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(71) Applicant: **HOECHST CELANESE CORPORATION**
Route 202-206 North
Somerville, N.J. 08876(US)

(72) Inventor: **Holden, William H., Jr.**
6622 Ronda Avenue
Charlotte, North Carolina(US)

(74) Representative: **von Kreisler, Alek,**
Dipl.-Chem. et al
Patentanwälte
von Kreisler-Selting-Werner
Bahnhofsvorplatz 1 (Deichmannhaus)
D-50667 Köln (DE)

(54) **Low pilling polyester blended yarn.**

(57) Fabric prepared from a polyester blended yarn consisting essentially of from about 42% to about 70% by weight matrix fibers, from about 1% to 20% by weight of crimped staple bicomponent fibers having a polyester core and a copolyester sheath and complementary to total 100% by weight from about 59% to about 10% of crimped polyester staple fiber. Fabrics formed of such a blended yarn having shown in the present invention to have low pilling.

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Background of the Invention

The present invention relates to polyester blended yarn and the use of bicomponent polyester fiber in the polyester blended yarn.

It is generally recognized that the fabrics comprising synthetic polymer fibers such as poly(ethylene terephthalate) (PET) fibers, and blends of natural and synthetic fibers have an undesirable propensity upon prolonged use to exhibit small, compact groupings of entangled fibers (i.e., fuzz balls) on the fabric surface. Such fiber groupings commonly are termed "pills" and tend to form and to tenaciously adhere to the surface of the fabric as the fabric encounters surface abrasion during normal use. The aesthetic appearance of fabric accordingly may be adversely influenced by these relatively compact groupings of entangled fibers which are retained on the surface of the fabrics.

Heretofore, it has been believed that such pills can be traced to the relatively high strength of the synthetic fibers present in the fabric. For instance, the pills may be more or less permanently attached to the fabric surface by one or a few
synthetic polymer fibers extending out of the fabric which will resist breakage as surface abrasion continues.

This theory of pill formation is supported by the lower level of the retention of undesired fuzz balls on the surface of the fabrics consisting solely of cotton fibers following the same surface abrasion conditions. It is believed, for instance, that entangled cotton fibers which form at the surface of the fabric readily break away since the cotton fibers are of an inherently lesser strength.

This pilling problem may be observed in fabrics formed in whole or in part from poly(ethylene terephthalate) fibers in a blend with cotton fibers in a yarn. Pills commonly are observed on the fabric formed from blends of cotton and staple poly(ethylene terephthalate) fibers following extended use. While pills may be observed in fabrics having wider variety of constructions, they are frequently observed on loosely constructed fabrics, particularly knitted fabrics using spun yarns of polyester staple fiber and cotton.

One approach heretofore proposed is to reduce the tendency of the poly(ethylene terephthalate) fibers to pill initially by limiting the molecular weight (measured as the intrinsic viscosity) of the poly(ethylene terephthalate) polymer prior to fiber formation. Such reduced intrinsic viscosity provides a general indication of reduced polymeric chain length and leads to fibers having a lesser strength. Accordingly, when such entangled fibers become free on the surface of the fabric following abrasion, they tend to cleanly break away more readily and do not serve as a secure length which retains a fuzz ball at the surface of the fabric.

It has been found, however, when this approach is followed, it is more difficult initially to process the poly(ethylene terephthalate) into fiber, spun yarn and a fabric using standard processing conditions because of its reduced strength. Such reduced strength can lead to premature fiber breakage and to concomitant processing disadvantages.

In U.S. Patent numbers 3,104,450; 3,576,773; 3,580,874; 3,607,804; 3,991,035; and 4,004,878 the incorporation of certain moieties in the backbone of the poly(ethylene terephthalate) fibers to reduce the fiber strength is proposed in an effort to improve the pilling characteristics.

In the polyester fiberfill art, it is well known that polyester fiberfill blends can be made of polyester fibers and binder fibers such as bicomponent fibers. In particular, such fibers are blended and formed into an unbonded back of the desired weight that is heat treated to melt the chief material of the
bicomponent fiber and then cooled to result in a bonded nonwoven fabric.

It is also known to blend bicomponent fibers with cotton fibers in yarns made for mops to enhance structural integrity of the yarns when the mop is used. As in fiberfill art, the cotton and bicomponent fibers are blended, which are then heat treated and cooled resulting in bonding of the bicomponent fiber and the cotton.

Prior efforts to control the pilling aspects of polyester have met with limited success and especially in the area of cotton/polyester blends. Some of the failure is due to the fact that it is difficult to implement these processes.

Summary of the Invention

A polyester blended yarn consisting essentially of from about 40% to about 70% by weight of matrix staple fiber, from about 1% to 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of the polyester core and complementary to total 100% by weight from about 59% to about 10% of crimped polyester staple fiber of a denier of about 0.5 to less than 10 dpf.

The instant product overcomes the disadvantages of the prior art because of its simplicity and ease of control. Accordingly, the instant product fulfills a need for a product to render polyester blended yarn, low pilling, which is simple to use, easy to control and readily commercializable.

Detailed Description of the Invention

The instant invention is directed to a polyester blended yarn consisting of 1% to 20% bicomponent fibers so that the resulting polyester fabric does not pill. The polyester blended yarn consists essentially of 40% to 70% by weight of matrix staple fibers and from about 1% to 20% by weight of crimped staple bicomponent fibers and complementary up to a total 100% by weight from about 59% to about 10% of crimped polyester staple fiber.

The staple fibers used in here, are textile fibers having a linear density suitable for wearing apparel, i.e., less than 10 dpf per fiber, preferably less than 6 dpf per fiber in lengths from 0.75 to 2.5 inches. Crimped fibers are particularly preferred for textile aesthetics and processability.

The matrix staple fiber used in the present invention may be any fiber whether synthetic or natural, used in conjunction with polyester fibers to make fabric. Such fibers may be made from cotton, wool, rayon, acrylic, nylon and polypropylene. Preferably, cotton fibers are used in the present invention.

The next ingredient is a polyester, in particular, poly (ethylene terephthalate) (PET). The PET polymer can be made by either terephthalic acid or dimethyl terephthalate or copolymer processes, which are well known to those of ordinary skill in the art.

The third essential ingredient in the blend is bicomponent fiber which is a sheath core fiber, the sheath of which comprises the lower melting binder polymer as suggested in U.S. Patent No. 4,068,036. In the present application, the bicomponent fiber is made up of a polyester core and a sheath of a polyester or a copolyester having a melting point lower than that of the polyester core the polyester staple fibers. A preferred sheath material is an ethylene terephthalate/isothalate copolyester. For the purposes of this embodiment, the matrix staple fiber is cotton fiber.

The process for making the fabric involves steps of first preparing a blend of about 40% to about 70% by weight of cotton fibers, from about 1 to about 20% by weight of bicomponent fibers and complementary to total 100% by weight of polyester staple fibers. A continuous yarn is spun from the blend. As will be understood by those skilled in the art, the spun yarn should have sufficient twist or entanglement for uses in fabric.

It is important to maintain the proper content of the fiber types in the novel yarn to achieve the desired results. Too much or too little bicomponent fiber in the yarn results in fabrics being too stiff or not having the low pilling property respectively.

The presence of cotton in the yarn provides added softness and moisture absorption.

The fabrics as then prepared and then processed through dyeing and finishing at temperatures from about 120 °C to about 220 °C. At these temperatures the sheath material of the bicomponent fiber is melted to form an adhesive which serves to bond the cotton fibers and the polyester fibers to the bicomponent fibers.

The fabrics made according to the process are low pill, i.e. they are low pilling fabrics. The term low pill, or it's equivalent, means herein that the tested material obtains a value of 4 to 5 as defined by ASTMD3512-82 entitled "Standard Test Method for Pilling Resistance In Other Related Surface Changes Of Textile Fabrics: Random Tumble Pilling Tester Method." The values of 4 or 5 indicates low pill formation whereas values between 1 and 3 indicate various levels of pilling.

The following examples illustrate specific embodiments of the invention, but the invention is not limited to such examples.

EXAMPLES

Comparative Example

A polyester blended yarn was prepared from a 50/50 blend of a polyester staple fiber having a denier of 0.9 dpf and a length of 1.25 inch, and standard cotton staple fiber.

The blend was carded to produce a 65 grain/yard sliver intimately blended with the mixture of fibers shown above. The sliver was then drawn twice to produce a 56 grain/yard sliver. The yarn was then spun on an open-end spinning machine to deliver a 28 singles cotton count yarn. The yarn was knitted to produce standard fleece circular knit fabric wherein the yarn was used for face and tie yarns with a normal 15 singles cotton count used as backing yarn. The fabric was dyed and finished to produce standard fleece fabric.

The fabric was tested for pilling by being washed for 60 minutes and rated 1, 2 and 2, unacceptable levels of pilling.

EXAMPLE 1

A polyester blended yarn was prepared from a blend of 10% bicomponent fiber, 40% polyester staple fiber and 50% cotton staple fiber. The bicomponent fiber has a polyester core and a copolyester sheath having a denier of 2.0 dpf and a length of 1.5 inch. The bicomponent fiber is available as Celbond® K-54 fiber from the Hoechst Celanese Corporation.

Fabric was prepared using the same procedure as set forth in the Comparative Example. It is noted

that the fleece fabric was dyed using a pressure jet equipment at 265 ° F.

The fabric was tested for pilling by being washed for 60 minutes and rated 5, 5 and 5 indicating low pill formation.

It is believed that during the dyeing operation, the bicomponent fiber tends to soften, mill and bind to the contiguous fibers thus producing fiber locking, contributing to the low pilling.

The invention has been described in considerable detail with reference to its preferred embodiments and examples. However, variations and modifications can be made within the scope of this invention as described in the foregoing specification and defined in the claims.

Claims

1. A polyester blended yarn consisting essentially of
   a) from about 40 to about 70% by weight of a matrix staple fiber,
   b) from about 1 to about 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of said polyester core; and
   c) complementary, to total 100% by weight, from about 59% to about 10% of crimped polyester staple fiber of denier about 0.5 to less than 10 dpf.

2. A blend according to claim 1 wherein said polyester fiber and polyester core is poly (ethylene terephthalate).

3. A blend according to claim 2 wherein the bicomponent fiber has a sheath of an ethylene terephthalate/isophthalate copolyester.

4. A blend according to claim 2 wherein the bicomponent fiber is of denier about 0.5 to about 6.

5. A blend according to claim 1 wherein the matrix staple fiber is selected from the group consisting of rayon, acrylic, polypropylene, wool and cotton.

6. A blend according to claim 1 wherein the matrix staple fibers is a natural fiber.

7. A blend according to claim 1 wherein the matrix staple fiber is a synthetic fiber.

8. A low pilling fabric comprising polyester blended yarn consisting essentially of
   a) from about 40 to about 70% by weight of a matrix staple fiber;
   b) from about 1 to about 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of said polyester core; and
   c) complementary, to total 100% by weight, from about 5% to about 10% of crimped polyester fiber of denier about 0.5 to less than 10 dpf wherein said polyester fiber has a melting point higher than that of said sheath of said bicomponent fiber.

9. A low pilling fabric according to claim 8 wherein said polyester fiber and polyester core is poly (ethylene terephthalate).

10. A low pilling fabric according to claim 9 wherein said bicomponent fiber has a sheath of an ethylene terephthalate/isophthalate copolyester.

11. A low pilling fabric according to claim 9 wherein the bicomponent fiber is of denier about 0.5 to about 6.

12. A low pilling fabric according to claim 8 wherein the matrix staple fiber is selected from the group consisting of rayon, acrylic, polypropylene, wool and cotton.

13. A low pilling fabric according to claim 8 wherein the matrix staple fiber is a natural fiber.

14. A low pilling fabric according to claim 8 wherein the matrix staple fiber is a synthetic fiber.

15. A method of preparing a low pilling fabric from polyester blended yarn comprising the steps of:
   a) forming a staple fiber blend of from about 40 to about 70% by weight of cotton fibers, about 1 to about 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of said polyester core, and complementary, total 100% by weight, from about 5% to about 10% of crimped polyester staple fiber;
   b) carding, drawing and spinning the fiber blend to form a continuous yarn;
   c) collecting the yarn;
   d) form the yarn into a fabric;

e) dye and finish the fabric at temperatures from about 120 ° C to about 220 ° C.

16. A blend according to claim 15 wherein said polyester fiber polyester core is poly(ethylene terephthalate).

17. A blend according to claim 16 wherein the bicomponent fiber has a sheath of an ethylene terephthalate/isophthalate copolyester.

18. A blend according to claim 16 wherein the bicomponent fiber is of denier about 0.5 to about 6.

19. A low pilling fabric comprising polyester blended yarn consisting essentially of

a) from about 40 to about 70% by weight of a matrix staple fiber;

b) from about 1 to about 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of said polyester core; and

c) complementary, to total 100% by weight, from about 5% to about 10% of crimped polyester fiber of denier about 0.5 to less than 10 dpf wherein said polyester fiber has a melting point higher than that of said sheath of said bicomponent fiber.

20. A low pilling fabric according to claim 19 wherein said polyester fiber and polyester core is poly(ethylene terephthalate).

21. A low pilling fabric according to claim 20 wherein said bicomponent fiber has a sheath of an ethylene terephthalate/isophthalate copolyester.

22. A low pilling fabric according to claim 20 wherein the bicomponent fiber is of denier about 0.5 to about 6.

23. A method of preparing a low pilling fabric from polyester blended yarn comprising the steps of:

a) forming a staple fiber blend of from about 40 to about 70% by weight of cotton fibers, about 1 to about 20% by weight of crimped staple bicomponent fiber having a polyester core and a sheath of polyester or a copolyester having a melting point lower than that of said polyester core, and complementary, total 100% by weight, from about 5% to about 10% of crimped polyester staple fiber;

b) carding, drawing and spinning the fiber blend to form a continuous yarn;

c) collecting the yarn;

d) form the yarn into a fabric;

e) dye and finish the fabric at temperatures from about 120 ° C to about 220 ° C.

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EUROPEAN SEARCH REPORT

Application Number
EP 93 12 1003

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.5)
A	CA-A-808 866 (CELANESE CORP.) * the whole document *	1-15	D02G3/04
A	EP-A-0 086 630 (E.I. DU POND DE NEMOURS) * the whole document *	1,8,15	
A	GB-A-1 524 857 (E.I. DU POND DE NEMOURS) * the whole document *	1,8,15	
A,D	US-A-3 104 450 (CHRISTENS ET AL.) * the whole document *	1,8,15	
A,D	US-A-3 576 773 (VAGINAY) * the whole document *	1,8,15	
A	US-A-4 270 913 (TSE) * claim 1 *	1,8,15	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

D02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 March 1994	Raybould, B

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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