



(11)

EP 4 060 103 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.09.2022 Bulletin 2022/38

(21) Application number: **20888510.3**

(22) Date of filing: **11.05.2020**

(51) International Patent Classification (IPC):
D02G 3/32 (2006.01) **D02G 3/36** (2006.01)
D02G 3/38 (2006.01) **D01D 5/34** (2006.01)
D02J 1/08 (2006.01) **D02G 1/16** (2006.01)
D03D 15/56 (2021.01)

(86) International application number:
PCT/KR2020/006160

(87) International publication number:
WO 2021/096008 (20.05.2021 Gazette 2021/20)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **14.11.2019 KR 20190146071**

(71) Applicant: **HYOSUNG TNC CORPORATION**
SEOUL, 04144 (KR)

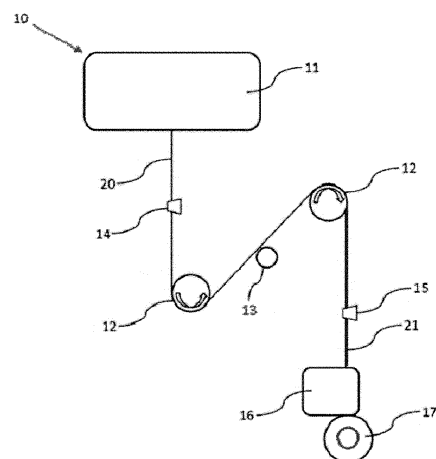
(72) Inventors:
• **KIM, Ki Rim**
Seoul 02598 (KR)
• **CHUNG, Hyun Gee**
Suwon-si Gyeonggi-do 16363 (KR)
• **KANG, Yeon Soo**
Gunpo-si Gyeonggi-do 15815 (KR)
• **KIM, Munseon**
Seoul 04369 (KR)

(74) Representative: **Westphal, Mussnug & Partner**
Patentanwälte mbB
Am Riettor 5
78048 Villingen-Schwenningen (DE)

(54) **COMPOSITE ELASTIC YARN, STRETCHABLE FABRIC, AND METHOD FOR MANUFACTURING COMPOSITE ELASTIC YARN**

(57) The present invention is directed to a composite elastic yarn, including a core section including an elastic core filament, and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which the inter-filament cohesion thereof is within the range of 9 to 198 mg when measured according to the ASTM D3822 method, and is also directed to a fabric, and a method for manufacturing a composite elastic yarn. According to the present invention, it is possible to solve a puckering problem occurring on the surface of a denim fabric, thereby improving a touch sensation and the quality of a final product.

FIG. 1



EP 4 060 103 A1

Description**Technical Field**

5 **[0001]** The present invention relates to a composite elastic yarn, a stretchable fabric, and a method for manufacturing a composite elastic yarn, and more particularly to a composite elastic yarn, stretchable fabric, and method for manufacturing a composite elastic yarn that solve a puckering problem in a fabric form by using a low-cohesion elastic yarn with low inter-filament cohesion as the core yarn of the composite elastic yarn.

10 **Background Art**

[0002] An elastic fabric used for denim is woven with a composite elastic yarn in which a spandex yarn is used as a core yarn. The composite elastic yarn is composed of a core section and a sheath section covering the core section. In general, a single-core or dual-core elastic yarn is used as the core yarn of a composite elastic yarn in a fabric for denim, and thus imparts elasticity to the denim fabric. In the single-core case, one elastic yarn is applied as the core yarn, and in the dual-core case, two strands of elastic yarn and polyester bicomponent fiber are applied as the core yarn.

15 **[0003]** As an example, U.S. Patent No. 8,093,160 discloses an elastic core yarn including a core consisting of at least one elastic core filament and at least one inelastic core filament and a sheath consisting of staple fibers arranged in such a way as to longitudinally surround the core, and also discloses a stretchable denim fabric including the elastic core yarn. However, the stretchable denim fabric obtained by this technology does not provide an appropriate level of elasticity, and has a limitation in terms of the thickness of a yarn that can be used in the sheath including the staple fibers.

20 **[0004]** Composite elastic yarns and methods for manufacturing them are well known. For example, composite elastomeric yarns in which an elastic fiber core is covered with inelastic fibers are described in U.S. Patent Nos. 4,470,250, 4,998,403, 7,134,265, and 6,848,151.

25 **[0005]** When a denim fabric is manufactured using a conventional composite elastic yarn, a thin cotton yarn does not completely cover a core section, and the surface area where the cotton yarn, i.e., a sheath section, and a core yarn are fused with each other is small, so that there is a problem in that the core yarn and the cotton yarn cannot be sufficiently fused with each other. This causes a slippage phenomenon in which the core yarn of the composite elastic yarn is separated from the sheath section after it has been woven into a denim fabric and formed into a garment. When the core yarn with elasticity is removed from the fabric due to the slippage phenomenon, there occurs a puckering problem in which the surface of the fabric is deformed in an unevenly wrinkled form. Since puckering occurring on the surface of the denim fabric is a factor that can impair the appearance of a garment and cause a product defect, the puckering problem needs to be overcome when a denim fabric is woven.

30 **[0006]** A yarn and fabric manufacturing technology for solving the puckering problem of a stretchable fabric using a composite elastic yarn has not yet been attempted.

Disclosure**Technical Problem**

40 **[0007]** The present invention intends to solve the problems of the prior art described above, and one object of the present invention is to apply an elastic yarn having low inter-filament cohesion to the core section of a composite elastic yarn, thereby overcoming a puckering problem that occurs on the surface of a denim fabric.

45 **[0008]** Another object of the present invention is to form a core section using two or more strands of elastic yarn fed from one single bobbin, thereby providing a composite elastic yarn having the high elasticity and significantly improved elastic recovery property of a fabric in which a core yarn is used.

[0009] Still another object of the present invention is to solve a puckering problem occurring in a final product of a stretchable fabric, thereby improving the quality of the product and also improving a touch sensation of use.

50 **Technical Solution**

[0010] In order to accomplish the above objects, an aspect of the present invention is directed to a composite elastic yarn, including a core section including an elastic core filament, and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which the inter-filament cohesion thereof is within the range of 9 to 198 mg when measured according to the ASTM D3822 method.

55 **[0011]** The elastic core filament has an inter-filament cohesion corresponding to 1.5 to 22% of the inter-filament cohesion of a general-purpose elastic core filament of the same fineness.

[0012] The core section may be made of polyurethane, polyurethane-urea, or a blend of polyurethane and polyurethane-

urea, and the sheath section may be made of a hard yarn selected from the group consisting of wool, linen, silk, polyester, nylon, olefin, cotton, Tencel, Modal, poly-viscose, and combinations thereof. In the present invention, the core yarn may have a fineness of 40 to 120 denier.

[0013] Another aspect of the present invention is directed to a fabric in which at least one of the warp and weft yarns thereof includes a composite elastic yarn, including a core section including an elastic core filament and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which the inter-filament cohesion thereof is within the range of 9 to 198 mg when measured according to the ASTM D3822 method. The fabric of the present invention may be used for denim or non-denim.

[0014] Still another aspect of the present invention is directed to a method for manufacturing a composite elastic yarn, the method including: after an elastic core filament yarn has been spun, preparing a low-cohesion core yarn by primarily interlacing the elastic core filament yarn so that the inter-filament cohesion thereof is 500 to 1500 mg, secondarily interlacing the primarily interlaced elastic core filament yarn so that the inter-filament cohesion thereof is 9 to 198 mg, and then winding the interlaced elastic core filament yarn; and coating the low-cohesion core yarn, prepared at a previous step, with a staple fiber roving yarn and then spinning the coated low-cohesion core yarn.

[0015] In the primary interlacing step, the primary interlacing may be performed at an air flow rate of 3 to 4 L/min and a temperature of 35 to 30°C, and in the secondary interlacing step, the secondary interlacing may be performed at an air flow rate of 1 to 2 L/min and a temperature of 15 to 20°C.

Advantageous Effects

[0016] The present invention has an excellent effect in that a puckering problem that occurs on the surface of a denim fabric when a general single-core or dual-core yarn is used as a core yarn is solved by applying a single elastic yarn as the core yarn of the composite elastic yarn and also using an elastic yarn with low inter-filament cohesion as the core yarn.

[0017] Furthermore, according to the manufacturing method of the present invention, the low-cohesion spandex yarn having low cohesion between filament strands in the yarn without the deterioration of the yarn physical properties and filamentation of the composite elastic yarn can be manufactured by the spinning process to which the primary and secondary air interlacing processes are added.

[0018] In the fabric of the present invention, a puckering problem occurring on the surface of the fabric is overcome, so that the quality of the surface thereof is improved, thereby providing a comfortable sensation of use to a user. In addition, a final product obtained using the low-cohesion core yarn of the present invention has a high elastic property, a significantly improved elastic recovery property, and a shape retention property.

Description of Drawings

[0019] FIG. 1 is a schematic view of an apparatus for preparing the core yarn of a composite elastic yarn according to an embodiment of the present invention; and

[0020] FIG. 2 is a schematic view of an apparatus for manufacturing a composite elastic yarn according to an embodiment of the present invention.

Best Mode

[0021] The present invention will be described in greater detail below with reference to the accompanying drawings.

[0022] As used herein and in the appended claims, the following terms are defined as follows:

The term "filament" used herein refers to a long fiber strand, and the term "staple fiber" used herein refers to a fiber strand of indefinite or short length.

[0023] The term "elastic core filament" used herein refers to a filament with an elongation at break exceeding 100%, and a preferred example thereof is a spandex fiber.

[0024] The term "composite elastic yarn" used herein refers to a "core-spun yarn" produced by covering an elastic core filament with fibers thereon.

[0025] In the present invention, the term "inter-filament cohesion" refers to a value (mg) obtained by separating one filament in a yarn into a length of 1 cm or more, hooking the ends of separated filaments to a cohesion measuring apparatus (manufactured by Lenzing Instruments GmbH & Co. KG, Vibrodyn 400), elongating them at a constant elongation rate, and measuring the breaking strength of fiber according to the ASTM D3822-07 method (standard test methods for tensile properties of single textile fibers).

[0026] A composite elastic yarn according to one aspect of the present invention is a composite elastic yarn, including a core section including an elastic core filament and a sheath section including staple fibers surrounding the core section. In this case, the elastic core filament has a low cohesion property in which the inter-filament cohesion thereof is within the range of 9 to 198 mg when measured by the ASTM D3822 method.

[0027] The elastic core filament may be a low-cohesion elastic core filament with low cohesion corresponding to 1.5% to 22% of the cohesion of a general-purpose elastic core filament of the same fineness. For example, the inter-filament cohesion of a spandex 80D yarn used for general purposes is 700 to 900 mg, whereas the low-cohesion elastic core filament according to the present invention has an inter-filament cohesion of about 9 to 198 mg in the case of 80D.

[0028] In the present invention, when the inter-filament cohesion of a core yarn is lower than 1.5% of the cohesion of a general-purpose spandex yarn of the same fineness, there may occur a filamentation phenomenon in which filaments in the yarn are separated due to excessively low cohesion. Meanwhile, when the inter-filament cohesion of the core yarn exceeds 22% of the cohesion of the general-purpose spandex yarn of the same fineness, a sufficient surface area that will come into contact with and be fused with a cotton yarn, i.e., a sheath section, is not provided during a covering process, so that there is concern that puckering may occur during manufacture in the form of a fabric.

[0029] The core section may be composed of an elastic core filament made of polyurethane, polyurethane-urea, or a blend of polyurethane and polyurethane-urea.

[0030] The sheath section may be natural fibers, e.g., cotton, wool, linen, silk, Tencel, or Modal. Alternatively, the sheath section may be single-component staple synthetic fibers. For example, the sheath section may be fibers selected from the group consisting of polyester, nylon, olefin, poly-viscose, acrylic, modified acrylic, rayon, and any combinations thereof. In the present invention, the sheath section preferably includes a cotton yarn.

[0031] In the composite elastic yarn of the present invention, the core yarn has a fineness of 40 to 120 denier. When the fineness of the core yarn is lower than 40 denier, a denim fabric thinner than general fabrics for denim is formed, so that a body shape correction effect is insignificant and the appearance of a garment is not desirable. Meanwhile, when the fineness of the core yarn exceeds 120 denier, a denim fabric thicker than general fabrics for denim is formed, so that the wearing comfort of a garment is deteriorated due to stiff and heavy sensations.

[0032] Another aspect of the present invention is directed to a method for manufacturing a composite elastic yarn. In the present invention, after an elastic core filament yarn has been spun, a low-cohesion core yarn is prepared by primarily interlacing the elastic core filament yarn so that the inter-filament cohesion thereof is 500 to 1500 mg, secondarily interlacing the primarily interlaced elastic core filament yarn so that the inter-filament cohesion thereof is 9 to 198 mg, and then winding the interlaced elastic core filament yarn. Thereafter, a composite elastic yarn may be manufactured by coating the low-cohesion core yarn, prepared in the previous step, with a staple fiber roving yarn and then spinning the coated low-cohesion core yarn.

[0033] The composite elastic yarn of the present invention is manufactured in such a way that a core yarn and a sheath are spun by ring spinning or open-end spinning in a spinning apparatus.

[0034] Spandex yarns are generally produced by dry spinning at high temperature in a spinning channel. In this case, the spandex yarn is in a state of being heated after spinning, so that the modulus thereof is lowered and the temperature thereof is appropriate to impart twist to the yarn. In a drawing process, the spandex yarn is passed through an air interlace nozzle to impart inter-filament cohesion, which is followed by winding. When it is necessary to produce a yarn with low cohesion in order to solve a puckering problem in a denim fabric yarn, a low-cohesion yarn may be produced by lowering the pressure applied by the air interlace nozzle during the yarn spinning process. However, when the cohesion of the yarn is lowered by the above-described spinning process, there occur a problem in which strength among the physical properties of the produced yarn is lowered and a filamentation phenomenon in which filament strands in the yarn are separated, resulting in a defective yarn problem.

[0035] In the present invention, as the air interlace nozzle (hereinafter referred to as the "interlace nozzle") that imparts cohesion in the process of spinning the core yarn, first and second interlace nozzles are applied to the spinning process, unlike in the existing spinning process using a single interlace nozzle, thereby enabling a puckering problem in a final fabric to be solved.

[0036] The first interlace nozzle 14 passes the yarn therethrough with air while controlling pressure and temperature in the same manner as in the existing process of spinning a spandex yarn. In a general interlace nozzle, the air flow rate is 3 to 4 L/min, and the temperature is 35 to 30°C. The air flow rate and temperature of the first interlace nozzle 14 according to the present invention are the same as the above-mentioned existing conditions. When air is supplied from the first interlace nozzle 14, the yarn is basically adjusted such that two filament strands are joined together.

[0037] In the present invention, the second interlace nozzle 15 passes the yarn strands, passed through the first interlace nozzle, therethrough while applying low-temperature and low-pressure air to finally produce a low-cohesion elastic core filament with low cohesion. More specifically, the yarn passed through the first interlace nozzle 14 is basically present in the form in which two filament strands are joined together, and this yarn is passed through the second interlace nozzle 15 with air at a flow rate of 1 to 2 L/min and a temperature of 15 to 20°C to impart significantly low cohesion between the two filament strands. For example, in the case of a product of 80 denier/6 filaments, two 40-denier/3-filament strands are obtained after passage through the first interlace nozzle 14, and low cohesion is imparted between the two strands during the passage through low-temperature and low-pressure air in the second interlace nozzle 15. By the primary and secondary spinning processes including air interlace nozzles described above, a low-cohesion spandex yarn with low cohesion between filament strands in the yarn can be produced without the deterioration of the physical

properties and filamentation of the spandex yarn.

[0038] A low-cohesion elastic core filament 21 is obtained by an apparatus 10 for manufacturing a core yarn, and a composite elastic yarn 40 is obtained by an apparatus 30 for spinning a composite elastic yarn.

[0039] FIG. 1 schematically shows an apparatus for manufacturing the core yarn of a composite elastic yarn according to an embodiment of the present invention. Referring to FIG. 1, the apparatus 10 for manufacturing a core yarn that is used to obtain the low-cohesion elastic core filament 21 basically includes a dry spinning unit 11, a guide cylinder 12, an oil pickup roller 13 and winding device 16 provided in succession to the dry spinning unit 11, and a bobbin 17 associated with the winding device 16.

[0040] In order to prepare the low-cohesion elastic core filament 21, a polyurethane-urea polymer is first spun in the form of an elastic yarn 20 in the dry spinning unit 11. Then, the obtained elastic yarn 20 is passed through the oil pickup roller 13, passed through the first interlace nozzle 14 and the second interlace nozzle 15 by the guide cylinder 12, and then transferred to the winding device 16. The oil pickup roller 13 transfers the elastic yarn 20 without oscillation and vibration in order to allow the elastic yarn 20 to be appropriately wound. The elastic yarn 20 transferred to the winding device 16 is wound around the bobbin 17.

[0041] Thereafter, the bobbin 17 around which the low-cohesion elastic core filament 21 is wound is provided to the apparatus 30 for spinning a composite elastic yarn, as schematically shown in FIG. 2. The apparatus 30 for spinning a composite elastic yarn basically includes a roving yarn 31, yarn drawing cylinders 32 configured such that the roving yarn 31 is passed therethrough, guide front cylinders 33 configured to be fed with the thin roving yarn 31 and the low-cohesion elastic core filament 21 obtained from the bobbin 17, a yarn guide 34 provided next to the guide front cylinders 33, and a spinning unit 35. The spinning unit 35 includes a ring 351, a moving unit 352, and a cop 353. The roving yarn 31 is passed between the yarn drawing cylinders 32, the low-cohesion elastic core filament 21 is fed from the bobbin 17 to the guide front cylinders 33 and combined with the drawn roving yarn 31, the thin roving yarn 31 and the low-cohesion elastic core filament 21 are fed from the yarn guide 34 to provide a smooth flow and oriented toward the spinning unit 35, the thin roving yarn 31 is wound around the low-cohesion elastic core filament 21 by operating the ring 351 and the yarn moving unit 352 together in the spinning unit 35, and then a resulting yarn is spun and wound around the cop 353, thereby manufacturing the composite elastic yarn 40.

[0042] Through this process, a composite elastic yarn having a core-sheath structure can be obtained. The composite elastic yarn obtained by this process has a structure in which the low-cohesion elastic core filament 21 is covered with the roving yarn 31 thereon. In the present invention, the elastic yarn 20 used in the core section is made of a two-end or more elastic yarn fed from a single bobbin. As described above, when a plurality of ends containing an elastic yarn, such as a spandex yarn, provided from a single bobbin is used in the core section, elasticity and elastic recovery rate can be improved in a final product, such as a fabric, in which the core yarn is used.

[0043] When the elastic yarn 20 included in the structure of the core yarn is fed from individual bobbins to provide high elasticity, a difference in tension is caused in a spandex yarn, so that a non-uniform core yarn structure is formed. The high elasticity in the disclosed core yarn according to the present invention is achieved by the plurality of elastic yarn (20) components of the core section provided from the single bobbin 17 to a plurality of ends. Accordingly, it is possible to obtain a core yarn having high uniformity.

[0044] Still another aspect of the present invention is directed to a stretchable fabric. The fabric of the present invention is characterized in that at least one of the warp and weft yarns thereof includes a composite elastic yarn, including a core section including an elastic core filament and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which the inter-filament cohesion thereof is within the range of 9 to 198 mg when measured according to the ASTM D3822 method. The use of the fabric of the present invention may be expanded to fabrics for denim or non-denim.

[0045] The composite elastic yarn of the present invention may be used in the production of woven fabrics, knitted fabrics, non-woven fabrics, etc. Preferably, the composite elastic yarn of the present invention may be used for a stretchable fabric for denim. In this case, the fabric may be produced in a variety of weave patterns including plain weave, poplin, twill, oxford, dobby, sateen, satin, and combinations thereof.

[0046] In the stretchable fabric of the present invention, the elongation rate thereof is 20 to 50%, and the elongation recovery rate thereof is 90 to 97%. The fabric may exhibit only weft-stretch, or may exhibit stretch in both directions. In this case, useful stretch and elastic recovery properties are exhibited in both warp and weft directions.

[0047] The present invention will be described in detail below with reference to examples. These examples are intended merely to illustrate the present invention, and the following examples should not be construed as limiting the scope of the present invention.

Examples**Example 1**

[0048] A spandex yarn used as the core yarn of a composite elastic yarn was prepared by the following method. Due to high temperature in a spinning channel, the spandex yarn was in a state of being heated after spinning, and was then drawn out at an appropriate temperature to impart twist to the yarn. In this case, air was applied while the spandex yarn was passing through the first interlace nozzle, and the inter-filament cohesion of the spandex yarn was 870 mg, which fell within the range of the cohesion values of a 80D general-purpose spandex yarn. Thereafter, low-temperature and low-pressure air was applied while the spandex yarn was passing through the second air interlace nozzle during a winding process, so that the inter-filament cohesion of the spandex yarn was measured to be 40 mg, i.e., 5% of 800 mg, which is the cohesion value of the 80D general-purpose spandex yarn.

[0049] A 16-thread cotton yarn was used as a hard yarn, and the low-cohesion elastic core filament prepared above was used as the core yarn. In the composite elastic yarn, the spandex yarn used for the weft of the composite elastic yarn was prepared at a DR (draw ratio) of 3.5.

[0050] The fabric was woven using a pure cotton 11-thread spun yarn as the warp thereof. When the fabric was woven using the composite elastic yarn, the composite elastic yarn was introduced as a weft yarn, and the spun yarn introduced as the warp yarn was used through beaming without additional elongation. After a twill fabric was prepared using the composite elastic yarn, the average width of the fabric before washing was determined to be 144 to 149 cm, and the width of the fabric after washing was determined to be 120 to 125 cm. After the fabric was produced by the above process, the fabric was prepared as a sample through a dyeing process in an ordinary manner.

[0051] The yarn characteristics of the core yarn of the composite elastic yarn and whether puckering had occurred in a fabric form were evaluated, and evaluation results are listed in Table 1 below.

Example 2

[0052] An elastic yarn with low inter-filament cohesion was applied as the core yarn of a composite elastic yarn used for the manufacture of a denim fabric. In this case, the inter-filament cohesion of the spandex yarn after passage through the first interlace nozzle was measured to be 880 mg, which fell within the range of the cohesion values of a 80D general-purpose spandex yarn, and the inter-filament cohesion of the spandex yarn after passage through the second air interlace nozzle was measured to be 14 mg, i.e., the 2% value of 700 mg, which was the cohesion value of the 80D general-purpose spandex yarn.

[0053] After the composite elastic yarn and a fabric were preparing in the same manner as in Example 1 except that the core yarn was changed as described above, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Example 3

[0054] An elastic yarn with low inter-filament cohesion was applied as the core yarn of a composite elastic yarn used for the manufacture of a denim fabric. In this case, the inter-filament cohesion of a spandex yarn after passage through the first interlace nozzle was measured to be 870 mg, which fell within the range of the cohesion values of a 80D general-purpose spandex yarn, and the inter-filament cohesion of the spandex yarn after passage through the second air interlace nozzle was measured to be 198 mg, i.e., the 22% value of 900 mg, which was the cohesion value of the 80D general-purpose spandex yarn.

[0055] After the composite elastic yarn and a fabric were prepared in the same manner as in Example 1 except that the core yarn was changed as described above, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Comparative Example 1

[0056] A composite elastic yarn and a fabric were prepared in the same manner as in Example 1 except that a 80D general-purpose spandex yarn manufactured via passage only through the first interlace nozzle without passage through the first and second air interlace nozzles was employed as the core yarn of a composite elastic yarn used for the manufacture of a denim fabric. Thereafter, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Comparative Example 2

[0057] A composite elastic yarn and a fabric were prepared in the same manner as in Example 1 except that a 50D inelastic fiber and a 70D spandex dual-core yarn (120D) were applied as the core yarn of a composite elastic yarn. Thereafter, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Comparative Example 3

[0058] A composite elastic yarn and a fabric were prepared in the same manner as in Example 1 except that the inter-filament cohesion of a spandex yarn after passage through the first interlace nozzle was set to 870 mg, which fell in the range of the cohesion values of a 80D general-purpose spandex yarn, and the inter-filament cohesion of the spandex yarn after passage through the second air interlace nozzle was set to 7 mg, i.e., the 1% value of 700 mg, which was the cohesion value of the 80D general-purpose spandex yarn. Thereafter, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Comparative Example 4

[0059] A composite elastic yarn and a fabric were prepared in the same manner as in Example 1 except that the inter-filament cohesion of a spandex yarn after passage through the first interlace nozzle was set to 890 mg, which fell in the range of the cohesion values of a 80D general-purpose spandex yarn, and the inter-filament cohesion of the spandex yarn after passage through the second air interlace nozzle was set to 230 mg, i.e., the 25.5% value of 900 mg, which was the cohesion value of the 80D general-purpose spandex yarn. Thereafter, the physical properties thereof were evaluated, and the results of the evaluation are listed in Table 1 together.

Test Example

[0060] The physical properties of the composite elastic yarns and fabrics obtained in the examples and the comparative examples were evaluated in the following manner. In view of the measurement range error, each of 20 samples was measured, and the average value of the median values excluding the highest and lowest values was obtained. In this case, each specimen was evaluated after conditioning at 23°C and a relative humidity of 65% for 14 hours.

[Method for Evaluating the Cohesion of Fiber]

[0061] The inter-filament cohesion in each of the composite elastic yarns obtained in the examples was measured using a cohesion measuring apparatus (manufactured by Lenzing Instruments GmbH & Co. KG, Vibrodyn 400) according to ASTM D3822-07. A measuring method was performed by separating one filament from each of the yarns into a length of about 1 cm or more with fingertips, hooking individual ends of the separated single strand of filament and the filaments remaining without being separated to a measuring apparatus (manufactured by LENZING, Vibrodyn-400) for measuring the tensile strength of one fiber, elongating the above ends at a constant rate of 1,000%/min, and then measuring the force (mg) when the separated one strand of filament and the remaining filaments were separated by the elongation.

[Method for Evaluating the Strength and Elongation of Fiber]

[0062] The inter-filament strength and elongation in each of the yarns were measured using an automatic strength and elongation measuring apparatus (manufacturer: Textechno; model name: MEL) under the conditions of a load cell of 32 cN, a sample length of 10 cm, and a tensile rate of 100 cm/min. In this case, the strength and elongation values at break were measured.

[Occurrence of Puckering]

[0063] After the fabrics were woven, it was evaluated with the unaided eye whether puckering had occurred.

Table 1

	Core Yam Structure	Yam Physical Properties			Primary Air Interface		Secondary Air Interface		Yam Cohesion (mg)		Occurrence of Fabric Puckering
		fineness (D)	strength (g/d)	elongation (%)	air flow rate (L/min)	air temperature (°C)	air flow rate (L/min)	air temperature (°C)	after passage through first IL nozzle	after passage through second IL nozzle	
Example 1	single	80	120	522	3.5	32.1	1.5	17.8	870	40	X
Example 2	single	80	1.18	540	3.5	32	1.1	15.3	880	14	X
Example 3	single	80	121	520	3.5	32.3	1.9	20.0	870	197	X
Comparative Example 1	single	80	120	560	3.5	32.5	-	-	900	-	O
Comparative Example 2	dual	50/70	-	-	-	-	-	-	-	-	O
Comparative Example 3	single	80	-	-	3.5	32.5	0.7	14.7	870	7	unable to prepare yarn
Comparative Example 4	single	80	124	517	3.5	32.2	2.8	22.4	890	230	O

[0064] As can be seen from the results in Table 1, when the composite elastic yarn of the present invention was applied, puckering did not occur in the fabrics and the elastic recovery rate was excellent. In contrast, in Comparative Examples 1, 2, and 4, puckering occurred, and in Comparative Example 3, a large number of yarn breakages occurred, thus making it impossible to manufacture a fabric and evaluate the physical properties thereof.

[0065] Although the preferred embodiments of the present invention have been described in detail above, these descriptions are intended for illustrative purposes only. Those skilled in the art will appreciate that modifications and changes may be made without departing from the spirit of the present invention, and all such modifications and modifications are intended to be included in the true scope of the present invention.

Claims

1. A composite elastic yarn comprising a core section including an elastic core filament, and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which inter-filament cohesion thereof is within a range of 9 to 198 mg when measured according to an ASTM D3822 method.
2. The composite elastic yarn of claim 1, wherein the elastic core filament has an inter-filament cohesion corresponding to 1.5 to 22% of an inter-filament cohesion of a general-purpose elastic core filament of a same fineness.
3. The composite elastic yarn of claim 1, wherein the core section is made of polyurethane, polyurethane-urea, or a blend of polyurethane and polyurethane-urea.
4. The composite elastic yarn of claim 1, wherein the sheath section is selected from the group consisting of wool, linen, silk, polyester, nylon, olefin, cotton, Tencel, Modal, poly-viscose, and combinations thereof.
5. The composite elastic yarn of claim 1, wherein the core yarn has a fineness of 40 to 120 denier.
6. The composite elastic yarn of claim 1, wherein the elastic core filament is prepared by being interlaced twice before being wound and being air-interlaced at a pressure and temperature lower than those of the primary interlacing step in the secondary interlacing.
7. A fabric in which at least one of warp and weft yarns comprises a composite elastic yarn, including a core section including an elastic core filament and a sheath section including staple fibers surrounding the core section, wherein the elastic core filament has a low cohesion property in which inter-filament cohesion thereof is within a range of 9 to 198 mg when measured according to an ASTM D3822 method.
8. A method for manufacturing a composite elastic yarn, the method comprising: after an elastic core filament yarn has been spun, preparing a low-cohesion core yarn by primarily interlacing the elastic core filament yarn so that inter-filament cohesion thereof is 500 to 1500 mg, secondarily interlacing the primarily interlaced elastic core filament yarn so that inter-filament cohesion thereof is 9 to 198 mg, and then winding the interlaced elastic core filament yarn; and coating the low-cohesion core yarn, prepared in a previous step, with a staple fiber roving yarn and then spinning the coated low-cohesion core yarn.
9. The method of claim 8, wherein the method comprises performing the primary interlacing via a first interlace nozzle at an air flow rate of 3 to 4 L/min and a temperature of 35 to 30°C and then performing the secondary interlacing via a second interlace nozzle at an air flow rate of 1 to 2 L/min and a temperature of 15 to 20°C.
10. The method of claim 8, wherein the elastic core filament is prepared to have an inter-filament cohesion corresponding to 1.5 to 22% of an inter-filament cohesion of a general-purpose elastic core filament of a same fineness.

FIG. 1

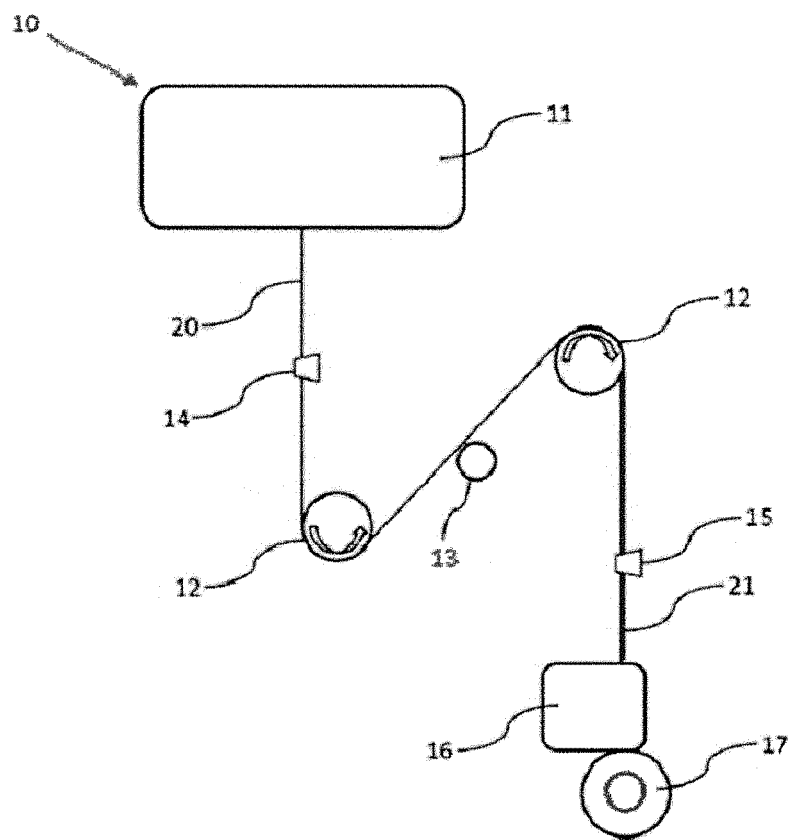
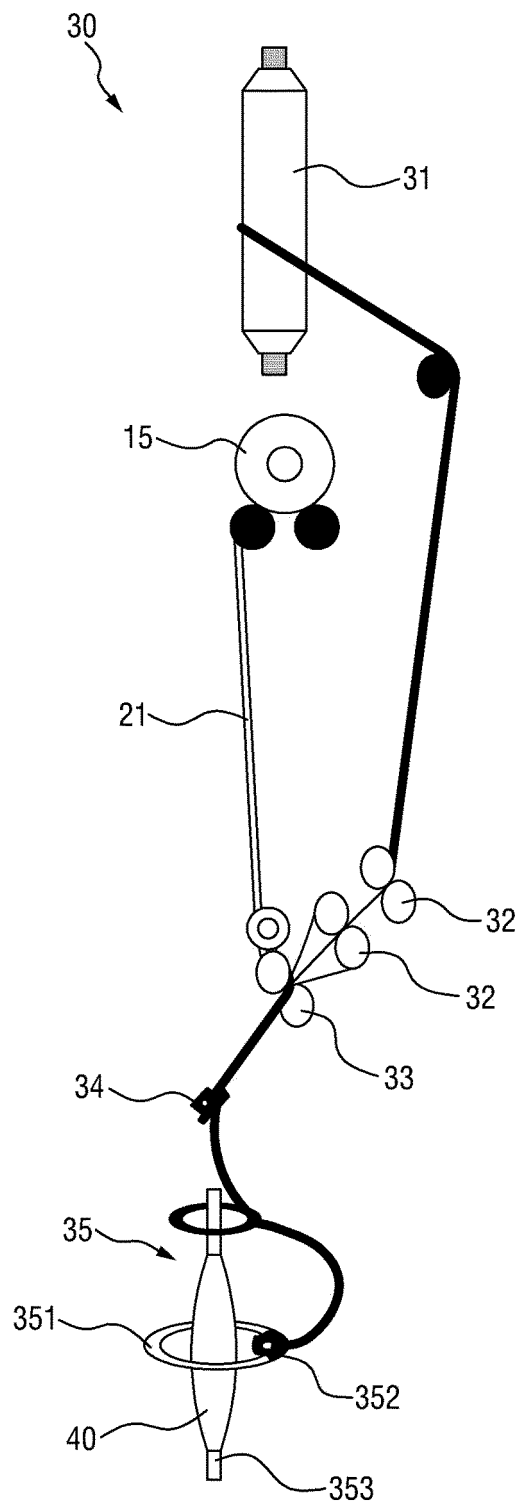


FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2020/006160

A. CLASSIFICATION OF SUBJECT MATTER

D02G 3/32(2006.01)i; **D02G 3/36**(2006.01)i; **D02G 3/38**(2006.01)i; **D01D 5/34**(2006.01)i; **D02J 1/08**(2006.01)i;
D02G 1/16(2006.01)i; **D03D 15/08**(2006.01)i

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)

D02G 3/32(2006.01); D01D 5/098(2006.01); D02G 1/02(2006.01); D02G 1/08(2006.01); D02G 1/18(2006.01);
D02G 3/36(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 복합탄성사 (composite elastic yarn), 필라멘트 (filament), 직물 (fabric), 인터레이싱 (interlacing)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2013-544983 A (SANKO TEKSTIL ISLETMELERI SAN. VE TIC. A.S.) 19 December 2013 (2013-12-19) See claims 1-3; and figures 1-3.	1-10
A	KR 10-2016-0064378 A (HUVIS CORPORATION) 08 June 2016 (2016-06-08) See paragraphs [0020]-[0046]; and figure 2.	1-10
A	JP 2001-279550 A (TORAY INDUSTRIES) 10 October 2001 (2001-10-10) See entire document.	1-10
A	JP 2004-143630 A (TEIJIN LTD.) 20 May 2004 (2004-05-20) See entire document.	1-10
A	KR 10-1999-0057610 A (HYOSUNG LIVING INDUSTRY CO., LTD.) 15 July 1999 (1999-07-15) See entire document.	1-10

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

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“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

“T” 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

“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

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

19 November 2020

Date of mailing of the international search report

19 November 2020

Name and mailing address of the ISA/KR

**Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208**

Facsimile No. **+82-42-481-8578**

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2020/006160

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2013-544983 A	19 December 2013	EP 2638192 A2	18 September 2013
		EP 2638192 B1	11 May 2016
		WO 2012-062480 A3	12 July 2012
		WO 2012-062480 A2	18 May 2012
		US 2019-0203385 A1	04 July 2019
		JP 2017-141539 A	17 August 2017
		JP 2018-193662 A	06 December 2018
		JP 6121332 B2	26 April 2017
		JP 6387136 B2	05 September 2018
		JP 6689922 B2	28 April 2020
		US 10260175 B2	16 April 2019
		US 2013-0260129 A1	03 October 2013
KR 10-2016-0064378 A	08 June 2016	KR 10-1680332 B1	30 November 2016
JP 2001-279550 A	10 October 2001	None	
JP 2004-143630 A	20 May 2004	None	
KR 10-1999-0057610 A	15 July 1999	KR 10-0476658 B1	04 August 2005

Form PCT/ISA/210 (patent family annex) (July 2019)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 8093160 B [0003]
- US 4470250 A [0004]
- US 4998403 A [0004]
- US 7134265 B [0004]
- US 6848151 B [0004]