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(54) **WOVEN/KNITTED ARTICLE, MANUFACTURING METHOD, AND TEXTILE PRODUCT**

(57) An object of the present invention is to obtain a fabric having superior water absorbency and sweat absorption/rapid drying while having anti-pilling qualities and a cotton-like texture. A woven/knitted article and a textile product material with good aesthetic properties and functionality, and good general physical properties are obtained which have anti-pilling qualities not obtained in conventional fabrics having a high synthetic fiber blend ratio, and functionality such as water absorbency, water absorption/rapid drying, and quick drying after laundering, which cannot be obtained in conventional cotton fab-

rics.

The present invention is a woven/knitted article comprising one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers, the woven/knitted article including a spun yarn, which contains 30 mass% or more of an aliphatic polyamide short fiber A having a single-fiber fineness of 0.5 dtex to 5 dtex and a fiber length of 25 mm to 70 mm in the spun yarn, and having water absorbency evaluated using a falling-drop method of 10 seconds or less; a method for manufacturing the woven/knitted article; and a textile product.

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Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a woven/knitted article and a method for manufacturing the same.

BACKGROUND ART

10 **[0002]** In general, for denim, chino pants, knit leggings, and shirts, spun yarns of natural fibers represented by cotton are subjected to yarn dyeing, fabric dyeing, printing, and the like, and singeing is performed as a countermeasure against pilling to reduce fluff, and a fabric having anti-pilling qualities is obtained. However, fabrics with a high weight and a large cotton count are poor in rapid drying property, and have problems in quick drying after laundering and sweat absorption/rapid drying. On the other hand, in a fabric having a high synthetic fiber blend ratio, there is a melting ball on the surface of the fabric only by performing singeing, and pilling is likely to occur, and in a polyester, the anti-pilling qualities are improved by performing weight reduction after singeing. However, the polyester fabric has strong luster, is poor in water absorbency and moisture absorbability, is prone to stuffiness, has a problem in wearing comfort, and tends to soften texture by performing weight reduction processing. Since the weight reduction processing is performed, there is a problem in that it is not possible to cope with a check pattern or a stripe pattern which is processed by yarn dyeing. In the case of the spun yarn of polyamide fibers, the fluff cannot be reduced even when the weight reduction is performed, and the fabric surface is coated with a resin for improving anti-pilling qualities to suppress the fluff. However, such a fabric cannot be adjusted in texture, and has a problem of affecting water absorbency and sweat absorption/rapid drying.

20 **[0003]** Incidentally, there are processes such as singeing, weight reduction, and shearing for improving the anti-pilling qualities of synthetic fibers.

25 Patent Document 1 discloses a method for polishing melting balls on the fluff tips after singeing fibers in order to overcome anti-pilling qualities of a woven/knitted article using a spun yarn of synthetic fibers.

Patent Document 2 discloses a method in which a composite yarn of a crimped yarn of polyamide-based moisture-absorbing and releasing fibers and a polyurethane yarn is used as a weft yarn in order to improve lightweight feeling and ease of stuffiness in a denim-like woven article.

30 Patent Document 3 discloses a method in which polyester or polyamide fibers having a modified cross-section or a hollow shape and not subjected to singeing or an alkali weight reduction treatment are used, a siro spun yarn or a fine spun twisted yarn is used as a weft yarn, and a cellulose fiber is used as a warp yarn in order to improve the anti-pilling qualities.

35 PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0004]

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Patent Document 1: International Publication WO 2019/031356

Patent Document 2: Japanese Patent No. 6109031

Patent Document 3: Japanese Patent Laid-open Publication No. 2004-197243

45 SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

50 **[0005]** However, in the method specifically described in Patent Document 1, only those having poor water absorbency are obtained. In the case of using a polyester spun yarn, there are problems of sweat absorption and ease of stuffiness.

[0006] In the method described in Patent Document 2, glare of the weft yarn filaments occurs, and the indigo dye of the cotton slub yarn having a fine count of the warp yarn sublimates during heat setting, so that the indigo dye is contaminated with the polyamide filament of the weft yarn, and there is a problem in that the appearance quality is greatly deteriorated. Regarding water absorption/rapid drying property, since cotton is used for warp yarns without performing water absorption processing, there are problems in water absorbency, water absorption/rapid drying property, and quick drying after laundering.

55 **[0007]** In the method described in Patent Document 3, the woven article of the cotton yarn and the polyester spun yarn specifically described in Patent Document 3 has a problem in water absorbency.

[0008] The present invention has been made to solve the above problems, and an object thereof is to obtain a fabric having superior water absorbency and sweat absorption/rapid drying while having anti-pilling qualities and a cotton-like texture. Another object of the present invention is to obtain a woven/knitted article and a textile product material with good aesthetic properties and functionality, and good general physical properties which have anti-pilling qualities not obtained in conventional fabrics having a high synthetic fiber blend ratio, and functionality such as water absorbency, water absorption/rapid drying, and quick drying after laundering, which cannot be obtained in conventional cotton fabrics.

SOLUTIONS TO THE PROBLEMS

[0009] The present invention has the following configurations in order to attain the above object.

(1) A woven/knitted article comprising one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers, the woven/knitted article including a spun yarn, which contains 30 mass% or more of an aliphatic polyamide short fiber A having a single-fiber fineness of 0.5 dtex to 5 dtex and a fiber length of 25 mm to 70 mm in the spun yarn, and having water absorbency evaluated using a falling-drop method of 10 seconds or less.

(2) The woven/knitted article described in (1), in which the spun yarn has a cotton count of 2 to 60.

(3) The woven/knitted article described in (1) or (2), in which a twist coefficient of the spun yarn is 3.5 to 5.

(4) The woven/knitted article described in any one of (1) to (3), in which a basis weight is 50 to 600 g/m².

(5) The woven/knitted article described in any one of (1) to (4), comprising a fiber B other than the aliphatic polyamide short fiber.

(6) The woven/knitted article described in (5), in which the fiber B is one or more selected from a polyester-based fiber and a polyurethane fiber.

(7) The woven/knitted article described in (5) or (6), in which the fiber B includes a modified cross-sectional fiber.

(8) The woven/knitted article described in any one of (5) to (7), in which 20% or more of the fiber B is exposed on one surface of the woven/knitted article.

(9) The woven/knitted article described in any one of (5) to (8), in which the fiber B includes a fiber having a color different from the color of the aliphatic polyamide short fiber.

(10) The woven/knitted article described in any one of (1) to (9), in which the spun yarn is one or more spun yarns selected from a ring spun yarn or a compact spun yarn, a siro spun yarn, a siro-compact spun yarn, an MVS spun yarn, and an air spun yarn.

(11) The woven/knitted article described in any one of 1 to 10, in which a surface has anti-pilling qualities of Grade 4 or higher in accordance with Method A of JIS L 1076 (2006).

(12) The woven/knitted article described in any one of (1) to (11), in which a diffusive residual moisture ratio after 60 minutes is 40% or less before washing and after washing 10 times.

(13) A textile product comprising the woven/knitted article described in any one of claims (1) to (12).

(14) A method for manufacturing the woven/knitted article described in any one of (1) to (12), comprising a step of knitting and weaving a fiber including a spun yarn, which contains 30 mass% or more of an aliphatic polyamide short fiber having a single-fiber fineness of 0.5 to 5 dtex and a fiber length of 25 mm to 70 mm, wherein the method further satisfies the following 1) and/or 2),

- 1) the method includes a step of water absorption processing, and
- 2) the fiber includes a modified cross-sectional fiber.

(15) The method for manufacturing the woven/knitted article described in (14), in which the aliphatic polyamide short fiber has a raw stock elongation of 10% to 70%.

EFFECTS OF THE INVENTION

[0010] According to a woven/knitted article of the present invention, it is possible to obtain a fabric having superior water absorbency and sweat absorption/rapid drying while having anti-pilling qualities and a cotton-like texture. Anti-pilling qualities not obtained in conventional fabrics having a high synthetic fiber blend ratio are obtained, and functionality such as water absorbency, water absorption/rapid drying, and quick drying after laundering, which cannot be obtained in conventional cotton fabrics, is obtained, so that a woven/knitted article and a textile product material with good aesthetic properties and functionality, and good general physical properties can be obtained.

EMBODIMENTS OF THE INVENTION

[0011] The present invention will be described in detail.

[0012] A woven/knitted article of the present invention includes a spun yarn including one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers, and including an aliphatic polyamide short fiber A. The woven/knitted article of the present invention preferably includes a fiber B other than the aliphatic polyamide short fiber A. The fiber B is one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers. The fiber B can also be mixed with the aliphatic polyamide short fiber A to form a spun yarn, or can also be used as an interwoven yarn or an interknitted yarn when knitting and weaving together with the spun yarn including an aliphatic polyamide short fiber.

[0013] Examples of the aliphatic polyamide constituting the aliphatic polyamide short fiber A include polycaproamide (nylon-6), poly- ω -aminoheptanoic acid (nylon-7), polyundecanamide (nylon-11), polyethylene diamine adipamide (nylon-2,6), polycyclobutane adipamide (nylon-4,6), polypentamethylene adipamide (nylon-5,6), polyhexamethylene adipamide (nylon-6,6), polyhexamethylene sebacamide (nylon-6,10), polyhexamethylene dodecamide (nylon-6,12), polyoctamethylene adipamide (nylon-8,6), polydecanomethylene adipamide (nylon-10,6), and copolymers thereof. Examples of the polyamide copolymer which can be used include caprolactam/laurinlactam copolymer (nylon-6/12) ("/" indicates copolymerization; the same applies hereinafter), caprolactam/ ω -aminononanoic acid copolymer (nylon-6/9), caprolactam/hexamethylene adipamide copolymer (nylon-6/6,6), laurinlactam/hexamethylene adipamide copolymer (nylon-12/6,6), hexamethylene adipamide/hexamethylene sebacamide copolymer (nylon-6,6/6,10), dimethylene adipamide/hexamethylene adipamide copolymer (nylon-2,6/6,6), and caprolactam/hexamethylene adipamide/hexamethylene sebacamide copolymer (nylon-6,6/6,10). Blended products of the above-described polymers can also be used. Among them, nylon 6 is preferably used because of its cotton-like texture, glossiness, and dyeing properties. The aliphatic polyamide short fiber can contain additives such as a matting agent such as titanium oxide and silica, an antibacterial agent, an antiviral agent, a water repellent, a flame retardant, an antistatic agent, an antioxidant, an ultraviolet absorber, and a pigment for spinning, depending on the purpose. Among them, titanium oxide is preferably contained from the viewpoint of cotton-like glossiness.

[0014] The fiber form of the aliphatic polyamide short fiber is not particularly limited, and examples thereof include fibers composed of only one component, so-called single yarns, and composite fibers such as core-sheath composite fibers and sea-island structure fibers.

[0015] The fiber cross-section may also be a modified cross-section in addition to a round cross-section. The modified cross-section may be any form of a polygonal cross-section such as a triangular cross-section or a quadrangular cross-section, a multilobar cross-section such as a flat cross-section, a cruciform cross-section, a hash mark-type cross-section, or an eight-lobe cross-section, and others. These fiber form and fiber cross-section can be appropriately selected depending on the purpose.

[0016] The aliphatic polyamide short fiber such as nylon 6 used in the present invention can be usually produced by the following method.

(1) A polyamide having a sulfuric acid relative viscosity of 2.5 to 2.8 is spun from a spinneret, and then taken up at a speed of 1000 to 1500 m/min while being cooled to obtain a partially oriented yarn, and the partially oriented yarn is drawn.

(2) In the drawing step, the partially oriented yarns are bundled into 50 to 200 ktex, drawn 2 to 5 times under steam or hot water, subjected to a tension heat treatment at 160°C to 190°C, crimped using a crimper such as a stuffer box type crimper, dried in a hot air atmosphere at 50 to 100°C, and cut to a predetermined fiber length to obtain polyamide fibers.

[0017] The number of crimps of the aliphatic polyamide fiber used in the present invention is preferably 10 to 20 crimps/25 mm, and the crimping degree is preferably 9 to 15%. When the crimp is too high, the entanglement of the fibers becomes too high, so that a nep occurs in a carding step during spinning processing, or when the crimp is too low, the entanglement of the fibers becomes too low, so that web sagging occurs in the carding step during the spinning processing, and thus the uniformity of the spun yarn may be lost. An oil agent can be applied in an arbitrary step before and after crimping, after drying, or the like.

[0018] The single-fiber fineness of the aliphatic polyamide short fiber used in the present invention is 0.5 to 5 dtex and preferably 0.5 dtex to 3.5 dtex. When the single-fiber fineness exceeds 5 dtex, the single yarn is thick, the luster is strong, the appearance quality is deteriorated, and the rigidity is high, so that the anti-pilling property is deteriorated. Since the single-fiber fineness is thick, the texture becomes hard and rough, and it is not suitable for clothing applications such as pants and shirts.

[0019] The fiber length of the aliphatic polyamide short fiber is 25 mm to 70 mm and preferably 35 mm to 55 mm. When the fiber length is less than 25 mm, there are problems such as yarn breakage, nep, and slub, and there is a problem in spinnability. When the fiber length exceeds 70 mm, since the fiber length is long, the glossiness becomes strong, and a cotton-like texture cannot be obtained, and in some cases, production cannot be performed in a facility for producing a general spun yarn.

[0020] In particular, when the aliphatic polyamide short fiber has a single-fiber fineness of 0.5 dtex to 3.5 dtex and a fiber length of 32 mm to 55 mm, a spun yarn can be easily produced by a general spinning machine, and versatility is high, which is particularly preferable.

[0021] The raw stock elongation is 10% to 70%. When a raw stock having an elongation of more than 70% is used, the raw stock is not stabilized at the time of drafting due to the high elongation of the raw stock, yarn unevenness and nep tend to occur, and problems tends to occur in spinnability. When the spun yarn using the raw stock is used as the warp yarn and woven, it is difficult to manage the tension of the warp yarn and yarn breakage easily occurs. The raw stock elongation is particularly preferably 35% or more and less than 65%.

[0022] The tensile strength of the raw stock is preferably 1 cN/dtex or more and 5.6 cN/dtex or less from the viewpoint of comfort during wearing and dyeing properties.

[0023] The tensile strength of the raw stock is a value determined by using an instron, measuring the strength at 30 points when a short fiber is pulled under prescribed conditions (test length: 20 mm, tensile: 20 mm/min) and cut, and calculating an average value, and the elongation is a value determined by calculating the elongation when the short fiber is cut in the above measurement as an average value.

[0024] In the spun yarn used in the present invention, the fiber B may be blended as described above. The fiber to be blended is not particularly limited as long as it is one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers, and preferred examples thereof include synthetic fibers such as polyester-based fibers, aromatic polyamides, polypropylene, polyethylene, and acrylic fibers, regenerated fibers such as rayon fibers and modal fibers, and semisynthetic fibers such as acetate. Polyester-based fibers and rayon fibers are preferable from the viewpoint of dyeing properties, fastness, and texture.

[0025] In order to impart stretchability, elastic fibers such as polyurethane fibers or side-by-side polyester-based elastic fibers can also be used. As the elastic fiber, polyurethane fibers are preferably used because both the elongation rate and the elongation recovery rate are high.

[0026] This elastic fiber may be used as a core to form a long/short composite yarn such as a core yarn or a core spun yarn. The elastic fiber may be combined and twisted with a spun yarn to be used in the form of a composite yarn.

[0027] In order to further improve rapid drying, a filament having low water absorbency such as polyester or acrylic may be used as a core to form a long/short composite yarn. The elastic fiber may be used in combination with this long/short composite yarn.

[0028] The content of the aliphatic polyamide short fiber in the spun yarn used in the present invention is 30 mass% or more, and the content of the aliphatic polyamide is more preferably 70 mass% or more from the viewpoint of a cotton-like texture, glossiness, anti-pilling qualities, and water absorbency.

[0029] The total fineness of the spun yarn including the aliphatic polyamide short fiber is preferably 2 or more and 60 or less in terms of cotton count.

[0030] The total fineness varies in a preferable range depending on the application, and is particularly preferable 2 or more and 10 or less for material application such as bags, 5 or more and 20 or less for pants application such as denim, and 30 or more and 50 or less for shirt application. When the total fineness is 60 or less, the spinnability is good, the tear strength and the abrasion resistance strength are excellent, defects such as nep and slub hardly occur, the quality of the woven/knitted article is good, and the woven/knitted article is easily commercialized.

[0031] A twist coefficient K is preferably 3.5 or more and 5 or less. The twist coefficient K is more preferably 3.7 or more and 4.5 or less particularly from the viewpoint of a texture and pilling. When the twist coefficient K is 5 or less, fluff feeling is obtained, the texture is soft, and appearance quality is excellent. The snarl of untwisting is less likely to occur during warping, and yarn breakage is also less likely to occur during yarn unwinding in a weaving step. When the twist coefficient K is set to 3.5 or more, the binding force between single fibers becomes sufficient, fluff is less likely to occur, and pilling is less likely to occur.

[0032] The twist coefficient is a value determined by the following formula.

$$K = T/D^{0.5}$$

K Twist coefficient

T Number of twists per inch (2.54 cm) of spun yarn

D Total fineness (yarn count) of spun yarn

[0033] When the twist coefficient K is set to 3.5 to 5, it is preferable to perform steam set at the stage of the spun yarn in order to take measures against snarling. As particularly preferable conditions, the temperature is 70°C or higher and 90°C or lower, and the steam setting time is 10 minutes or longer and 30 minutes or shorter.

[0034] The spun yarn used in the present invention is not particularly limited, but one or more spun yarns selected from a ring spun yarn, a compact spun yarn, a siro-compact spun yarn, and an MVS spun yarn, and an air spun yarn

can be preferably used. These spun yarns can be produced by ring spinning, compact spinning, siro-compact spinning, MVS spinning, and air spinning, respectively.

[0035] When the aliphatic polyamide short fiber has a fiber length of 40 mm or more, one or more spun yarns selected from a ring spun yarn or a compact spun yarn, a siro spun yarn, a siro-compact spun yarn, an MVS spun yarn, and an air spun yarn are preferable. When the aliphatic polyamide short fiber has a fiber length of less than 40 mm, since the ring spun yarn tends to have more fuzz and the anti-pilling qualities tend to be easily deteriorated, a spun yarn selected from a siro spun yarn, a siro-compact spun yarn, and an MVS spun yarn is preferable.

[0036] In the application of a denim-like woven/knitted article, it is particularly preferable to use a ring spun yarn or a compact spun yarn of a single yarn instead of a siro spun yarn from the viewpoint of a cotton-like texture, hardness, and appearance quality.

[0037] The woven/knitted article of the present invention is obtained by weaving and knitting fibers including the spun yarn.

[0038] In the case of a woven article, the spun yarn may be used as a warp yarn and a weft yarn for weaving, or may be interwoven with the fiber B. The spun yarn can also be used as a warp yarn or a weft yarn, and the fiber B can also be used as a weft yarn or a warp yarn. Such a fiber B can be selected from synthetic fibers such as polyester-based fibers, polyamide fibers, acrylic fibers, polyethylene, and polypropylene, regenerated fibers such as rayon and modal, and semisynthetic fibers such as acetate.

[0039] In order to obtain a cotton-like appearance quality, it is preferable to use a spun yarn as the fiber B.

[0040] It is also preferable that the filament and the raw stock used as the fiber B contain titanium oxide from the viewpoint of achieving appropriate glossiness.

[0041] As the fiber form of the single yarn, in addition to a normal, so-called single yarn, a composite fiber such as a core-sheath composite fiber or a sea-island type composite fiber may be used.

[0042] The fiber cross-section may be a modified cross-section in addition to a round cross-section. The modified cross-section may be any form of a polygonal cross-section such as a triangular cross-section or a quadrangular cross-section, a multilobar cross-section such as a flat cross-section, a cruciform cross-section, a hash mark-type cross-section, or an eight-lobe cross-section, and others, and can be selected depending on the purpose. A form in which the periphery of the cross-section forms irregularities, such as a multilobar cross-section such as an eight-lobe cross-section or a cruciform cross-section, in which water absorbency is improved by capillary action, is particularly preferable.

[0043] In addition to the titanium oxide, additives such as a matting agent such as silica, an antibacterial agent, an antiviral agent, a water repellent, a water absorbent, a flame retardant, an antistatic agent, an antioxidant, an ultraviolet absorber, and a pigment for spin-dyeing can be contained depending on the purpose.

[0044] When a filament is used as the fiber B, a false twisted yarn or a taslan processed yarn is preferable rather than a drawn yarn, from the viewpoint of obtaining appropriate glossiness. In order to impart stretchability, the filament may be combined and mixed with polyurethane or side-by-side polyester-based elastic fibers. From the viewpoint of water absorption/rapid drying property, the filament is preferably a polyester-based multifilament.

[0045] When a spun yarn is used as the fiber B, in order to impart stretchability, the spun yarn may be a long/short composite yarn such as a core yarn of polyurethane or a side-by-side polyester-based elastic fiber and the other fiber B, or may be combined and twisted with a spun yarn made of the other fiber B.

[0046] From the viewpoint of water absorption/rapid drying property, as the short fibers used for the spun yarn, polyester-based short fibers, polypropylene short fibers, polyethylene short fibers, and acrylic short fibers are preferable.

[0047] When the fiber B as described above is used and woven with a spun yarn including an aliphatic polyamide fiber, it is preferable to use a spun yarn including an aliphatic polyamide fiber as a warp yarn and to use a filament or spun yarn made of the fiber B as a weft yarn.

[0048] The raw stock of the weft yarn preferably has a single-fiber fineness of 0.5 dtex or more and 4 dtex or less and a fiber length of 25 mm or more and 70 mm or less. The single-fiber fineness is particularly preferably 0.5 dtex or more and less than 3.5 dtex. When the single-fiber fineness is set to 4 dtex or less, since the single fiber is not thick, luster becomes moderate, appearance quality is good, and rigidity is moderate, so that anti-pilling property is hardly deteriorated. Since the single-fiber fineness is moderate, the texture does not become hard and rough, and it is suitable for clothing applications such as pants and shirts. The fiber length is particularly preferably 35 mm or more and less than 55 mm. When the fiber length is 25 mm or more, there is no problem such as yarn breakage, nep, and slub, and spinnability is good. When the fiber length is 70 mm or less, the fiber length is appropriate, the glossiness is not too strong, a cotton-like texture can be obtained, and production can be performed in a facility for producing a general spun yarn. The filament preferably has a total fineness of 10 dtex or more and 1500 dtex or less and a single-yarn fineness of 0.01 or more and 15 dtex or less. As for the total fineness, the bottom is preferably 100 dtex or more and 1000 dtex or less and the shirt fabric is preferably 10 dtex or more and 500 dtex or less. The single-fiber fineness is preferably 0.01 or more and 4 dtex or less. When the single-fiber fineness exceeds 4 dtex, the single yarn is thick, the luster is strong, and the appearance quality is deteriorated. Since the single-fiber fineness is thick, the texture becomes hard and rough, touch is not good, and it is not suitable for clothing applications such as pants and shirts. When the single-fiber fineness is less than 10

dtex, there is a high possibility that yarn breakage occurs during weaving or during warping, and handling is not easy.

[0049] The weaving step can be performed in the same step as a normal spun article. As a weaving loom, weaving can be performed by an innovative loom such as an air jet loom, a rapier loom, a water jet loom, or a gripper loom, or a shuttle loom.

[0050] The weave stitch is not limited, and may be a stitch such as plain weave, twill weave, satin weave, or double weave. In the case of a woven article, the spun yarn may be used alone for weaving, or may be interwoven with the fiber B. In the case of interweaving, a stitch in which more spun yarns including the aliphatic polyamide short fibers appear on one surface is preferable from the viewpoint of particularly excellent cotton-like texture, glossiness, anti-pilling qualities, and water absorbency, and specifically, a stitch such as twill weave, satin weave, and double weave is preferable.

[0051] In the case of a knitted article, the spun yarn may be used alone for knitting, or may be interknitted with the fiber B.

[0052] As the fiber B, the same as a spun yarn or filament made of the fiber B used in the woven article is used.

[0053] The knitting stitch in the case of a knitted article is not particularly limited, and may be a stitch arbitrarily selected from single circular knitting, double circular knitting, tricot, raschel knitting, and the like. In the case of single circular knitting, a stitch using plating, welt, or tack is preferable, and in the case of double circular knitting, a tack or reversible stitch is preferable. The raschel knitting may be double raschel knitting. Also in the case of a multiple knitted article such as tricot or double raschel, the stitch is preferable a stitch in which the spun yarn including the aliphatic polyamide short fiber appears more on one surface of the multiple knitted article from the viewpoint of a cotton-like texture, glossiness, anti-pilling qualities, and water absorbency, and a double warp knitting stitch or the like may be used.

[0054] In the present invention, in the case of using the fiber B that is a fiber other than the aliphatic polyamide short fiber, it is preferable that 20% or more of the fiber B is exposed on one surface of the woven/knitted article, and it is preferable that the woven stitch and the knitted stitch are configured such that 20% or more of the fiber B is exposed on one surface of the woven/knitted article. Specifically, in the case of a woven article, a stitch such as twill weave or satin weave is preferable. Plating or reversible stitch is preferable for the knitted article. In particular, when a modified cross-sectional fiber is used as the fiber B, it is preferable that the surface on which 20% or more of the fiber B is exposed is disposed on the skin side from the viewpoint of excellent water absorbency and water absorption/rapid drying property.

[0055] The woven/knitted article of the present invention can pass through general processing steps. Since both the warp yarn and the weft yarn are one or more fibers selected from synthetic fibers, semisynthetic fibers, and regenerated fibers, it is preferable to add a singeing step. Since synthetic fibers have higher strength than natural fibers, when the spun yarn has a large amount of fluff, a problem of pilling easily occurs as a product. In order to solve the problem of pilling, a method of adding a singeing step is preferably used. The fluff of the spun yarn can be removed by performing the singeing step, and when a spun yarn spun using a polyester raw stock is used as the weft yarn, the fluff can also be further improved by performing alkali weight reduction after the singeing.

[0056] In the woven/knitted article of the present invention, in the case of performing a singeing step, the singeing step is preferably performed on both sides, and the singeing processing speed is preferably 50 to 120 m/min.

[0057] A dyeing method can be so-called pre-dyeing in which dyeing is performed at any stage before obtaining weaving yarns used for knitting and weaving when only warp yarns of denim or the like are dyed or when a pattern such as stripe or check is added. Specifically, it is possible to perform top dyeing of a raw stock, and cheese dyeing, shaker dyeing, and beam dyeing, which are package dyeing of yarns. In the case of not performing multi-color dyeing, it is preferable to form a woven/knitted article and then perform dyeing, and as a dyeing method, it is possible to perform dyeing by a method such as liquid jet dyeing, aerodynamic jet dyeing, jigger dyeing, beam dyeing, continuous dyeing, or printing performed in a can.

[0058] When the fiber B is used in the woven/knitted article of the present invention, a fiber having a color different from that of the aliphatic polyamide short fiber is preferably included as the fiber B. In this case, all of the fibers B may have a color different from that of the aliphatic polyamide short fiber, or at least a part of the fibers B may have a color different from that of the aliphatic polyamide short fiber. Different colors described herein include not only a case where color tones are different but also a case where shades are different even if the color tones are the same. When fibers having different colors are included, since a dyeing method is different and there is a difference in dyeing, or dyeing in different colors like denim in which only the warp yarn side is dyed and the weft yarn is not dyed can be performed and dyeing in different colors can be performed by imparting a difference in shades of color using a difference in dyeing, dyeing in different colors like denim or chambray or impartment of natural fiber-like heather mixture tone can be applied to the appearance, which is preferable.

[0059] After dyeing the woven/knitted article, or after knitting and weaving in the case of pre-dyeing, finishing processing can be performed. The finishing processing can be arbitrarily selected. Specifically, various functional processing such as water absorption processing, water repellent processing, a softener, antistatic processing, and acrylic coating processing can be performed. From the viewpoint of water absorption/rapid drying property, it is more preferable to perform water absorption processing. Examples of a water-absorbing processing agent include a polyester-based water-absorbent resin, a urethane resin, a silicon-based resin, and a polyamide resin, and in consideration of adhesion to nylon and polyester, a combination of a polyester-based resin and a urethane-based resin or a polyamide resin is preferably used.

[0060] In order to obtain a more worn texture, when a wrinkle feeling is required, a liquid jet dyeing machine or an aerodynamic jet dyeing machine may be used to give a wrinkle feeling and a kneading effect, or post-processing having a kneading effect may be added by air pressure using an air tumbler or the like with dry heat.

[0061] The woven/knitted article of the present invention preferably has a basis weight of 50 to 600 g/m² from the viewpoint that the woven/knitted article is used for shirts and bottoms, and more preferably has a basis weight of 100 to 400 g/m² from the viewpoint of the texture, physical properties, and hardness of the fabric.

[0062] In the woven/knitted article of the present invention, the water absorption time by the falling-drop method is 10 seconds or shorter, and preferably 4 seconds or shorter from the viewpoint of sweat absorbency at the time of wearing and drying property after laundering. The lower limit is not particularly limited, and may be as close as possible to 0 seconds. The woven/knitted article having such water absorbency can be obtained by a method of subjecting a woven/knitted article to the water absorption processing, a method of using fibers having a modified cross-section, so-called modified cross-sectional fibers, as synthetic fibers used for a woven/knitted article, or a combination of these methods. Examples of the modified cross-section include a polygonal cross-section such as a triangular cross-section or a quadrangular cross-section, and a multilobar cross-section such as a flat cross-section, a cruciform cross-section, a hash mark-type cross-section, or an eight-lobe cross-section, and a form in which the periphery of the cross-section forms irregularities, such as a multilobar cross-section such as an eight-lobe cross-section or a cruciform cross-section, in which water absorbency is improved by capillary action, is particularly preferable.

[0063] In particular, when a large amount of modified cross-sectional fibers are exposed on the surface to be used on the skin surface side in a woven/knitted article (in the case of Example 1, weft yarn), absorption of sweat and moisture is promoted by capillary action, the diffusion area of water is widened, and a state where water easily evaporates is obtained, which is preferable. Since the fiber A has a high official regain of the aliphatic polyamide short fiber and easily retains water, it is preferable to expand the diffusion area by performing the water absorption processing.

[0064] Since the woven/knitted article of the present invention is excellent in anti-pilling qualities, it is possible to achieve Grade 4 or higher as anti-pilling qualities defined by Method A of JIS L 1076 (2006). When the anti-pilling qualities are Grade 4 or higher, it is possible to obtain a woven/knitted article which has less fluff, is less likely to cause pilling, is excellent in appearance quality such as wearing, is less likely to cause fabric breakage, and is excellent in practicality.

[0065] The woven/knitted article of the present invention is excellent in sweat absorbency at the time of wearing and drying property after laundering not only before washing but also after washing 10 times in accordance with C4M Method of JIS L 1930 (2014). In a preferred embodiment, it is also possible to achieve a diffusive residual moisture ratio of 40% or less before washing and further, it is also possible to achieve a diffusive residual moisture ratio of 30% or less before washing, after 60 minutes by the KAKEN method. The lower limit is not particularly limited, and may be as close as possible to 0%.

[0066] Also after washing 10 times in accordance with C4M Method of JIS L 1930 (2014), in the woven/knitted article of the present invention, it is also possible to achieve a diffusive residual moisture ratio of 40% or less and further, it is also possible to achieve a diffusive residual moisture ratio of 30% or less, after 60 minutes by the KAKEN method. The lower limit is not particularly limited, and may be as close as possible to 0%.

[0067] The color bleeding fastness of the woven/knitted article of the present invention is preferably Grade 4 or higher, and more preferably Grade 4-5 or higher by the Daimaru method. The color bleeding fastness can be adjusted to the above range by arbitrarily selecting a dye from a disperse dye, a cationic dye, an acid dye, a reactive dye, and a direct dye having relatively good color bleeding fastness according to the material for the fiber to be dyed and the desired finish, and processing an appropriate fixing agent in a normal range. When only warp yarns are dyed by cheese dyeing or shaker dyeing, an acid dye or a reactive dye dyeing nylon is bled at the time of desizing refining or a heat setting process, and thus it is more preferable to include a soaping step at the end of the finishing processing.

[0068] Even when water absorption processing is performed by padding, the color bleeding is likely to occur, and thus it is more preferable to include a soaping step. As a soaping method, an open soaper, a Sofcer, or the like is used, and it is more preferable to use 0.1 to 10 g/L of a soaping agent.

[0069] In an FIX treatment, it is preferable to perform processing by pre-dyeing or finishing padding. In the case of not using an FIX agent, the bleeding of the dye is likely to occur, and particularly, the color bleeding of fastness is likely to deteriorate. When the color bleeding occurs, since color migration to other clothes occurs, in the present invention, the FIX treatment is performed. The used amount of the FIX agent varies depending on the dye concentration, but it is more preferable to use 0.1 to 8% owf of synthetic tannin, natural tannin, or the like and perform the processing at 20 to 90°C.

[0070] The woven/knitted article of the present invention may be further subjected to secondary processing after being formed into a sewn product. In general, a denim material is often subjected to color tone and texture adjustment by product washing, bleaching processing, laser processing, sanding processing, printing processing, or the like, and similar secondary processing can be performed. Any of various types of in-bath processing can be performed during product washing. For example, any post-processing agent such as water absorption/rapid drying can be selected. In the present invention, in order to further improve the water absorption/rapid drying property, it is preferable to use a finishing softener having high water absorbency when product washing is performed.

[0071] The woven/knitted article thus obtained is excellent in aesthetic properties and functionality such as water absorbency or anti-pilling qualities, and is also excellent in aesthetic properties such as natural feeling of wearing depending on the aspect, and thus can be preferably used for chino pants, denim, shirts, denim shirts, outer clothes, blouses, dresses, T-shirts, and the like.

EXAMPLES

[0072] Hereinafter, the present invention will be described specifically by means of Examples; however, the present invention is not limited to these Examples.

[0073] Physical properties of the obtained woven article were evaluated by the following tests.

[0074] Total fineness (cotton count) of fiber spun yarn:

The cotton count defined in JIS L 1095 (2010 version 9.4.1) was measured and regarded as the total fineness.

[0075] Single-fiber fineness:

The single-fiber fineness was measured and determined by a method defined in Method B of JIS L 1015 (2010 version 8.5.1).

· Fiber length:

The fiber length was determined by a method defined in Method C of JIS L 1015 (2010 version 8.4.1).

[0077] · Twist coefficient:

The twist coefficient was determined by the following formula (1) from the number of twists T per inch of a polyamide fiber spun yarn obtained by decomposing the woven/knitted article, which was calculated by an untwisting machine, and the total fineness D (1).

[0078] The twist coefficient was determined from the average value of ten samples.

$$T = K \times D^{1/2} \quad \dots (1)$$

where T is the number of twists per inch (2.54 cm) of the spun yarn, and D is the total fineness (yarn count) of the spun yarn.

[0079] · Basis weight The basis weight was determined by a method defined in Method A of JIS L 1096 (2010).

· Exposure rate of fiber B

[0080] The exposure rate of the skin surface side (back surface) was obtained using a VHX-5000 digital microscope manufactured by KEYENCE CORPORATION. The luminance was adjusted so that the fiber A and the fiber B used form the woven/knitted article could be clearly distinguished, and the area of the fiber B was determined using an automatic area measuring function. The exposure rate was determined by the following formula.

$$\text{Exposure rate (\%)} = \frac{\text{Extracted total area (fiber B)}}{\text{Total area of region}}$$

· Water absorbency (falling-drop method)

[0081] The measurement was made in accordance with JIS L 1907 (2010). One drop of water is dropped from a position of 10 mm in height from the surface of a test piece, and the time from when the water droplet reaches the surface of the test piece to when the water droplet is completely absorbed is measured. As water, ion-exchanged water was used.

· Diffusive residual moisture ratio (KAKEN method)

[0082] The test piece is left to stand still in an atmosphere at 20°C × 65% RH for 12 hours or longer, and then the mass (W0) of the test piece of 20 cm × 20 cm is measured. To the test piece, 0.3 g of pure water is added dropwise, and the test piece is left to stand still in an atmosphere at 20°C × 65% RH for 60 minutes, and then the mass (W1) of the test piece is measured. The residual moisture ratio is calculated by the following formula, the average value of the measured values obtained by performing the same operation three times is rounded to an integer, and this value is regarded as the diffusive residual moisture ratio (%). As water, ion-exchanged water was used.

$$\text{Residual moisture ratio (\%)} = (W1 - W0) \div 0.3 \times 100$$

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· Washing method: C4M Method of JIS L 1930 (2014) 10 times Washing method hanging for drying

· Color bleeding

[0083] The color bleeding fastness was measured by the grade determination of the Daimaru method.

[0084] A sample was cut into a size of 2.5 cm in width × 3 cm in length, and separately, a vertically long attached white cotton cloth prescribed in JIS was prepared, and stitched in an overlapping manner with a part of the sample.

[0085] A 0.5% non-ionic surfactant solution was placed in a container, and the lower end of the suspended test piece was immersed, left to stand still at room temperature for 2 hours, and then drawn up from the liquid. When the liquid sucked up to the middle of the test piece was dried and a trace remained, the trace became "warping", and the degree of contamination of this "warping" portion was determined according to gray scale for assessing staining of JIS L 0805 (2005).

· Pilling test

[0086] Regarding the anti-pilling qualities, two sheets in each of the warp direction (or the wale direction) and the weft direction (course direction) were measured according to Method A (woven article: 10 hours, knitted article: 5 hours) of JIS L1076 (2006), and the average value of four sheets was determined. Evaluation is performed with values of 1 to 5, and the larger the value, the more preferable the anti-pilling qualities are.

· Sensory evaluation

[0087] The texture and glossiness were analyzed by the following methods.

[0088] The texture and glossiness were evaluated by sensory evaluation by five persons. The evaluation was performed at 3 levels based on the following criteria. Note that the evaluation supported by the largest number of examiners was adopted, and when there were evaluations supported by the same number of examiners, the lowest evaluation result was adopted.

[0089] Texture and glossiness of woven/knitted article:

3: The woven/knitted article has a soft texture and excellent cotton-like glossiness, and exhibits a natural cotton denim tone.

2: The woven/knitted article has a slightly soft texture and cotton-like glossiness, and exhibits a cotton denim tone.

1: The woven/knitted article has a rough and hard texture and glossiness with glare.

[Example 1]

[0090] A raw stock of aliphatic polyamide short fibers (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 51 mm, and a raw stock elongation of 60% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4 was obtained by ring spinning. A raw stock of polyester (polyethylene terephthalate (PET)) short fibers (cruciform cross-section) having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0091] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0092] The dyed warp yarns and the undyed weft yarns were used and woven with a rapier loom while a width of 162 cm, a warp density of 78 yarns/2.54 cm, a weft density of 56 yarns/2.54 cm, and 3/1 twill were set.

[0093] The obtained gray fabric was subjected to continuous refining, double-sided singeing at 100 m/min, intermediate setting, padding water absorption processing, finishing setting, and soaping. In the padding water absorption processing, curing was performed using 20 g/L of a urethane-based water absorbent. In order to improve color bleeding, soaping was performed using 1 g/L of a soaping agent after heat setting.

[0094] A fabric having a basis weight of 354 g/m², a pilling of grade of 4.5, a water absorbency of 3 seconds before washing and 1 second after washing, a diffusive residual moisture ratio of 22% before washing and 13% after washing, and a color bleeding of 4-5 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has natural cotton denim-like glossiness and texture, could be obtained.

[Example 2]

[0095] As warp yarns, a raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber

length of 51 mm, and a raw stock elongation of 60%, and a raw stock of 1.5 dtex rayon and a fiber length of 51 mm were blended at 90 : 10, and a spun yarn of English cotton count No. 9 having a twist coefficient of 4 was obtained by ring spinning. A polyester cruciform cross-sectional raw stock having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was

obtained by siro-compact spinning.

[0096] The obtained warp yarns were subjected to cheese dyeing into a color of navy using an acid dye at 98°C to dye only nylon, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0097] After the weaving step, a fabric was obtained in the same steps as in Example 1.

[0098] Since nylon and rayon of warp yarns have a difference in dyeing density, a fabric having a natural feeling and having a basis weight of 360 g/m², a pilling of grade of 4, a water absorbency of 5 seconds before washing and 2 seconds after washing, a diffusive residual moisture ratio of 37% before washing and 18% after washing, and a color bleeding of 4 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has natural cotton denim-like glossiness and texture, could be obtained.

[Example 3]

[0099] A raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 38 mm, and a raw stock elongation of 55% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4.3 was obtained by siro-compact spinning. A polyester cruciform cross-sectional raw stock having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0100] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0101] After the weaving step, a fabric was obtained in the same steps as in Example 1.

[0102] A fabric having a basis weight of 352 g/m², a pilling of grade of 4, a water absorbency of 2 seconds before washing and shorter than 1 second after washing, a diffusive residual moisture ratio of 25% before washing and 20% after washing, and a color bleeding of 4-5 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has natural cotton denim-like glossiness and texture, could be obtained.

[Example 4]

[0103] A raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 38 mm, and a raw stock elongation of 55% was used as an interknitted yarn, and a spun yarn of English cotton count No. 20 having a twist coefficient 4.3 was obtained by siro-compact spinning. A covering yarn obtained by drafting and drawing a 55 dtex urethane elastic yarn 3.0 times and covering the yarn using an 83 dtex filament polyester (PET) multifilament (cruciform cross-section) was interknitted into a circular knitting of 20 G at 1 : 1 arrangement, and the spun yarn has a combined knit and welt stitch to obtain a twill-like knitted gray fabric. The obtained gray fabric was subjected to a gray fabric set/liquid jet purification step, and in the subsequent dyeing step, the gray fabric was subjected to acidic dyeing using a liquid jet dyeing machine, and a polyester-based water-absorbent resin was padded at 10 g/L for finishing.

[0104] A fabric having a basis weight of 315 g/m², a pilling of grade of 4, a water absorbency of 1 second before washing and shorter than 1 second after washing, a diffusive residual moisture ratio of 18% before washing and 11% after washing, and a color bleeding of 4-5 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has cotton denim-like glossiness and texture, could be obtained.

[Example 5]

[0105] A raw stock (round cross-section) of aliphatic polyamide short fibers of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 51 mm, and a raw stock elongation of 60% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4 was obtained by ring spinning. A raw stock of polyester (polyethylene terephthalate (PET)) short fibers (round cross-section) having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0106] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0107] The dyed warp yarns and the undyed weft yarns were used and woven with a rapier loom while a width of 162 cm, a warp density of 78 yarns/2.54 cm, a weft density of 56 yarns/2.54 cm, and 3/1 twill were set.

[0108] The obtained gray fabric was subjected to continuous refining, double-sided singeing at 100 m/min, intermediate setting, padding water absorption processing, finishing setting, and soaping. In the padding water absorption processing,

curing was performed using 20 g/L of a urethane-based water absorbent. In order to improve color bleeding, soaping was performed using 1 g/L of a soaping agent after heat setting.

[0109] A fabric having a basis weight of 355 g/m², a pilling of grade of 4.5, a water absorbency of 6 seconds before washing and 5 seconds after washing, a diffusive residual moisture ratio of 36% before washing and 33% after washing, and a color bleeding of 4-5 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has natural cotton denim-like glossiness and texture, could be obtained.

[Example 6]

[0110] A raw stock (round cross-section) of aliphatic polyamide short fibers of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 51 mm, and a raw stock elongation of 60% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4 was obtained by ring spinning. A raw stock of polyester (polyethylene terephthalate (PET)) short fibers (cruciform cross-section) having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0111] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0112] The dyed warp yarns and the undyed weft yarns were used and woven with a rapier loom while a width of 162 cm, a warp density of 78 yarns/2.54 cm, a weft density of 56 yarns/2.54 cm, and 3/1 twill were set.

[0113] The obtained gray fabric was subjected to continuous refining, double-sided singeing at 100 m/min, intermediate setting, padding water absorption processing, finishing setting, and soaping. A water absorbent was not used. In order to improve color bleeding, soaping was performed using 1 g/L of a soaping agent after heat setting.

[0114] A fabric having a basis weight of 351 g/m², a pilling of grade of 4.5, a water absorbency of 8 seconds before washing and 8 seconds after washing, a diffusive residual moisture ratio of 35% before washing and 38% after washing, and a color bleeding of 4-5 Grade, which is excellent in anti-pilling property and water absorption/rapid drying property and has natural cotton denim-like glossiness and texture, could be obtained.

[Comparative Example 1]

[0115] A raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 6 dtex, a fiber length of 51 mm, and a raw stock elongation of 56% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4 was obtained by ring spinning. A polyester cruciform cross-sectional raw stock having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0116] After the cheese dyeing, processing was performed in the same steps as in Example 1. A fabric having a basis weight of 358 g/m², a thick single yarn, a pilling of grade of 2.5, increased surface luster by reducing the surface area of the spun yarn, glare, and a rough texture was obtained.

[Comparative Example 2]

[0117] A raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 38 mm, and a raw stock elongation of 55% and a raw stock (round cross-section) of polyester having 1.5 dtex and a fiber length of 38 mm were blended as warp yarns at 10 : 90, and a spun yarn of English cotton count No. 9 having a twist coefficient of 4 was obtained by ring spinning. A polyester cruciform cross-sectional raw stock having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0118] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C to dye only nylon, and wound up around a cone using 1% owf of a fixation agent for maintaining fastness.

[0119] After the weaving step, a fabric was obtained in the same steps as in Example 1. A non-cotton-like fabric having a basis weight of 362 g/m², a pilling of grade of 2 due to a high combined rate of polyester with high flexural rigidity, increased surface luster by higher glossiness of polyester than that of nylon, glare, and a hard texture was obtained.

[Comparative Example 3]

[0120] A raw stock (round cross-section) of nylon 6 having a single-fiber fineness of 1.7 dtex, a fiber length of 51 mm, and a raw stock elongation of 60% was used as a warp yarn, and a spun yarn of English cotton count No. 9 having a twist coefficient 4 was obtained by ring spinning. A raw stock of polyester (PET) short fibers (round cross-section) having a single-fiber fineness of 1.5 dtex and a fiber length of 38 mm was used as a weft yarn, and a spun yarn of English cotton

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count No. 16 having a twist coefficient of 4 was obtained by siro-compact spinning.

[0121] The obtained warp yarns were subjected to navy cheese dyeing using an acid dye at 98°C, and wound up around a cone using 3% owf of a fixation agent for maintaining fastness.

[0122] The dyed warp yarns and the undyed weft yarns were used and woven with a rapier loom while a width of 162 cm, a warp density of 78 yarns/inch (2.54 cm), a weft density of 56 yarns/inch (2.54 cm), and 3/1 twill were set.

[0123] The obtained gray fabric was subjected to continuous refining, double-sided singeing at 100 m/min, finishing setting, and soaping. In order to improve color bleeding, soaping was performed using 1 g/L of a soaping agent after heat setting. Since the fabric had a basis weight of 359 g/m², did not use a modified cross-sectional yarn, and was not subjected to water absorption processing, and thus did not absorb water and hardly diffuse, the fabric had a water absorbency of 38 seconds before washing and 27 seconds after washing and a diffusive residual moisture ratio of 47% before washing and 63% after washing and thus lacked comfort in actual wearing.

[Table 1]

			Example 1	Example 2	Example 3	Example 4
Spun yarn A including aliphatic polyamide short fiber	Raw stock a	Material	Nylon 6 round cross-section	Nylon 6 round cross-section	Nylon 6 round cross-section	Nylon 6 round cross-section
		Single-yarn fineness (dtex)	1.7	1.7	1.7	1.7
		Fiber length (mm)	51	51	38	38
		Raw stock elongation (%)	60	60	55	55
	Raw stock b	Material	-	Rayon	-	-
		Single-yarn fineness (dtex)	-	1.5	-	-
		Fiber length (mm)	-	51	-	-
	Raw stock mass ratio a : b		-	90:10	-	-
	Cotton count		9	9	9	20
	Twist coefficient		4	4	4.3	4.3
	Spinning method		Ring	Ring	Siro-compact	Siro-compact
	Usage form		Warp yarn	Warp yarn	Warp yarn	Interknitted yarn (front side)

(continued)

			Example 1	Example 2	Example 3	Example 4
5	Other fibers	Material	PET cruciform cross-section	PET cruciform cross-section	PET cruciform cross-section	PET round cross-section/ urethane elastic yarn
10		Single-yarn fineness (dtex)	1.5	1.5	1.5	1.5
15		Fiber length (mm)	38	38	38	38
		Cotton count	16	16	16	16
		Twist coefficient	4	4	4	4
20		Yarn form	Siro-compact spun yarn	Siro-compact spun yarn	Siro-compact spun yarn	Covering yarn
		Usage form	Weft yarn	Weft yarn	Weft yarn	Interknitted yarn (back side)
25	Woven/ knitted article	Stitch	3/1 twill	3/1 twill	3/1 twill	Circular knitting
	Exposure rate (%) of fiber B		49	50	51	48
	Water absorption processing (g/L)		20	20	20	20
	Basis weight (g/m ²)		354	360	352	315
30	Anti-pilling qualities (grade)		4.5	4	4	4
35	Water absorbency (sec)	Before washing	3	5	2	1
		Afterwashing 10 times	1	2	Less than 1	Less than 1
40	Diffusive residual moisture ratio (%)	Before washing	22	37	25	18
		Afterwashing 10 times	13	18	20	11
	Color bleeding (grade)		4-5	4	4-5	4-5
45	Texture and glossiness of woven/knitted article		3	3	3	2

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[Table 2]

			Example 5	Example 6	Comparative Example 1	Comparative Example 2	Comparative Example 3
5	Spun yarn A including aliphatic polyamide short fiber	Material	Nylon 6 round cross- section	Nylon 6 round cross- section	Nylon 6 round cross-section	Nylon 6 round cross-section	Nylon 6 round cross-section
10		Single- yarn fineness (dtex)	1.7	1.7	6	1.7	1.7
15		Fiber length (mm)	51	51	51	38	51
20		Raw stock elongation (%)	60	60	56	55	60
25		Material	-	-	-	Polyester	-
25		Single- yarn fineness (dtex)	-	-	-	1.5	-
30		Fiber length (mm)	-	-	-	38	-
30		Raw stock mass ratio a : b	-	-	-	10:90	-
35		Cotton count	9	9	9	9	9
35		Twist coefficient	9	9	4	4.1	9
35		Spinning method	Ring	Ring	Ring	Compact	Ring
35		Usage form	Warp yarn	Warp yarn	Warp yarn	Warp yarn	Warp yarn

(continued)

			Example 5	Example 6	Comparative Example 1	Comparative Example 2	Comparative Example 3
5	Other fibers	Material	PET round cross- section	PET cruciform cross- section	PET cruciform cross-section	PET cruciform cross-section	PET round cross-section
10		Single- yarn fineness (dtex)	1.5	1.5	1.5	1.5	1.5
15		Fiber length (mm)	38	38	38	38	38
20		Cotton count	16	16	16	16	16
25		Twist coefficient	9	9	9	9	9
		Yarn form	Siro- compact spun yarn	Siro- compact spun yarn	Siro-compact spun yarn	Siro-compact spun yarn	Siro-compact spun yarn
		Usage form	Weft yarn	Weft yarn	Weft yarn	Weft yarn	Weft yarn
30	Woven/ knitted article	Stitch	3/1 twill	3/1 twill	3/1 twill	3/1 twill	3/1 twill
	Exposure rate (x) of fiber B		49	50	53	49	51
	Water absorption processing (g/L)		20	20	20	20	Absent
	Basis weight (g/m ²)		355	351	358	362	359
35	Anti-pilling qualities (grade)		9.5	9.5	2.5	2	4.5
40	Water absorbency (sec)	Before washing	6	8	6	12	38
		After washing 10 times	5	8	9	10	27
45	Diffusive residual moisture ratio (%)	Before washing	36	35	37	20	47
		After washing 10 times	33	38	35	18	63
	Color bleeding (grade)		4-5	4-5	4-5	4-5	4-5
50	Texture and glossiness of woven/ knitted article		3	3	1	1	3

Claims

1. A woven/knitted article comprising one or more fibers selected from synthetic fibers, regenerated fibers, and semisynthetic fibers, the woven/knitted article including a spun yarn, which contains 30 mass% or more of an aliphatic polyamide short fiber A having a single-fiber fineness of 0.5 dtex to 5 dtex and a fiber length of 25 mm to 70 mm in

the spun yarn, and having water absorbency evaluated using a falling-drop method of 10 seconds or less.

2. The woven/knitted article according to claim 1, wherein the spun yarn has a cotton count of 2 to 60.

5 3. The woven/knitted article according to claim 1 or 2, wherein a twist coefficient of the spun yarn is 3.5 to 5.

4. The woven/knitted article according to any one of claims 1 to 3, wherein a basis weight is 50 to 600 g/m².

10 5. The woven/knitted article according to any one of claims 1 to 4, comprising a fiber B other than the aliphatic polyamide short fiber.

6. The woven/knitted article according to claim 5, wherein the fiber B is one or more selected from a polyester-based fiber and a polyurethane fiber.

15 7. The woven/knitted article according to claim 5 or 6, wherein the fiber B includes a modified cross-sectional fiber.

8. The woven/knitted article according to any one of claims 5 to 7, wherein 20% or more of the fiber B is exposed on one surface of the woven/knitted article.

20 9. The woven/knitted article according to any one of claims 5 to 8, wherein the fiber B includes a fiber having a color different from the color of the aliphatic polyamide short fiber.

25 10. The woven/knitted article according to any one of claims 1 to 9, wherein the spun yarn is one or more spun yarns selected from a ring spun yarn or a compact spun yarn, a siro spun yarn, a siro-compact spun yarn, an MVS spun yarn, and an air spun yarn.

11. The woven/knitted article according to any one of claims 1 to 10, wherein a surface has anti-pilling qualities of Grade 4 or higher in accordance with Method A of JIS L 1076 (2006).

30 12. The woven/knitted article according to any one of claims 1 to 11, wherein a diffusive residual moisture ratio after 60 minutes is 40% or less before washing and after washing 10 times.

13. A textile product comprising the woven/knitted article according to any one of claims 1 to 12.

35 14. A method for manufacturing the woven/knitted article according to any one of claims 1 to 12, comprising a step of knitting and weaving a fiber including a spun yarn, which contains 30 mass% or more of an aliphatic polyamide short fiber having a single-fiber fineness of 0.5 to 5 dtex and a fiber length of 25 mm to 70 mm, wherein the method further satisfies the following (1) and/or (2),

40 (1) the method includes a step of water absorption processing, and
(2) the fiber includes a modified cross-sectional fiber.

45 15. The method for manufacturing the woven/knitted article according to claim 14, wherein the aliphatic polyamide short fiber has a raw stock elongation of 10% to 70%.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/042403

A. CLASSIFICATION OF SUBJECT MATTER

D03D 15/47(2021.01)i; **D02G 3/04**(2006.01)i; **D03D 15/283**(2021.01)i; **D03D 15/37**(2021.01)i; **D04B 1/16**(2006.01)i;
D04B 21/16(2006.01)i; **D06M 15/507**(2006.01)i; **D06M 15/564**(2006.01)i
 FI: D03D15/47; D02G3/04; D03D15/283; D03D15/37; D04B1/16; D04B21/16; D06M15/507; D06M15/564

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D03D1/00-27/18; D04B1/00-1/28; D04B21/00-21/20; D02G1/00-3/48; D06M13/00-15/715

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
 Published unexamined utility model applications of Japan 1971-2021
 Registered utility model specifications of Japan 1996-2021
 Published registered utility model applications of Japan 1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 7-331509 A (TORAY IND INC) 19 December 1995 (1995-12-19) claim 1, example 2	1-4, 10, 12-15
A		5-9, 11
X	US 2008/0286513 A1 (INVISTA NORTH AMERICA S A R L) 20 November 2008 (2008-11-20) claim 1, examples 1-5, paragraph [0030]	1-6, 8-15
A		7
A	JP 2004-316003 A (TORAY IND INC) 11 November 2004 (2004-11-11) claim 1, paragraph [0005], example 1	1-15
A	JP 2015-108204 A (TORAY IND INC) 11 June 2015 (2015-06-11) example 1	1-15
A	CN 105386204 A (CHANGSHU WEIFENG TEXTILE CO., LTD.) 09 March 2016 (2016-03-09) claim 1	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2021/042403

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JP 2015-108204 A	11 June 2015	(Family: none)	
CN 105386204 A	09 March 2016	WO 2017/107879 A1	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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