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(54) Brushing a fabric with low tenacity-elongation nylon yarn.

(57) Fabrics for brushing contain a nylon yarn having an elongation less than 60% and a tenacity less than the lesser of 5 grams per denier and (7 -[0.06 X elongation%]). The yarn tenacity is preferably between 1.5 and 4 grams per denier, and the yarn is preferably composed of filaments having deniers between 1.4 and 6.

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BRUSHING A FABRIC WITH LOW TENACITY-ELONGATION NYLON YARN

The invention relates to the art of making napped fabrics, and more particularly to the art of making such fabrics wherein polyamide yarns are included in the fabric.

Brushed or napped fabrics have long been known, particularly in fabrics made from staple yarns. Such fabrics are typically made by abrading the fabric surface by contact with teazels or wire carding cloth (see textbook "Textile Finishing" by Hall, published 1966 by American Elsevier, pages 105-108). When a very short pile or nap is to be raised, the cloth surface may be subjected to abrasion by contact with emery or other similar material (page 107 of the Hall text). Fabrics made of continuous filament nylon have not been used extensively for many types of brushed fabrics, since conventional nylon yarns give poor results in the brushing operation when using conventional brushing equipment.

It has been discovered that the brushing operation can be successful with fabrics containing continuous filament nylon yarns if the properties of the nylon yarns are properly selected as disclosed below. The yarns must have elongations less than about 60%, and must have tenacities less than the lesser of 5 grams per denier and (7 -(0.06 X elongation%)) grams per denier.

According to a first aspect of the invention there is provided a process for producing napped fabrics, comprising providing a fabric comprising a critically selected polyamide yarn having a plurality of continuous polyamide filaments, the polyamide yarn being at least partly exposed on a surface of the fabric, and abrading the surface sufficiently to break some of the filaments of the polyamide yarn. The polyamide yarn must have an elongation less than about 60%, and must have a tenacity less than the lesser of 5 grams per denier and (7 -[0.06 X elongation%]) grams per denier.

According to further aspects of the invention, the tenacity of the polyamide yarn is preferably between 1.5 and 4 grams per denier, and the elongation of the polyamide yarn is preferably between 10 and 50%. The polyamide yarn is preferably nylon 66, and advantageously the filaments of the polyamide yarn have deniers between 1.4 and 6. The yarn tenacity is advantageously less than the lesser of 5 grams per denier and (6.8 -[0.06 X elongation%]) grams per denier. For various desirable dyeing effects, the fabric may comprise a second yarn which does not comprise polyamide filaments. Advantageously such a second yarn may be a polyester, with the preferred polyester being polyethylene terephthalate.

Other aspects of the invention will appear in the following detailed description of the invention.

Example 1

This is an example of attempts to brush fabrics made of conventional nylon yarns. A conventional apparel 34 filament nylon 66 yarn is melt-spun at 1400 MPM, quenched, steamed and wound, the spun denier being selected such that the drawn yarn will have 70 denier. The spun yarn is cold drawn to an elongation of 40%, yielding a drawn yarn having a tenacity of 5.6 grams per denier. A warp knit fabric is formed from the yarn. Attempts to brush the fabric using a Gessner knit goods napping apparatus are unsuccessful due to rapid dulling of the wires on the napping apparatus and failure of the filaments to cleanly break.

The spinning and drawing operations are modified to provide a 70 denier drawn yarn having an elongation of 60%, resulting in a tenacity of 4.2 grams per denier, and to provide a 70 denier drawn yarn having an elongation of 30%, resulting in a tenacity of 6.5 grams per denier. Similar unsuccessful results are obtained when it is attempted to brush warp knit fabrics formed from either of the drawn yarns of this paragraph.

Example 2

This is an example according to the present invention. Nylon 66 polymer having an RV of 80 and nylon 66 polymer having an RV of 40 are extruded as 34 side-by-side conjugate molten streams through spinneret capillaries, the volumetric ratio being 40% high RV polymer and 60% low RV polymer. The spinning temperature is 285°C., and the 34 conjugate molten steams are conventionally quenched into filaments by transversely directed quench air in a quench zone immediately below the spinneret. The filaments are converged into a yarn and simultaneously subjected to finish application by a metered finish applicator located 91.44 CM below the spinneret face. The yarn then passes in a partial wrap about a feed roll running at a peripheral speed of 3333 MPM, the feed roll being located 6.1 meters below the face of the spinneret. The yarn next passes in a partial wrap about a delivery roll running at a peripheral speed of 5000 MPM. The surfaces of both feed and draw rolls are selected to minimize slippage, so that the yarn is drawn between the rolls. Next the yarn

passes through a 300°C. tube 61 CM long and is then wound at a winding speed of 4605 MPM. The yarn has 34 filaments, 70 denier, an elongation of 43%, and a tenacity of 2.4 grams per denier.

A warp knit fabric is formed from the conjugate yarn of this example and subjected to the conventional brushing operation, surprisingly with excellent results.

The nylon yarns usable according to the invention may be used as an accent yarn in a fabric including another fiber, or as a 100% face yarn. The fabric construction may be either woven or knitted so long as some of the nylon yarn is exposed so as to be accessible to the brushing process.

Example 3

The necessary yarn properties can be achieved by other processes than that of Example 2. A 34 filament yarn is spun from 40 RV nylon 66 polymer at a melt temperature of 285°C., the molten streams being conventionally quenched and converged into a yarn 52 inches (132 CM) below the face of the spinneret. The yarn next passes downwardly to a metered finish applicator located 3.3 meters below the spinneret face, then in a partial wrap about each of two ceramic snubbing pins prior to contact with a feed roll running at a surface speed of 3800 MPM. After passing in a partial wrap about the feed roll, the yarn passes in a partial wrap about a delivery roll running at a surface speed of 3710 MPM, then is wound at a winding tension of about 7 grams. The snubbing pins are arranged such that the yarn tension between the snubbing pins and the feed roll is 55 grams.

The resulting 70 denier yarn has an elongation of 44%, and a tenacity of 3.9 grams per denier. A warp knit fabric formed from the yarn is brushed with excellent processability, and the resulting napped fabric is of excellent quality.

TEST METHODS

Fifty yards of yarn are stripped from the bobbin and discarded. Elongation is determined using an Instron tensile testing instrument. The gage length (initial length of yarn sample between clamps on the instrument) is 25 CM and the crosshead speed is 30 CM per minute. The yarn is extended until it breaks. Elongation is defined as the increase in sample length at the time of maximum force (stress) applied, expressed as a percentage of the original gage length (25 CM). Tenacity is defined as the maximum stress applied in grams divided by the yarn denier prior to extending the yarn.

Claims

1. A process for producing napped fabrics, comprising:

(a) providing a fabric comprising a polyamide yarn having a plurality of continuous polyamide filaments, said polyamide yarn being at least partly exposed on a surface of said fabric and having:

(1) an elongation less than about 60%; and

(2) a tenacity less than the lesser of:

(a) 5 grams per denier, and

(b) (7 -[0.06 times elongations %]) grams per denier, and

(b) abrading said surface sufficiently to break some of the filaments of said polyamide yarn or said surface.

2. The process defined in claim 1, wherein said tenacity is between 1.5 and 4 grams per denier.

3. The process defined in claim 1, wherein said elongation is between 10 and 50%.

4. The process defined in claim 2, wherein said elongation is between 10 and 50%.

5. The process defined in claim 1, wherein said filaments are composed of nylon 66.

6. The process defined in claim 1, wherein said filaments have deniers greater than 1.5.

7. The process defined in claim 1, wherein said fabric further comprises a second yarn which does not comprise polyamide filaments.

8. The process defined in claim 7, wherein said second yarn comprises polyester filaments.

9. The process defined in claim 8, wherein said second yarn comprises polyethylene terephthalate filaments.

10. The process defined in claim 1, wherein said yarn has a tenacity less than the lesser of 4 grams per deer or (6.8 -[0.06 times elongation %]) grams per denier.

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EUROPEAN SEARCH REPORT

Application number

EP 86 87 0104

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 365 652 (MONSANTO)		D 06 C 11/00
A	GB-A-2 095 300 (FORSCHUNGSINSTITUT FÜR TEXTILTECHNOLOGIE)		
A	FR-A-2 145 263 (MITSUBISHI RAYON)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
D 06 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31-10-1986	PETIT J.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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