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Amended claims in accordance with Rule 137(2) EPC.

(54) TWISTED UNION YARN, AND FABRIC AND TEXTILE PRODUCTS FOR CLOTHING USING THE SAME

(57) A twisted union yarn (24) of the present invention includes a filament and staple composite spun yarn (20) composed of a first multifilament yarn (22) and staple fibers (21), and a second multifilament yarn (23) arranged on the outside of the filament and staple composite spun yarn (20). The staple fibers (21) include animal fibers. The twist direction of the filament and staple composite spun yarn (20) is different from that of the second multifilament yarn (23). A woven fabric or a knitted fabric of the present invention includes the twisted union yarn (24). A textile product for clothing of the present invention is obtained by using the woven fabric or the knitted fabric. The present invention provides the twisted union yarn that has improved stretchability and washability by winding another multifilament yarn around the filament and staple composite spun yarn, and the fabric and textile product for clothing that use the twisted union yarn.

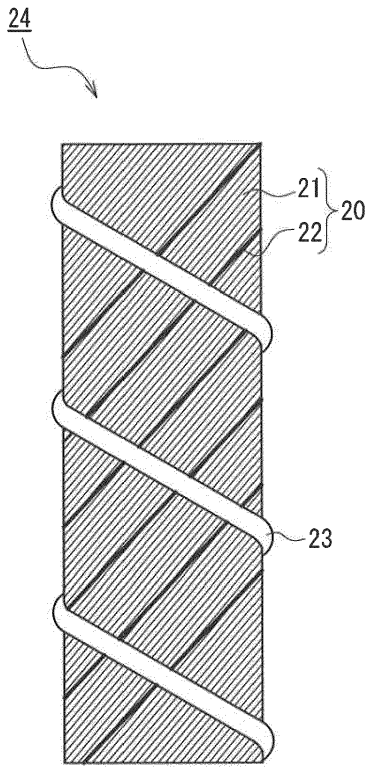

FIG. 1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a twisted union yarn that includes a filament and staple composite spun yarn composed of a multifilament yarn and staple fibers, and another multifilament yarn that is wound around the filament and staple composite spun yarn. The present invention also relates to a fabric and textile products for clothing, both of which use the twisted union yarn.

2. Description of Related Art

[0002] A filament and staple composite spun yarn is composed of filament fibers and staple fibers. Conventionally, various proposals have been made to take full advantage of the properties of both the filament fibers and the staple fibers. Patent Document 1 proposes a method for producing a filament and staple composite spun yarn with a uniformly combined fiber structure. In this method, a multifilament yarn is opened and then twisted with staple fibers. Patent Document 2 proposes a method for producing a core yarn with a core-sheath structure. In this method, monofilament fibers (continuous filament fibers) are used as a core, and spun fibers (staple fibers) are used as a sheath. The monofilament fibers and the spun fibers are twisted together so that the outer circumference of the monofilament fibers is covered with the spun fibers. In Patent Document 3, the present inventors propose a filament and staple composite spun yarn in which a multifilament yarn is present inside and eccentrically located in the periphery of the filament and staple composite spun yarn when viewed in cross section.

Prior Art Documents

Patent Documents

[0003]

Patent Document 1: JP 2012-102445
Patent Document 2: JP 2006-225827
Patent Document 3: JP 2003-73944

SUMMARY OF THE INVENTION

[0004] However, the stretchability and washability of the conventional filament and staple composite spun yarns are not yet sufficient and need to be improved further.

[0005] To solve the above conventional problem, the present invention proposes a twisted union yarn that includes a filament and staple composite spun yarn and another multifilament yarn that is wound around the filament and staple composite spun yarn, and thus has improved stretchability and washability. The present invention also proposes a fabric and textile products for clothing, both of which use the twisted union yarn.

[0006] A twisted union yarn of the present invention includes a filament and staple composite spun yarn composed of a first multifilament yarn and staple fibers, and a second multifilament yarn arranged on the outside of the filament and staple composite spun yarn. The staple fibers include animal fibers. The twist direction of the filament and staple composite spun yarn is different from that of the second multifilament yarn.

[0007] A woven fabric or a knitted fabric of the present invention includes the twisted union yarn. A textile product for clothing of the present invention is obtained by using the woven fabric or the knitted fabric.

[0008] In the twisted union yarn of the present invention, the filament and staple composite spun yarn is composed of the first multifilament yarn and the staple fibers, and the second multifilament yarn is arranged on the outside of the filament and staple composite spun yarn. The staple fibers include animal fibers. The twist direction of the filament and staple composite spun yarn is different from that of the second multifilament yarn. With this configuration, the twisted union yarn can improve both stretchability and washability. Moreover, since the second multifilament yarn is wound around the filament and staple composite spun yarn, the twisted union yarn also has good pilling resistance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

[FIG. 1] FIG. 1 is a schematic conceptual diagram of a twisted union yarn of an embodiment of the present invention.
[FIG. 2] FIG. 2 is a schematic external view of the twisted union yarn.
[FIG. 3] FIG. 3A is a cross-sectional view of an example of a filament and staple composite spun yarn used in the present invention. FIG. 3B is a side view of the filament and staple composite spun yarn.
[FIG. 4] FIG. 4 is a perspective view illustrating the main portion of a ring spinning frame for producing the filament and staple composite spun yarn.
[FIG. 5] FIG. 5 is a schematic diagram for explaining the main portion of a front roller of the ring spinning frame.

DETAILED DESCRIPTION OF THE INVENTION

[0010] A twisted union yarn of the present invention includes a filament and staple composite spun yarn composed of a first multifilament yarn and staple fibers, and a second multifilament yarn arranged on the outside of the filament and staple composite spun yarn. The staple fibers include animal fibers. The twist direction of the filament and staple composite spun yarn is different from that of the second multifilament yarn. In the twisted union yarn, the filament and staple composite spun yarn and the second multifilament yarn are twisted together so that the twist direction of the filament and staple composite spun yarn is different from that of the second multifilament yarn.

[0011] It is preferable that the first multifilament yarn includes a group of filaments, and the group of filaments are eccentrically located in the periphery of the filament and staple composite spun yarn with most of the filaments being incorporated into the staple fibers and with some of the filaments being exposed, when the filament and staple composite spun yarn is viewed in cross section. Due to the incorporation of the first multifilament yarn into the staple fibers, the first multifilament yarn is embedded to reduce the degree of exposure, so that more properties of the staple fibers can be derived. Thus, the filament and staple composite spun yarn has a fluffy and soft texture while suppressing crispiness.

[0012] The filament and staple composite spun yarn is a single yarn and preferably has a twist coefficient K_1 of 70 to 200. The twist coefficient K_1 is more preferably 75 to 190, and particularly preferably 80 to 180. The twist coefficient K_1 is expressed by the following formula (1). When the twist coefficient K_1 of the single yarn to be spun by a ring spinning frame is within the above range, the filament and staple composite spun yarn has more preferred properties, i.e., a fluffy and soft texture like a general wool yarn while suppressing crispiness. This yarn is useful as a single yarn for a knitting yarn or a jersey yarn. The twist coefficient K_1 is calculated by

$$K_1 = T / (10000/D)^{1/2} \qquad (1)$$

where T represents the number of twists per 1 m and D represents a fineness (decitex) of the filament and staple composite spun yarn.

[0013] The twisted union yarn is a single yarn and preferably has a twist coefficient K_2 of 70 to 200. The twist coefficient K_2 is more preferably 75 to 190, and particularly preferably 80 to 180. The twist coefficient K_2 is calculated by

$$K_2 = T / (10000/D)^{1/2} \qquad (2)$$

where T represents the number of twists per 1 m and D represents a fineness (decitex) of the twisted union yarn.

[0014] It is preferable that the twist coefficient (first twist coefficient) K_1 of the filament and staple composite spun yarn is equal to the twist coefficient (second twist coefficient) K_2 of the twisted union yarn. When the two twist coefficients K_1 and K_2 are made equal, the twists can be balanced and stable, since the first twist direction and the second twist direction are different from each other.

[0015] The proportions of the first and second multifilament yarns and the staple fibers in the twisted union yarn may be defined in the following manner. When the twisted union yarn is 100% by weight, the total amount of the first and second multifilament yarns is preferably 5% by weight or more and less than 50% by weight, and the amount of the staple fibers is preferably more than 50% by weight and 95% by weight or less. If the twisted union yarn is rich in staple fibers, it can easily use the advantages of animal fibers such as warmth.

[0016] The staple fibers may include animal fibers or a blended yarn composed of any combination of animal fibers and polyester fibers, animal fibers and nylon fibers, animal fibers and cellulose acetate fibers, animal fibers and cupra fibers, or animal fibers and silk fibers. The presence of the animal fibers can make good use of its advantages such as warmth. Examples of the animal fibers include wool, cashmere, mohair, and camel's hair. The wool is particularly useful. Moreover, the wool mixed with cashmere or mohair is lightweight and lustrous, providing a high-grade material. The fiber length of the staple fibers is preferably 20 to 200 mm, and more preferably 30 to 180 mm.

[0017] It is preferable that the first and second multifilament yarns are made of at least one selected from the group

consisting of polyester fibers, nylon fibers, cellulose acetate fibers, cupra fibers, and silk fibers. The combination of these multifilament yarns with animal fibers can add value to the twisted union yarn.

[0018] In the present invention, the fineness of the twisted union yarn is preferably 58.8 to 417 decitex per single yarn (i.e., 24 to 170 metric number per single yarn, which is expressed as 1/24 to 1/170), and more preferably 64.5 to 333.3 decitex per single yarn (i.e., 30 to 155 metric number per single yarn, which is expressed as 1/30 to 1/155). For a plied yarn, the preferred fineness is 117.6 to 833 decitex (i.e., 12 to 85 metric number per plied yarn, which is expressed as 2/24 to 2/170).

[0019] In the present invention, the washability means that the twisted union yarn is able to withstand domestic washing. Specifically, the size of the twisted union yarn is measured after it has been washed in water 20 times by a method according to JIS L 0217 (105 method). The measurements show that changes in the size of the twisted union yarn are 2.0% or less in both the vertical and horizontal directions. The reason for this may be that the multifilament yarns are helically wound around the staple fibers and restrict the movement of the staple fibers in the twisted union yarn. Therefore, even if the staple fibers (such as wool) are likely to shrink when washed by rubbing in water, the twisted union yarn can exhibit its washability.

[0020] Hereinafter, the present invention will be described in more detail with reference to the drawings. In the drawings, the same components are denoted by the same reference numerals. FIG. 1 is a schematic conceptual diagram of a twisted union yarn of an embodiment of the present invention. A twisted union yarn 24 includes a filament and staple composite spun yarn 20 and a second multifilament yarn 23 that are twisted together. In this case, both yarns may be drawn and twisted by a twisting machine such as a double twister. The filament and staple composite spun yarn 20 is composed of staple fibers 21 and a first multifilament yarn 22. The staple fibers 21 include animal fibers. FIG. 2 is a schematic external view of the twisted union yarn 24. As illustrated in FIG. 2, the filament and staple composite spun yarn 20 and the second multifilament yarn 23 are twisted around each other to form the twisted union yarn 24. The actual twisted union yarn is close to that of FIG. 2.

[0021] FIG. 3A is a cross-sectional view of an example of the filament and staple composite spun yarn used in the present invention. FIG. 3B is a side view of the filament and staple composite spun yarn. In the filament and staple composite spun yarn 20, the first multifilament yarn 22 includes a group of filaments and is twisted together with the staple fibers 21. In the cross-sectional view, the group of filaments of the first multifilament yarn 22 are present inside and eccentrically located in the periphery of the filament and staple composite spun yarn 20. In the side view, the first multifilament yarn 22 is twisted in the same direction as the twist direction of the filament and staple composite spun yarn 20. In other words, the group of filaments of the first multifilament yarn 22 are incorporated into the staple fibers 21 and displaced from the center of the filament and staple composite spun yarn 20, as illustrated in FIG. 3A. Moreover, the first multifilament yarn 22, which is incorporated into the staple fibers 21, is helically twisted in the same direction as the twist direction of the filament and staple composite spun yarn 20, as illustrated in FIG. 3B. Due to the incorporation of the first multifilament yarn 22 into the staple fibers 21, the first multifilament yarn 22 is embedded to reduce the degree of exposure, so that more properties of the staple fibers 21 can be derived. Thus, the filament and staple composite spun yarn 20 has a fluffy and soft texture while suppressing crispiness. In addition, the first and second multifilament yarns 22, 23 twine around the staple fibers 21, i.e., the staple fibers 21 are bound with the first and second multifilament yarns 22, 23. This prevents the staple fibers 21 from fuzzing. Consequently, the filament and staple composite spun yarn 20 has resistance to fuzzing and pilling as well as washability.

[0022] It is preferable that the filament and staple composite spun yarn 20 is substantially circular in cross section, as illustrated in FIG. 3A, and is substantially linear in side view, as illustrated in FIG. 3B. With this appearance, the first multifilament yarn 22 is embedded to reduce the degree of exposure, so that more properties of the staple fibers 21 can be derived. Thus, the filament and staple composite spun yarn 20 has a fluffy and soft texture while suppressing crispiness.

[0023] In relation to the twist coefficient, the winding pitch of each of the first and second multifilament yarns is preferably 0.5 to 5.0 mm, more preferably 0.6 to 4.0 mm, and particularly preferably 0.7 to 3.0 mm. If the winding pitch is within the above range, the first and second multifilament yarns are wound around the staple fibers to bind them together, thereby improving the washability. Moreover, since the first and second multifilament yarns are helically wound around the staple fibers, the multifilament yarns extend like a coil when they are pulled in the longitudinal direction, and thus can impart good extensibility to the filament and staple composite spun yarn. In particular, when the staple fibers are wool, the fiber length is 55 to 100 mm. Therefore, the winding pitch within the above range can increase the number of times the multifilament yarns are wound around each single fiber, which contributes to the integration of the staple fibers and the multifilament yarns.

[0024] FIG. 4 is a perspective view illustrating the main portion of a ring spinning frame for producing the filament and staple composite spun yarn in an example of the present invention. In FIG. 4, reference numeral 3 represents a positively rotatable front-bottom main shaft. Front-bottom rollers 4 are provided on the front-bottom main shaft 3 for each spindle. Front-top rollers 5 are placed on the front-bottom rollers 4, respectively. Each of the front-top rollers 5 is covered with a rubber cot. The front-top rollers 5 are fitted on a common arbor 6 under a load so that they can roll independently. A staple fiber bundle 15 is fed from a roving bobbin 1, passes through a guide bar and a trumpet feeder 7, and is supplied

to a back roller 8. Then, the staple fiber bundle 15 is fed from the back roller 8 and drafted in a draft apron 9. Subsequently, the staple fiber bundle 15 is nipped between the front-bottom roller 4 and the front-top roller 5, and spun into a strand.

[0025] A multifilament yarn 16 is fed from a pirn 2, passes through thread guides and a yarn guide 14 in a state free of tension, and is supplied to the upstream side of the front-top roller 5. The multifilament yarn 16 is laid on the staple fiber bundle 15 on the nip line of the front-bottom roller 4 and the front-top roller 5, and then these strands are truly twisted. In this case, the true twist may be inserted into the yarn by passing it through a snail wire 10 and an anti-node ring 11, and winding it on a spindle 13 via a traveler 12. Thus, the resulting filament and staple composite spun yarn 20 is wound on the spindle 13.

[0026] FIG. 5 is a schematic diagram for explaining a state in which the staple fiber bundle 15 and the multifilament yarn 16 are twisted together when viewed from the above of the front-top roller 5. The staple fiber bundle 15 and the multifilament yarn 16 are joined together on the nip line 17 of the front-bottom roller 4 and the front-top roller 5, and then twisted after these strands have passed through the nip line 17, so that the filament and staple composite spun yarn 20 is obtained.

[0027] As described above, in the ring spinning frame, the staple fiber bundle is supplied to a drafting zone, and the multifilament yarn is supplied to the upstream side of the front-top roller in a state free of tension. The multifilament yarn is laid on the drafted staple fiber bundle on the nip line, and then these strands are truly twisted, thereby producing the filament and staple composite spun yarn. In the above description, the state free of tension means that it allows the multifilament yarn to simply passes through the yarn guide without using, e.g., a washer tensor while minimizing friction. Specifically, the tension is preferably 0 to 15 g, more preferably 0 to 10 g, and particularly preferably 0 to 6.5 g.

[0028] The filament and staple composite spun yarn thus obtained and the second multifilament yarn are twisted around each other by a twisting machine such as a double twister to form a twisted union yarn.

[0029] Next, a fabric of the present invention will be described. The fabric of the present invention is a woven fabric or a knitted fabric that includes the twisted union yarn. The twisted union yarn is preferably 10 to 100% by weight with respect to 100% by weight of the entire fabric. When the staple fibers used for the twisted union yarn are animal fibers (e.g., wool), only about 5% by weight of the twisted union yarn is enough to give the fabric a soft texture and warmth, and thus can make it well suited for comfortable clothing. The fabric of the present invention can be widely used as general woven fabrics or knitted fabrics. Examples of the woven fabrics include plain weave fabric, twill weave fabric, and satin weave fabric. Examples of the knitted fabrics include warp knitted fabric, weft knitted fabric, and double knitted fabric. The weight per unit area of the woven fabric or knitted fabric is preferably 100 to 300 g/m^2. Dyeing may be performed in the usual manner at any stage of cotton, yarn, or fabric (including woven fabric and knitted fabric).

[0030] Textile products for clothing of the present invention are obtained by sewing the above fabric. Examples of the textile products for clothing include suits, uniforms, school uniforms, workwear, sportswear, shirts, innerwear, and socks. These clothing products are suitable for three seasons from autumn through winter to spring.

[Examples]

[0031] Hereinafter, the present invention will be described in more detail by way of examples. The following measuring methods were used in the examples and comparative examples of the present invention.

(1) Strength and elongation of yarn

[0032] The strength and elongation of the yarn was measured in accordance with JIS L 1095 9.5.1.

(2) Strength of woven fabric

[0033] The strength of the woven fabric was measured in accordance with JIS L 1096 A.

(3) Pilling resistance

[0034] The pilling resistance was measured in accordance with JIS L 1076 A.

(4) Texture

[0035] The texture was measured by a KES texture measurement test available from KATO TECH CO., LTD.

(5) Other physical properties

[0036] Other physical properties were measured in accordance with JIS or the industry standards.

(Example 1)

(1) Production of filament and staple composite spun yarn

[0037] A filament and staple composite spun yarn of this example was a single yarn for woven fabric. A filament and staple composite spun yarn was produced in the manner illustrated in FIGS. 4 to 5. As the staple fiber bundle 15, a rove of Merino wool having 4.0 metric number (2500 decitex) was supplied and drafted 19 times in the drafting zone of the ring spinning frame. As the multifilament yarn 16, a polyethylene terephthalate (PET) multifilament yarn (total fineness: 33 decitex, the number of filaments: 12) was supplied to the upstream side of the front-top roller in a state free of tension (0 to 6.5 g). The PET multifilament yarn was laid on the drafted wool fiber bundle on the nip line, and then these strands were truly twisted, thereby producing a filament and staple composite spun yarn. The filament and staple composite spun yarn had 60 metric number per single yarn (expressed as 1/60), i.e., a fineness of 166.7 decitex, and a twist coefficient K_1 of 90 (Z-twist).

(2) Production of twisted union yarn

[0038] The filament and staple composite spun yarn thus obtained and a PET multifilament yarn (total fineness: 84 decitex, the number of filaments: 24) were twisted around each other with a twist coefficient K_2 of 90 (S-twist) by a twisting machine (double twister). The resulting twisted union yarn had a strength of 575 g and a breaking elongation of 41.9%.

(3) Production of woven fabric

[0039] Using the twisted union yarn as both warp and weft, a 2/2 twill weave fabric was produced. Table 1 shows the physical properties of this woven fabric.

(Comparative Example 1)

[0040] A filament and staple composite spun yarn was produced in the same manner as Example 1, except for the changes shown in Table 1. Two filament and staple composite spun yarns thus obtained were twisted together by a twisting machine (double twister) to form a plied yarn having a twist coefficient K_2 of 90. The plied yarn had a strength of 495 g and a breaking elongation of 39.6%. Using the plied yarn as both warp and weft, a 2/2 twill weave fabric was produced. Table 1 shows the physical properties of this woven fabric.

[TABLE 1]

Test item		Example 1	Comparative Example 1	Test method
Blending ratio (wool/PET = wt%/wt%)		W/PET = 52/48	W/PET = 80/20	
Type of yarn	Metric number	1/40	2/60	JIS L 1096 8.3.2 (A method)
	Fineness (decitex)	250	333.3	
Weight per unit area of woven fabric (g/m^2)		221.9	253.7	JIS L 1096 8.3.2 (A method)
Yarn density of woven fabric	Warp (number of yarns/ 10 cm)	462	348	JIS L 1096 8.6.1
	Weft (number of yarns/ 10 cm)	344	310	
Abrasion resistance (Martindale) Wear (number of times)		more than 60000	more than 60000	JIS L 1096 8.19.5 (E method)

(continued)

Test item		Example 1	Comparative Example 1	Test method
Dimensional change (C method)	Warp (%)	-0.2	- 0.7	JIS L 1096 8.39.1 (C method)
	Weft (%)	0.0	- 0.5	
Dimensional change in washing (105 method)	20 times for warp (%)	- 0.7	- 1.6	JIS L 0217 (105 method)
	20 times for weft (%)	- 0.2	- 1.1	
	20 times for appearance (grade)	4 to 5	4 to 5	
Pilling resistance (A method)	10 h (grade)	5	5	JIS L 1076 8.1.1 (A method)
	20 h (grade)	5	5	
	30 h (grade)	5	5	
KES	Vertical extension (%)	3.5	3.1	KES FB1
	Horizontal extension (%)	11.8	7.2	

[0041] As can be seen from Table 1, the woven fabric of Example 1 had washability, excellent pilling resistance, and good stretchability (extensibility).

(Example 2)

[0042] As shown in Table 2, a filament and staple composite spun yarn produced in the same manner as Example 1 and a PET multifilament yarn (total fineness: 33 decitex, the number of filaments: 12) were twisted around each other with a twist coefficient K_2 of 90 (S-twist) by a twisting machine (double twister). The resulting twisted union yarn had a strength of 346 g and a breaking elongation of 35.3%. Using the twisted union yarn, a plain knitted fabric was produced by a circular knitting machine. Table 2 shows the physical properties of this knitted fabric.

(Comparative Example 2)

[0043] A filament and staple composite spun yarn was produced in the same manner as Example 1, except for the changes shown in Table 2. The filament and staple composite spun yarn had a strength of 211 g and a breaking elongation of 32.9%. Using this yarn as a single yarn, a plain knitted fabric was produced by a circular knitting machine. Table 2 shows the physical properties of this knitted fabric.

[TABLE 2]

Test item		Example 2	Comparative Example 2	Test method
Blending ratio (wool/PET = wt%/wt%)		W/PET = 65/35	W/PET = 80/20	
Type of yarn	Metric number	1/50	1/60	JIS L 1096 8.3.2 (A method)
	Fineness (decitex)	200	166.7	
Weight per unit area of woven fabric (g/m^2)		241	154	JIS L 1096 8.3.2 (A method)
Abrasion resistance (Martindale) Wear (number of times)		more than 20000	more than 20000	JIS L 1096 8.19.5 (E method)
Breaking strength (kPa)		520	275	JIS L 1096 8.18.1 (A method)

(continued)

Test item		Example 2	Comparative Example 2	Test method
Dimensional change in washing (103 method)	1 time for warp (%)	- 3.7	- 7.5	JIS L 0217 (103 method)
	1 times for weft (%)	- 2.2	- 3.0	
Pilling resistance (A method)	10 h (grade)	5	4 to 5	JIS L 1076 8.1.1 (A method)
	20 h (grade)	5	4 to 5	
	30 h (grade)	5	4 to 5	

[0044] As can be seen from Table 2, the knitted fabric of Example 1 had high breaking strength, washability, and excellent pilling resistance.

Industrial Applicability

[0045] The filament and staple composite spun yarn of the present invention can be used for pleating while maintaining the properties of staple fibers such as the ability to make clothes comfortable to wear. Moreover, the filament and staple composite spun yarn has excellent washability (including domestic washing), strength, durability, and dimensional stability. Further, the filament and staple composite spun yarn is suitable for, e.g., school uniforms, uniforms, suits, workwear, sportswear, shirts, and underwear.

Description of Reference Numerals

[0046]

1	Roving bobbin
2	Pirn
3	Front-bottom main shaft
4	Front-bottom roller
5	Front-top roller
6	Arbor
7	Trumpet feeder
8	Back roller
9	Drafting apron
10	Snail wire
11	Anti-node ring
12	Traveler
13	Spindle
14	Yarn guide
15	Staple fiber bundle
16, 22, 23	Multifilament yarn
17	Nip line
20	Filament and staple composite spun yarn
21	Staple fiber
24	Twisted union yarn

Claims

1. A twisted union yarn comprising:

a filament and staple composite spun yarn composed of a first multifilament yarn and staple fibers; and
a second multifilament yarn arranged on an outside of the filament and staple composite spun yarn,

wherein the staple fibers include animal fibers, and
a twist direction of the filament and staple composite spun yarn is different from that of the second multifilament yarn.

2. The twisted union yarn according to claim 1, wherein the first multifilament yarn includes a group of filaments, and the group of filaments are eccentrically located in a periphery of the filament and staple composite spun yarn with most of the filaments being incorporated into the staple fibers and with some of the filaments being exposed, when the filament and staple composite spun yarn is viewed in cross section.

3. The twisted union yarn according to claim 1 or 2, wherein the filament and staple composite spun yarn is a single yarn and has a twist coefficient K_1 of 70 to 200, which is calculated by the following formula (1):

$$K_1 = T / (10000/D)^{1/2} \qquad (1)$$

where T represents a number of twists per 1 m and D represents a fineness (decitex) of the filament and staple composite spun yarn.

4. The twisted union yarn according to any one of claims 1 to 3, wherein the twisted union yarn is a single yarn and has a twist coefficient K_2 of 70 to 200, which is calculated by the following formula (2):

$$K_2 = T / (10000/D)^{1/2} \qquad (2)$$

where T represents the number of twists per 1 m and D represents a fineness (decitex) of the twisted union yarn.

5. The twisted union yarn according to any one of claims 1 to 4, wherein proportions of the first and second multifilament yarns and the staple fibers in the twisted union yarn are defined so that a total amount of the first and second multifilament yarns is 5% by weight or more and less than 50% by weight, and an amount of the staple fibers is more than 50% by weight and 95% by weight or less when the twisted union yarn is 100% by weight.

6. The twisted union yarn according to any one of claims 1 to 5, wherein the staple fibers include animal fibers or a blended yarn composed of any combination of animal fibers and polyester fibers, animal fibers and nylon fibers, animal fibers and cellulose acetate fibers, animal fibers and cupra fibers, or animal fibers and silk fibers.

7. The twisted union yarn according to any one of claims 1 to 6, wherein the first and second multifilament yarns are made of at least one selected from the group consisting of polyester fibers, nylon fibers, cellulose acetate fibers, cupra fibers, and silk fibers.

8. A woven fabric or a knitted fabric comprising the twisted union yarn according to any one of claims 1 to 7.

9. A textile product for clothing obtained by using the woven fabric or the knitted fabric according to claim 8.

Amended claims in accordance with Rule 137(2) EPC.

1. A twisted union yarn (24) comprising:

a filament and staple composite spun yarn (20) composed of a first multifilament yarn (22) and staple fibers (21) including animal fibers, **characterized in that** a second multifilament yarn (23) is further wound around an outside of the filament and staple composite spun yarn (20),
a twist direction of the filament and staple composite spun yarn (20) is different from a winding direction of the second multifilament yarn (23), and
the twisted union yarn (24) is a single yarn and has a twist coefficient K2 of 70 to 200, which is calculated by the following formula (2):

$$K_2 = T / (10000/D)^{1/2} \qquad (2)$$

where T represents the number of twists per 1 m and D represents a fineness (decitex) of the twisted union yarn (24).

2. The twisted union yarn according to claim 1, wherein the first multifilament yarn (22) includes a group of filaments, and the group of filaments are eccentrically located in a periphery of the filament and staple composite spun yarn (20) with most of the filaments being incorporated into the staple fibers (21) and with some of the filaments being exposed, when the filament and staple composite spun yarn (20) is viewed in cross section.

3. The twisted union yarn according to claim 1 or 2, wherein the filament and staple composite spun yarn (20) is a single yarn and has a twist coefficient K_1 of 70 to 200, which is calculated by the following formula (1):

$$K_1 = T / (10000/D)^{1/2} \qquad (1)$$

where T represents a number of twists per 1 m and D represents a fineness (decitex) of the filament and staple composite spun yarn (20).

4. The twisted union yarn according to any one of claims 1 to 3, wherein proportions of the first and second multifilament yarns (22, 23) and the staple fibers (21) in the twisted union yarn (24) are defined so that a total amount of the first and second multifilament yarns (22, 23) is 5% by weight or more and less than 50% by weight, and an amount of the staple fibers (21) is more than 50% by weight and 95% by weight or less when the twisted union yarn (24) is 100% by weight.

5. The twisted union yarn according to any one of claims 1 to 4, wherein the staple fibers (21) include animal fibers or a blended yarn composed of any combination of animal fibers and polyester fibers, animal fibers and nylon fibers, animal fibers and cellulose acetate fibers, animal fibers and cupra fibers, or animal fibers and silk fibers.

6. The twisted union yarn according to any one of claims 1 to 5, wherein the first and second multifilament yarns (22, 23) are made of at least one selected from the group consisting of polyester fibers, nylon fibers, cellulose acetate fibers, cupra fibers, and silk fibers.

7. A woven fabric or a knitted fabric comprising the twisted union yarn (24) according to any one of claims 1 to 6.

8. A textile product for clothing obtained by using the woven fabric or the knitted fabric according to claim 7.

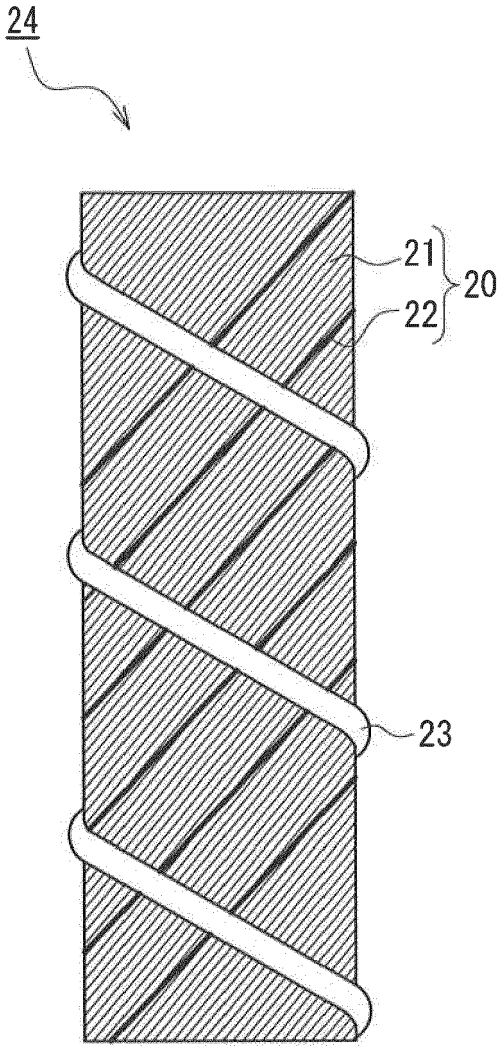

FIG. 1

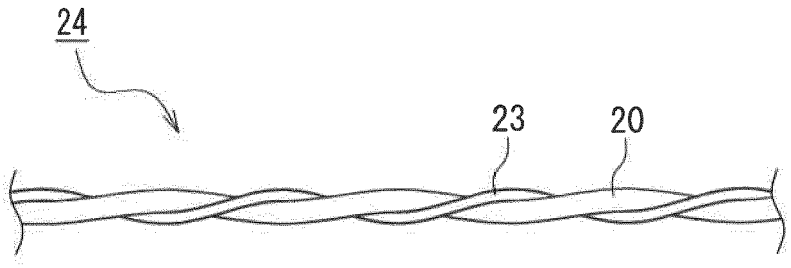

FIG. 2

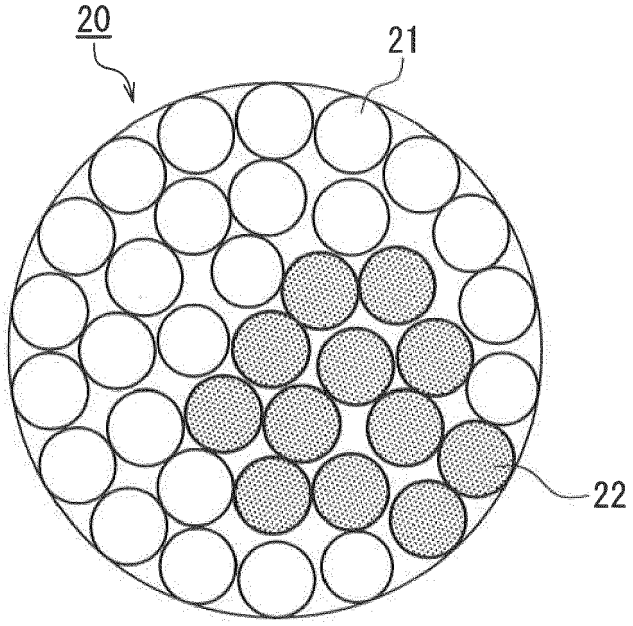

FIG. 3A

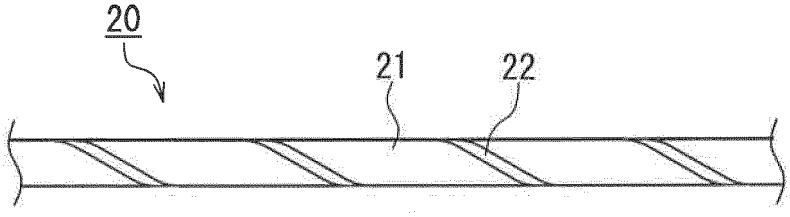

FIG. 3B

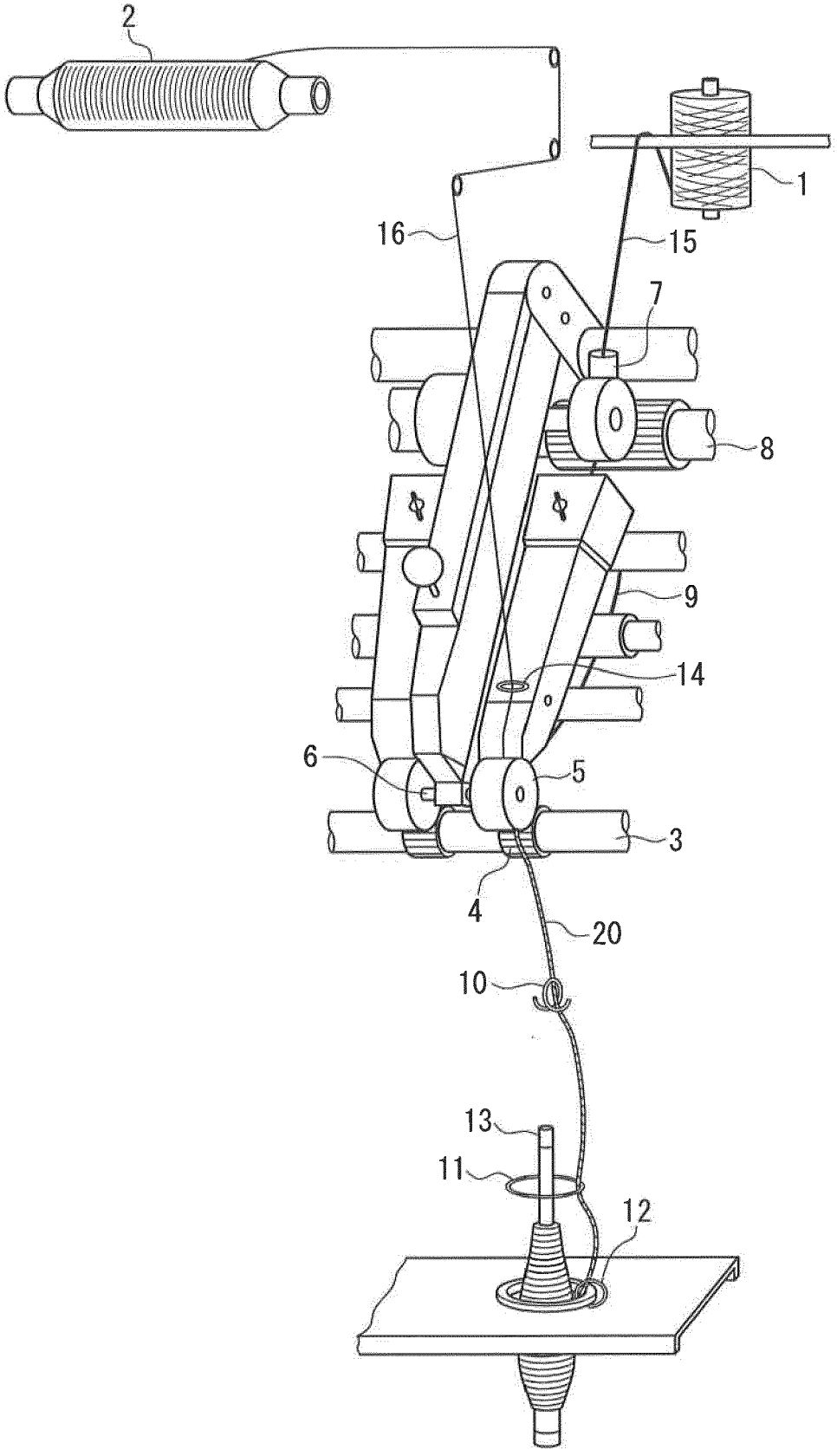

FIG. 4

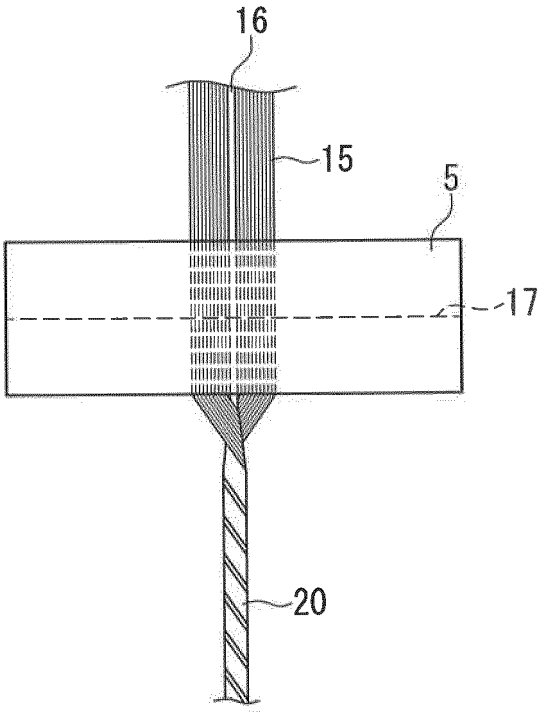

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 9127

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 January 2018	Pollet, Didier

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29-01-2018

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