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PRODUCTION OF ENTANGLED NOVELTY YARN

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ABSTRACT OF THE DISCLOSURE

This process involves the treatment of a synthetic high polymer filamentary yarn. An undrawn, untwisted yarn is passed through a drawing zone where it is drawn to several times its original length in a non-uniform manner to produce variable denier yarn, and then immediately passing the same through an air jet to effect a uniformly entangled yarn.

The present invention relates to the treatment of synthetic high polymer yarns such as nylon, polyester, and polypropylene. More specifically, the invention relates to submitting a variable denier, or nubby yarn hereinafter referred to as thick-and-thin yarn to a uniform tangling operation to protect the yarn during the subsequent slashing or other textile operations.

In U.S. Patent No. 3,103,098 there is disclosed a method of producing a variable luster yarn. This yarn is the variable denier type and the patentee is concerned with producing a variable luster by passing the yarn through an air jet under conditions that will tangle the yarn in the finer denier portions and not disturb the parallel filaments in the thicker portions. By this treatment, it is alleged that the thickened yarn portions remain lustrous whereas the tangled thin portions assume a reduced or low luster. This is stated to provide a novelty yarn having pleasing properties and is produced in a more economical manner than in prior systems.

To show that certain critical conditions have to be maintained during the tangling operation, patentee shows in Example II that under conditions different from those in Example I a variable luster was not obtained and therefore did not come within the scope of his invention.

In contradistinction to the patented process, the object of the present invention is to utilize certain conditions for passing variable denier yarn through an air jet such as that shown in U.S. Patent No. 2,924,868 and get very uniform tangling in both the thick and thin portions without the formation of loops. This is the desired result for reasons completely different from those given in the aforementioned Patent No. 3,103,098.

The thick-and-thin yarn may be manufactured according to a system such as that shown and described in U.S. application Ser. No. 444,283 filed Mar. 31, 1965 (having common ownership herewith), now U.S. Patent No. 3,319,411, the subject matter of which is incorporated herein by reference. Such yarn does not have sufficient filament-to-filament cohesion to properly withstand subsequent treatments such as slashing where a sizing emulsion bath is applied to the yarn passing through the bath. Substantially untwisted, i.e.parallel, filaments will form loops, wander, and therefore become entangled with filaments of other yarns. This will cause defects to show up in the woven fabric and accordingly is not first quality.

In order to condition normal uniform denier yarn for slashing and subsequent operations, it is given a twist of several turns per inch but, when it was attempted to twist thick-and-thin yarn having marked differences in denier in the several portions, it was determined that the twist ran back to the thin portions and the thick portions remained substantially untwisted. This resulted in the same

difficulties that were involved in slashing untwisted yarn. For the same reason, it was thought that tangling would occur in the thin portions and not in the thick portions, particularly in view of the teachings of said Patent No. 3,103,098.

Now, however, it has been unexpectedly determined that under certain conditions thick-and-thin yarn can be uniformly tangled. Such yarn has no wandering filaments and no loopiness, so that it is fully protected during slashing, and fabric woven therefrom has excellent appearance and contrast. The fiber quality during warping is also ideal. The novelty of the fabric depends not only on the denier differences, but also on the difference in dye take-up of the thick (undrawn) portions, both of which contribute to the pleasing appearance of the fabric, although the luster is not changed.

When utilizing the system disclosed in said Patent No. 3,319,411, the undrawn, untwisted yarn is unwound from a supply package and passed through feed rollers and thence to rollers operating at higher peripheral speeds so as to draw the yarn several times its original length while it is traveling between the several sets of rollers. Novel mechanism for imparting a nonuniform drawing action on the yarn is interposed between the rollers. Variable denier or thick-and-thin yarn is obtained by this process. The thus drawn yarn is next propelled to and thorugh an air jet of the type shown in U.S. Patent No. 2,924,868 where it is uniformly tangled sufficiently to give the necessary cohesion for later treatments. Finally, the uniformly tangled thick-and-thin yarn is collected either on a pirn, with a producer's twist, i.e., 0.5 turn per inch to 0.75 turn per inch, or collected in an untwisted condition on a flat package take-up.

Although, in the foregoing description of the system, the yarn is first drawn in a random irregular manner and then tangled, it may be desirable to first tangle the yarn and then draw the same. However, in that case, the yarn should be given a higher entanglement so that the drawing will not remove too much to be beneficial.

The degree of cohesion between the filaments is known as the cohesion factor or C.F., which is determined by 100/L, where L is the average length (in inches) between yarn entanglements. The determination is made by repeatedly measuring the length of yarn through which a hook-shaped needle may be pulled before encountering resistance to further axial movement. The C.F. of the yarn should be sufficient to process properly, i.e., no broken filaments through later treatments such as slashing and weaving. A C.F. in the neighborhood of 60 gives excellent fiber quality during subsequent operations, although yarn having a lower C.F. can be used if the conditions are modified such as by changing the composition of the size in the slashing operation. A suitable range of C.F.'s is 40–80.

It is necessary to control the air pressure in the tangling zone very carefully and correlate the same with the tension on the yarn so that no loops will be formed in the filaments. Whereas the air pressure can be as much as 28 pounds per square inch (p.s.i.), the normal range is from 6 to 18 p.s.i. In this range of air pressures, the tension on the yarn can range between 18–21 grams without the formation of loops.

The following examples will serve to illustrate the invention in more detail.

EXAMPLE I

A 140 denier, 24 filament yarn was drawn on a draw-twister which was equipped with a thick-and-thin drawing unit and a tangling unit. The drawing speed was 1044 feet per minute. The draw ratio was 2.14:1 and the air pressure was 12 p.s.i. The tension on the yarn was 18 grams and the C.F. was 60. The processability of the

yarn was excellent with no broken filaments. The fabric appearance in both the warp and filling was acceptable with excellent color contrast.

EAMPLE II

A 70 denier, 24 filament yarn was drawn on a draw-twister which was equipped with a thick-and-thin drawing unit and a tangling unit. The drawing speed was 1044 feet per minute. The draw ratio was 1.96:1 and the air pressure was 10 p.s.i. The tension on the yarn was 18 grams and the C.F. was 69. The processability of the yarn was considered quite acceptable and the weaving quality was considerably better than the control yarn which did not use the tangling jet and therefore had substantially no C.F. The fabrics gave a pleasing appearance with excellent color contrast.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove, and as defined in the appended claim.

What is claimed is:

1. A continuous process for producing a drawn and uniformly tangled thick-and-thin synthetic high polymer multifilamentary yarn from undrawn yarn, which comprises the steps of

(a) feeding an undrawn, untwisted, and untangled multifilament yarn to a drawing zone;

(b) subjecting the yarn to intermittent drawing forces to produce thick and thin portions along the length thereof;

(c) propelling the thick-and-thin yarn immediately after drawing through a tangling zone;

(d) subjecting the yarn to between 6 and 18 p.s.i. turbulent air pressure in said tangling zone; and

(e) maintaining yarn tension in said tangling zone at between 18 and 21 grams in order to produce a uniform entanglement of filaments in both the thick and thin portions of the yarn to provide a cohesion factor of between 40 and 80 without producing loops or wandering filaments detrimental to subsequent processing.

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