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3,611,701

PROCESS FOR THE PRODUCTION OF DYED CRIMPED YARNS

Herbert Scherzberg, Dormagen, Germany, assignor to Farbenfabriken Bayer Aktiengesellschaft, Leverkusen, Germany

No Drawing. Filed Nov. 20, 1969, Ser. No. 378,563
Claims priority, application Germany, Nov. 29, 1968,
P 18 11 718.5

Int. Cl. D02g 1/02

U.S. Cl. 57—157 TS

3 Claims

ABSTRACT OF THE DISCLOSURE

The invention relates to a texturing process for the production of dyed, crimp yarns from endless filaments by the false-twist method. The endless filaments consist of synthetic polymers, such as high-molecular weight linear polyamides or high-molecular weight linear polyesters. The process is carried out by making up the endless synthetic filaments issuing from a spinning station by knitting into a tubular structure, being dyed in that form, the filaments then being stretched and false-twist-cripped. The knitting machine required to produce the tube is arranged immediately beneath the spinning station. The false-twisting is effected at temperatures of above 100° C.

This invention relates to a process for the production of dyed crimp yarns from fully synthetic endless filaments, in which the filaments are dyed after spinning from the duct and are then further processed into crimp yarn.

When texturing is carried out by the false-twist process, there are at present two alternative methods for producing coloured crimp filaments. The completed crimp yarn is dyed either after texturing in strand form or making up in soft cross-wound bobbins (muff), or before texturing on cross-wound bobbins. Polyamide and polyester fibres are usually dyed after texturing since, with these materials, dyeing before texturing results in a poor yarn yield because the crystallinity of the material is increased under the effect of the heat-treatment during dyeing and the filament is fully shrunk. By contrast, polyacrylonitrile yarns are dyed before texturing.

The present practice of dyeing polyamide and polyester yarns after they have been textured involves a number of operations. Highly elastic crimp yarns intended for highly elastic articles are dyed in skein form so that the elasticity is not affected by dyeing, whilst crimp yarns intended for medium-stretch articles are dyed in the soft cylindrical make-up, in which case the reduction in the elasticity of the yarn accompanying dyeing is of advantage to application in this field. Hitherto, moderately elastic crimp yarns, produced on false-twist machines, have only been satisfactorily dyed in special made-up forms because dyeing in the soft make-up readily produces differences in volume between the inner and outer layers of the bobbin.

The operations involved in the production of crimped and dyed highly elastic polyamide and polyester yarns for use in highly elastic articles are as follows:

- (1) Spinning on to cylindrical cross-wound bobbins,
- (2) Stretching on cops or cylindrical cross-wound bobbins,
- (3) Texturing a highly elastic crimp yarn on cylindrical cross-wound bobbins,
- (4) Twisting together yarns with an S- and Z-crimp tendency,
- (5) Preparing the skein (max. skein weights approx. 400 g.)
- (6) Steaming,
- (7) Multiple yarn dyeing,

- (8) Winding,
- (9) Making up into cones.

Twisting before the skein is made up is absolutely essential because it is extremely difficult to finish yarn that has been dyed in single yarn form (monofilaments) in the skein inasmuch as the material becomes tangled and gives rise to difficulties in take-off.

Moderately elastic crimp yarns are used in the manufacture of outer clothing. With such materials, the following operations are involved:

- (1) Spinning on to cylindrical cross-wound bobbins,
- (2) Stretching on cops or cylindrical cross-wound bobbins,
- (3) Texturing a highly elastic crimp yarn made up in a soft cylindrical form (max. bobbin weights approx. 600 g.),
- (4) Steaming,
- (5) Single yarn (monofilaments) dyeing accompanied by a reduction in elasticity,
- (6) Off-wind with rollers.

With yarns of this kind, there is no need for doubling and twisting before dyeing. If plied yarn (multifilament material) is required for use, for example in the cotton field, it is produced by doubling and twisting after dyeing. Off-winding with rollers produces a large number of breakages in the yarn.

Moderately elastic crimp yarns can also be produced on special false-twist machines with after-treatment under heat.

The following operations are involved in dyeing:

- (1) Spinning,
- (2) Stretching,
- (3) Texturing,
- (4) Preparing a special dye package,
- (5) Steaming,
- (6) Single yarn dyeing (max. bobbin weights approximately 800 g.),
- (7) Winding or in the case of plied yarn processing, twisting and making up.

In this instance, also, finishing the special dye packages in the case of single yarn dyeing involves numerous yarn breakages and hence difficulties. Accordingly, it is also standard practice with plied yarn processing, to carry out the twisting operation before the special dye package is prepared and to dye the plied yarn in twisted form.

In none of the processes described above is it possible to process dyed and undyed yarns in admixture with one another because, on completion of dyeing, the material is fully shrunk, whilst the undyed material shows a residual shrinkage of from 4 to 6%, depending on the conditions under which it has been prepared.

When dyeing is carried out before texturing, a practice confined solely to polyacrylonitrile filaments, the following operations are currently involved:

- (1) Spinning on to cylindrical cross-wound bobbins,
- (2) Stretching,
- (3) Fully shrinking the material,
- (4) Winding to form dye packages (maximum package weights approximately 1 kg.),
- (5) Single yarn dyeing,
- (6) Texturing on cylindrical cross-wound bobbins and, with plied yarn processing, twisting and making up.

In this instance, too, dyed and undyed material can only be processed in combination with one another if the undyed material has also been fully shrunk before texturing.

A process for the production of dyed crimp yarns by the false-twist method has now been found in which

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hitherto-essential operations can be eliminated, providing the endless filaments issuing from the extrusion spinnerette are made up into a knitted tubular structure, are dyed in this tubular form, and are then stretched and false-twist-crimped in a single operation. Dyed and undyed material can also be processed in admixture with one another, because the residual shrinkage after texturing is the same in both yarns. For this purpose, the spun material is made up and dyed in tubular form. This spun material can be stretched and crimped in a single operation on the false twist texturing machine. The knitting machine required to produce the tube is arranged immediately beneath the spinning duct. Deformation of the loops accompanying preparation of the tubular structure is eliminated by the stretching operation. Dyeing can be carried out in known manner both with the package system and also with the creel system. This process is suitable for polyamide, polyester and polyacrylonitrile filaments. False-twisting is effected at temperatures of above 100° C.

The following examples show that this novel process affords considerable advantages. By reducing the number of operations involved and also by virtue of the fact that mixed-yarn processing is possible, considerable economy can be achieved especially when the stretch-crimping principle is adopted.

EXAMPLE 1

A 140-denier with 18 filaments polyamide crimp yarn of moderate elasticity is required for use in knitting to produce a knitted article (Wevenit). It is spun with a spinning denier of 427 denier and directly made up into a tubular structure on a 10-gg knitting machine. This tubular structure is dyed by the creel method and stretched on a texturing machine with 2 texturing zones in a stretching ratio of 1:3.2 at 1800 r.p.m./160° C. and false-twist-crimped at 150° C. with an overfeed of 4% at 2000 t./m.

EXAMPLE 2

A moderately elastic 90 denier 4-ply crimp yarn of polyamide-6 is required for use in the cotton sector. It is spun with a denier of 315 denier and directly made up into a tubular structure on a knitting machine. After dyeing in the tubular structure, the yarn is stretched on a texturing machine with 2 texturing zones in a ratio of 1:3.12 at 1600 revolutions/150° C. and then false-twist crimped at 160° C. and 3000 t./m. with an overfeed of 9%. This material is twisted and coned in 4-ply form.

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EXAMPLE 3

A 90 denier polyamide crimp yarn is required for use in the production of highly elastic sock yarns. It is spun with a denier of 315 denier and directly made up into tubular form. This material is dyed in tubular structure. After stretching in a ratio of 1:3.5 on a standard drawing machine, the yarn is false-twisted at 3000 t./m. at 180° C. under a 6% overfeed on a standard false-twist machine.

EXAMPLE 4

A 240 denier polyacrylonitrile crimp yarn is required for the production of outer clothing. It is used in a spinning denier of 860 denier. This material is made up into a tubular structure on a 10-gg knitting machine and then dyed. After dyeing, the tubular structure is fed directly to a false-twist texturing machine incorporating a stretching frame, stretched in a stretching ratio of 1:5.5 at 160° C. and then false-twisted at 1560 t./m. at 170° C. with a 3% overfeed.

What we claim is:

1. A process for the production of dyed crimp yarns from fully synthetic endless filaments by the false-twist method, which comprises extruding endless filaments from an extrusion spinnerette, knitting the same into a tubular structure, dyeing the filaments in said tubular structure and then stretching and false-twist crimping said filaments.

2. The process as claimed in claim 1, wherein a knitting machine is arranged immediately beneath the extrusion spinnerete.

3. The process of claim 1 wherein the stretching and false-twist crimping are carried out in a single operation.

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JOHN PETRAKES, Primary Examiner

U.S. Cl. X.R.

28—72.16; 57—164; 264—103