high-twist level yarns and, in general, in the use of yarns of cellulose acetate, acetate, and the like, known in the art, could produce the crepe-type effect but would not provide the wash and wear characteristic which is now highly accepted and desired in the textile trade.

The initial phase in the process of this invention is to prepare two different types of polyester yarns; namely, a heat stabilized and non-heat stabilized yarn. The polyester yarn can be prepared by conventional methods; namely, by spinning fiber-forming polymethylene terephthalate polymer, such as described in U.S. 2,465,319, among others, or known derivatives thereof into filaments. The undrawn filaments can then be stretched to improve their physical properties in their use for producing fabrics. The stretching operation can be conducted by winding the yarn or filaments from one roller to another, the second roller rotating at a higher speed than the first roller so as to draw or stretch the yarn or filament from about 2 to about 8 times, preferably 3 to 5 times, its original length. During the drawing operation, the temperature of the polyester yarn or filaments can range from

its second order transition temperature to about 80° C. above the second order transition temperature. The term "second order transition temperature" as used is defined in "Fibers From Synthetic Polymers," Elsevier Publishing Company, 1953, at page 322. The second order transition temperature can vary depending on the nature of the polyester polymer or copolymer. For example, for non-crystalline undrawn polyethylene terephthalate, the second order transition temperature is 69° C. and for crystalline undrawn polyethylene terephthalate, the second order transition temperature is 81° C.

After the stretching stage, the resulting product can be utilized in the form of filaments or can be cut up in the form of staple and reassembled by known procedures.

After the yarn has been stretched or drawn, a portion of the yarn is heat stabilized by subjecting said yarn to a heat treatment at temperatures in the range from about 100° C. to below the softening point of the polyester product, preferably in the range from about 100° C. to about 220° C. for a period of time sufficient to provide a relaxed yarn. The purpose of the heat treatment or relaxing step is to provide a yarn which will not shrink in excess of 5 percent, preferably less than 2 percent, of the original length. The period of time of heat treatment or heat stabilization cannot extend beyond that period which would decompose the yarn product. The length of time of heat treatment is proportional to the temperature used, i.e. at lower temperatures a longer heat treatment can be tolerated; but at higher temperatures, a shorter period of time of exposure is essential. For example, the heat treatment of the yarn product at 100° C. can tolerate a dwell time or exposure time for as long as 15 minutes and longer, if desired, without significant detrimental effects; however, heat treatments at, or close to, the softening point of the polyester, the dwell time should be maintained to a minimum and, in some instances, should not exceed 0.01 second. The heat treatment or stabilizing treatment can be conducted by steaming, infrared heat, dielectric heat passing the yarn through hot air, inert gas, or hot fluids such as boiling water, inert organic liquids, and the like.

The non-heat stabilized polyester yarn which is utilized has the property of shrinking in excess of 5 percent, preferably in excess of 10 percent when exposed to elevated temperatures.

After the two types of polyester yarns have been prepared for the process of the invention, they are further subjected to a twisting operation wherein a twist up to 18 turns per inch are placed in the yarn. Excellent crepe-like fabrics have been produced wherein the twist level ranges from about 4 to about 15 turns per inch. The twist can be placed in the yarn before or after the heat stabilization treatment. It should be observed that a maximum twist of 18 turns per inch are placed in the polyester yarns to provide a low-twist level product. This low-twist level type of yarn is highly desirable for manufacturing a crepe-type fabric since a high twisting operation which is economically undesirable and generally used to produce a high-twist yarn for crepe-like fabrics can now be avoided according to the process of this invention.

After the desired twist has been placed in the yarn, the heat stabilized polyester yarn and non-heat stabilized polyester yarn are then incorporated into woven fabrics in both the weft or filling and warp of said fabric or in knitted fabrics. The most preferred combination of the heat stabilized and non-heat stabilized polyester yarns in the fabric is carried out in such a manner so that at least alternate lengths of heat stabilized and non-heat stabilized polyester yarns are contained in both the filling and warp of the fabric. Under these conditions, a uniform crepe-like fabric is produced on subjecting the fabric to further heat treatment at elevated temperatures. The crepe-ef-

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fect, as described herein, is defined as the surface effect of a fabric which is crinkled, puckered or pebbled. This definition, however, does not include a blistered effect which can be produced when six or more threads form a fancy effect in material because of light, loose or uneven warp tension arrangement. While crepe-effects are produced with amounts of non-heat stabilized polyester yarn as low as 20% and as high as 80% in both the filling and warp of the fabric, and not exceeding six threads of said non-heat stabilized polyester yarn in a row, it is preferred to utilize 35% to 65% of non-heat stabilized yarn in the fabric and not exceeding six threads in a row to provide the greatest crepe-effect in combination with the heat stabilized polyester yarn.

After the fabric containing the non-heat stabilized and heat stabilized yarn in amounts as described above has been prepared, the fabric is subjected to heat elevated temperatures from about 100° C. to below the softening point of the polyester yarn for a period of time sufficient to provide shrinkage of the non-stabilized yarn in the fabric. The preferred temperatures for heating the fabric range from about 100° C. to about 150° C. The heating of the fabric can be conducted by steaming, infrared heat, hot air, hot inert gas, or hot fluids such as boiling water, inert organic liquids and the like. The length of time of the heat treatment is proportional to the temperatures used, i.e. at lower temperatures a long heat treatment can be tolerated but at higher temperatures a shorter period of time of exposure is essential. In any event, the most desired crepe-like effect of fabric is obtained after the non-stabilized polyester yarn present in the fabric has been shrunk to its greatest degree, and the heat stabilized polyester yarn present will, in general, not be affected.

The following examples will serve to illustrate the process of the invention without limiting the same:

Example 1

A warp for a fabric is prepared which contains 2 ends of heat stabilized (hot air at 100° C.) polyethylene terephthalate yarns of 70 denier, 36 filaments having a twist of 7 Z turns per inch alternated with 2 ends of non-heat stabilized polyethylene terephthalate yarns of 70 denier, 36 filaments having a twist of 7 Z turns per inch. The filling of weft yarn utilized with the above warp consist of 76 picks per inch wherein 2 picks of heat stabilized (hot air at 100° C.) polyethylene terephthalate yarns of 70 denier, 36 filaments having a twist of 4 Z turns per inch alternating with 2 picks of non-heat stabilized polyethylene terephthalate yarns of 70 denier, 36 filaments having a twist of 4 Z turns per inch. The resulting fabric was scoured, dyed and heat-set according to conventional dyehouse procedures.

The resulting fabric had highly desirable uniform crepe-like effects. The shrinkage of the fabric after five launderings was nil while maintaining an excellent wash-and-wear rating, permanency of the crepe-like effect as well as permanency of the hand (slightly softer than un-laundered fabric).

Example 2

In a similar manner as Example 1, a similar warp was prepared as described in Example 1. The filling (76 picks per inch), however, contained all non-heat stabilized polyethylene terephthalate yarns of 70 denier, 36 filaments and having a twist of 4 Z turns per inch. The resulting fabric after scouring and dyeing provided only an almost insignificant crepe-like effect in comparison with the fabric of Example 1. This example appears to indicate that the non-heat stabilized polyester yarn as well as the heat stabilized polyester yarn is essential in both the warp and weft or filling to obtain the desired effect.

Example 3

In a similar manner as Example 1, a fabric was prepared using the similar warp of Example 1 and utilizing

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a filling yarn in the same manner as in Example 1 except that polyethylene terephthalate yarns used had a twist level of 15 Z turns per inch. After the scouring and dyeing process has been applied the resulting fabric had highly desirable uniform crepe-like effects. The shrinkage of the fabric after 5 launderings was nil while maintaining an excellent wash-and-wear rating, permanency of the crepe-like effect as well as permanency of the hand (slightly softer than the unlaundered fabric). Utilizing polyester yarns having a twist level of 25, i.e. S or Z, according to the process of this invention, no significant improvements of the resulting fabrics were observed over those fabrics made of the low-twist level polyester yarns as well as the yarns containing opposite twist characteristics.

It is to be understood that the foregoing description is merely illustrative of preferred embodiments of the invention of which many variations may be made by those skilled in the art within the scope of the following claims without departing from the spirit thereof.

What is claimed is:

1. A process for producing wash-and-wear textile fabric having a uniform crepe-like effect from polyester yarns which have a low-level twist up to about 18 turns per inch comprising the incorporation into the weft and warp of said textile fabric at least alternate lengths of heat stabilized and non-heat stabilized polyester yarns and not exceeding six threads in a row of said non-heat stabilized yarns; and subjecting said textile fabric to elevated temperatures from about 100° C. to below the softening point of said polyester yarn to shrink the non-heat stabilized yarn, whereby the shrinkage of the non-heat stabilized yarn cause the fabric to crinkle and pucker into a crepe-like effect fabric.

2. A process for producing wash-and-wear textile fabric having a uniform crepe-like effect from polyester yarns which have a low-level twist in the range from about 4 to about 15 turns per inch comprising the incorporation into the weft and warp of said textile fabric at least alternate lengths of heat stabilized and non-heat stabilized polyester yarns and not exceeding six threads in a row of said non-heat stabilized yarns; and subjecting said textile fabric to elevated temperatures from about 100° C. to about 150° C. to shrink the non-heat stabilized yarn, whereby the shrinkage of the non-heat stabilized yarn cause the fabric to crinkle and pucker into a crepe-like effect fabric.

3. A process for producing wash-and-wear textile fabric having a uniform crepe-like effect from polyester yarns which have a low-level twist in the range from about 4 to 15 turns per inch comprising the incorporation into the weft and warp of said textile fabric two adjacent lengths of heat stabilized polyester yarn and two adjacent lengths of non-heat stabilized polyester yarn throughout said fabric; and subjecting said textile fabric to elevated temperatures from about 100° C. to about 150° C. to shrink the non-heat stabilized yarn, whereby the shrinkage of the non-heat stabilized yarn cause the fabric to crinkle and pucker into a crepe-like effect fabric.

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