United States Patent

Scherzberg

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[54] **PROCESS FOR THE PRODUCTION OF MODERATELY ELASTIC CRIMP YARNS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** .....**57/157 TS**

[51] **Int. Cl.** **D02g 1/02**

[58] **Field of Search** .....57/140, 34 HS, 157, 157 TS, 57/157 MS, 36, 51; 28/72

[56] **References Cited**

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[57] **ABSTRACT**

A process for the continuous production of moderately elastic crimp yarn from unstretched synthetic filaments by false-twist crimping, wherein the unstretched synthetic filaments are initially fully stretched under heat with a slight false-twist, after which they are subjected in the same operation to false-twist crimping under heat in the opposite direction and wound up under relaxation. Stretching is carried out at stretching ratios of from 1:3 to 1:6 and at temperatures of from 80° to 180° C.

7 Claims, 2 Drawing Figures

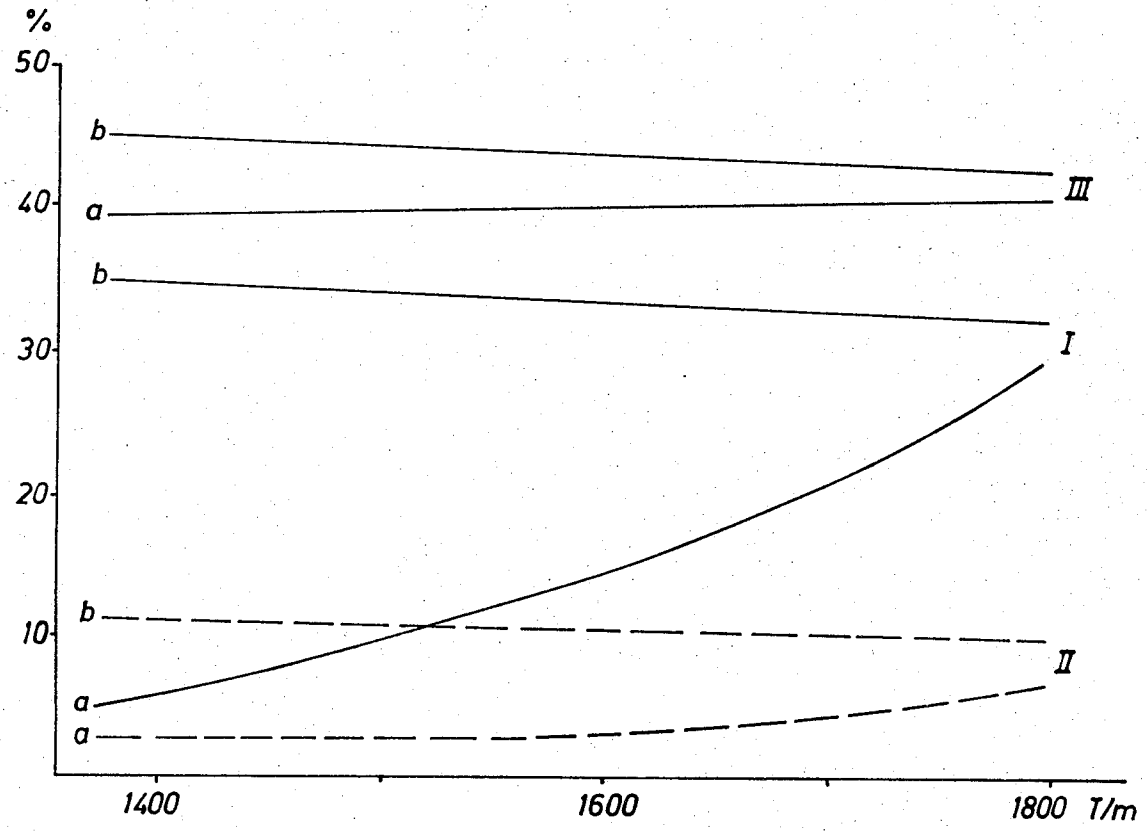

FIG. 1

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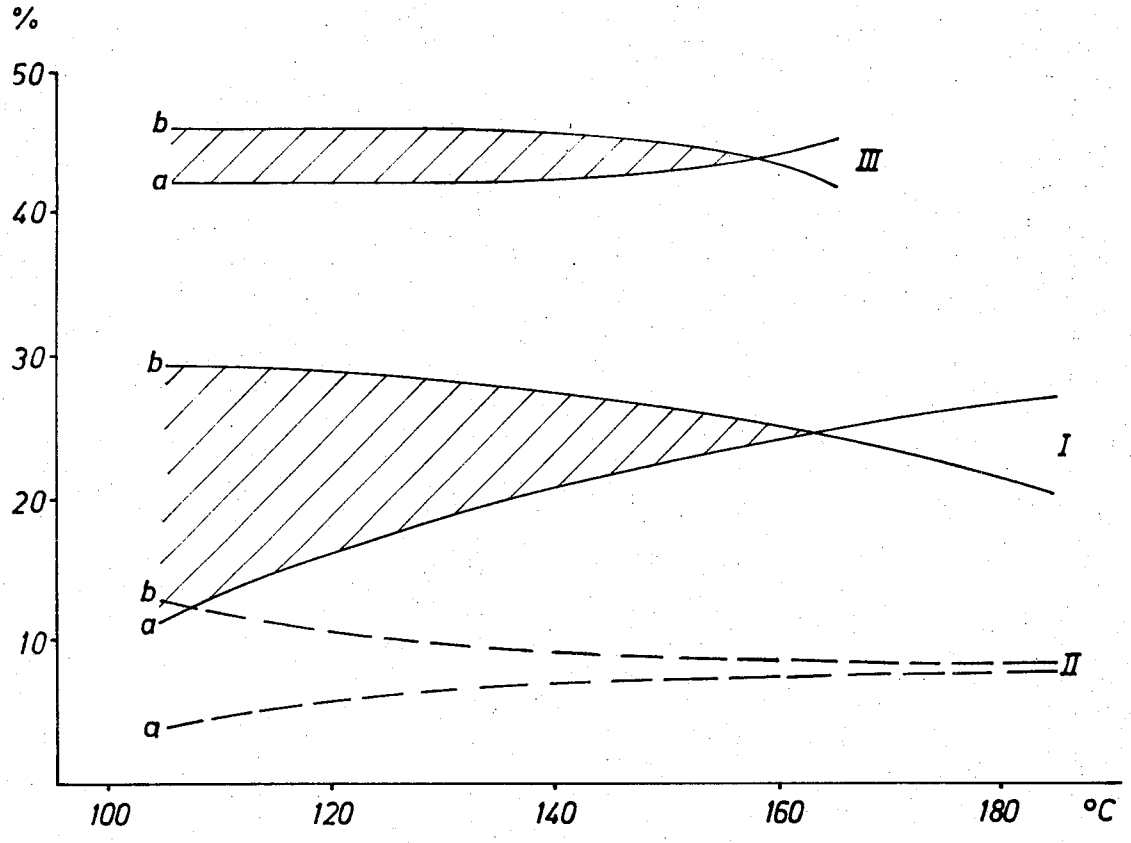

FIG. 2

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PROCESS FOR THE PRODUCTION OF MODERATELY ELASTIC CRIMP YARNS

This invention relates to a continuous process for the production of a moderately elastic crimp yarn from unstretched synthetic filaments by the false-twist method.

It is known in connection with synthetic filaments that, to produce moderately elastic crimp yarns by the false-twist method for use in the manufacture of outer clothing, the elasticity of the highly elastic crimp yarns can be reduced by subsequent heat treatment of the filament optionally in the presence of tension.

It is also known that in cases where unstretched synthetic material is used the stretching operation can be combined with the crimping operation and the elasticity of the highly elastic crimp yarn similarly reduced by a subsequent heat treatment so that it can be used in the manufacture of outer clothing. Finally, it is also known that unstretched synthetic material can be stretched under heat in two stages and given a false twist in opposite directions during stretching. This yarn can either be moderately elastic, for example for use in the manufacture of outer clothing, or highly elastic, for example for use in the production of sports clothing, depending both upon the temperature and the degree of twist during the stretching operations in the two stages. The processes in which crimp elasticity is subsequently reduced have — when effecting reducing without tension in strands, muffs or winding rings — the disadvantage of a considerable increase in production costs through a series of additional operations, Furthermore, in cases where elasticity is reduced in the presence of tension in the moving filament or even in the bobbin, they have the disadvantage of high residual shrinkage which has an adverse effect upon finishing and dyeing insofar as it is not possible to obtain optimum make-up widths or, in the case of textured fabrics, for example relief fabrics, to obtain the full structure or texture because the fabric undergoes excessive shrinkage when washed during dyeing and has to be subsequently stretched under excessive tension over the tenter frame during finishing. In addition to these disadvantages affecting subsequent reduction of elasticity, there is the further disadvantage in cases where stretching is combined with crimping that, with the yarn thicknesses in excess of 90 den which are required for outer clothing, an irregular yarn is obtained because the outer capillary filaments are stretched to a greater extent and crimped to a lesser extent than the inner capillary filaments due to the high twist required for crimping during the stretching operation.

The false-twist crimping process together with the stretching operation carried out under heat in two stages, accompanied by false-twisting in opposite directions, does not have the disadvantage of the occurrence of different capillary lengths. The yarn is regular without any tendancy towards twisting, although it does have the disadvantage of high residual shrinkage because stretching also occurs in the second stage.

A continuous process for the production of a moderately elastic crimp yarn from unstretched synthetic filaments by the false-twist method has now been found in which the unstretched synthetic filaments are initially subjected to continuous full

stretching under heat under a slight false-twist, immediately afterwards are subjected to false-twist crimping under heat in the opposite direction and when wound up in the absence of tension. The machine settings, the temperature and the twist in the two treatment stages are maintained so that after stretching in the first stage the stretched yarn shows limited crimp elasticity, for example in the S-direction, and after the second stage shows the required higher crimp elasticity in the opposite direction, for example in Z-direction, with minimal residual shrinkage. Twisting in the opposite direction during stretching in the first stage obviates the disadvantage of irregularities in the yarn which accumulate and also eliminates any tendency towards twisting in the completed crimp yarn. The twists and temperatures of the two stages are adapted to one another so that, instead of being reduced, the crimp elasticity is increased. (See FIGS. 1 and 2 : curve I = shrinkage due to crimping, curve II = shrinkage, curve III = shrinkage in steam, according to Melliand Textilber. 5/66, pages 493 et seq.).

Accordingly, the yarn is continuously stretched under heat in a first stage with a slight false-twist and then in another stage is crimped under heat to the required crimp elasticity. In this second stage, the yarn is simultaneously subjected to higher false twisting in the opposite direction. The first-stage stretching is carried out with the stretching ratios normally used for synthetic filaments (1:3 to 1:6) at temperatures of from 80° to 180° C. Twisting in the first stage can be carried out for example with a mechanical twister. The degree of twisting in the first stage should amount to from 1,000 to 2,000 false twists per meter. In the second stage, false-twist crimping is carried out with twists from 1,500 to 3,000 false twists per meter for deniers of from 200 to 50 dtex at temperatures of from 120° to 180° C. The lead is advantageously between 2 and 8 percent and the relaxation during winding between 5 and 15 percent.

This process represents an advance in that by virtue of the process it is possible to obtain a moderately elastic crimp yarn with minimal residual shrinkage without any tendency towards twisting in a single operation from an unstretched material. Filaments of high molecular weight polyamides and high molecular weight linear polyesters are particularly suitable for the process.

The process is easy to carry out. The fabrics can be uniformly dyed because the ring and spindle rail movements which occur during texturing from cops can no longer occur because the material is continuously stretched, treated and wound up to cylindrical cheeses.

EXAMPLE 1

A filament of poly-ϵ-caprolactam (140 dtex with 18 individual filaments) is stretched in a ratio of 1:3.14 in a heating tube at a temperature of 150° C and by means of a twister has 1,400 false twists per meter (T/m) imparted to it in the S-direction during stretching. It is then subjected to false-twist crimping in the Z-direction in the same operation in a false-twist crimping stage under the usual texturing conditions (2,200 twists at 160° C), the lead mounting to 2 percent. The filament thus stretched and crimped in two stages is wound up under 12 percent relaxation. The yarn obtained is used

for a circular knit fabric dyed and finished individually. The crimped filament has a crimp shrinkage of from 30 to 35 percent, shrinkage of 14 percent and a residual shrinkage of approximately 3 percent. It has no tendency towards twisting and can be processed like a monofilament.

EXAMPLE 2

For use in the production of ladies stockings, a poly-ϵ-caprolactam filament (40 dtex with nine individual filaments) is stretched in a ratio of 1:3.14 at 120° C, initially twisted in the S-direction with 1,800 twists per meter, crimped in a second stage in the conventional manner by the false-twist method with 3,000 twists in the Z-direction at 160° C and with a 2 percent lead and then wound up under 8 percent relaxation. The filament thus produced has a crimp shrinkage of around 50 percent and a residual shrinkage of 4 percent. The filament has no tendency towards twisting and can be processed like a monofilament in the welt.

What we claim is:

1. A process for the continuous production of crimp yarn from synthetic filaments wherein the synthetic filaments are:

I. fully stretched under heating at temperatures of above 80° C with a false-twist of below 2,000 false twist per meter;

II. subjected without further stretching in the same working stage to false-twist crimping under heat at temperatures of above 120° C in the opposite direction; and

III. wound up under relaxation.

2. A process as claimed in claim 1, wherein stretching is carried out at a stretching ratio of from 1:3 to 1:6.

3. A process as claimed in claim 1, wherein the stretching is carried out at a temperature of from 80° to 180° C.

4. A process as claimed in claim 1, wherein the degree of twisting in stage (1) is from 1,000 to 2,000 false-twists per meter.

5. A process as claimed in claim 1, wherein the degree of twisting in stage (II) is from 1,500 to 3,000 false-twiste per meter.

6. A process as claimed in claim 1, wherein the synthetic filaments are filaments of a high molecular weight polyamide.

7. A process as claimed in claim 1, wherein the synthetic filaments are filaments of a high molecular weight linear polyester.

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