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(54) METHOD OF PIERCING SPUN YARN AND KNITTING INCLUDING PIERCING OF YARN

(57) An object of the invention is to increase quality and aesthetic appearance by eliminating the formation of knots in piecing spun yarn and the mixing of colors and the projection of end yarn. Tip end sides (11a, 12a) of two spun yarns (11, 12) are turned back in the shape of "J", and opposed to each other so that turned-back portions (11b, 12b) can be linked to each other. The tip end sides (11a, 12a) are intertwined to the base end sides (11c, 12c) of the turned-back portions (11b, 12b) so as to be joined to each other. Since, the tip end sides (11a, 12a) of the spun yarns (11, 12) are intertwined to the base end sides (11c, 12c) of the turned-back portions (11b, 12b) so as to be joined to each other, and the intertwining is performed within the spun yarns (11, 12), piecing can be securely performed irrespective of the type of a mating material. Since no knot is formed, the possibility can be lowered that a portion of knitting yarns becomes an obstacle when forming stitches, or is caught on a knitting needle and breaks the yarns. Since the yarns are linked to each other at the turned-back portions (11b, 12b), color mixture is not caused even when the colors of the yarns are different from each other, and thus quality and appearance can be improved.

FIG. 1A

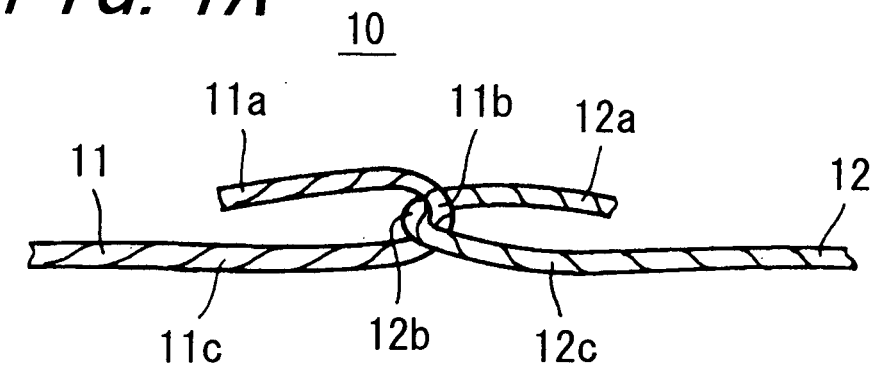

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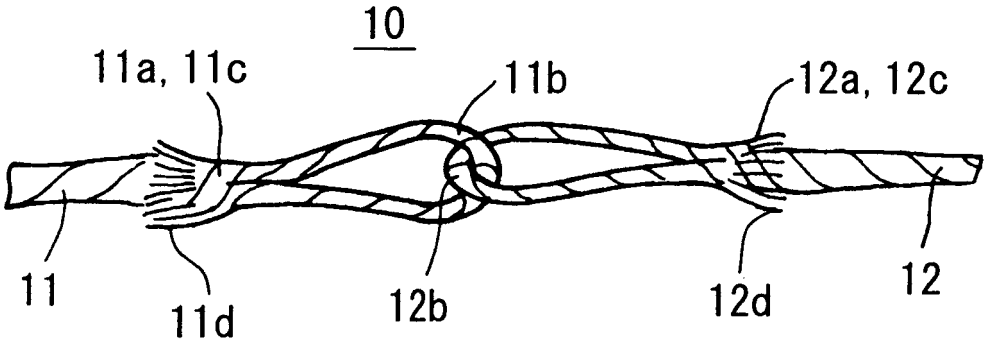
FIG. 1B



Description

Technical Field

[0001] The present invention relates to a spun yarn piecing method for piecing spun yarns formed by bundling thin fibers by spinning, and a knit fabric comprising a pieced portion of yarn.

Background Art

[0002] Conventionally, for forming knit fabrics or woven fabrics, knitting yarns or weaving yarns are commonly used that are obtained by spinning materials such as natural fibers or synthetic fibers. These knitting yarns or weaving yarns may be broken in the course of knitting or weaving, and thus piecing is necessary in order to fix the yarns. In a case where a knit fabric is knitted with a knitting yarn, piecing into another knitting yarn is also performed at the time when patterns are switched (see Japanese Unexamined Patent Publication JP-A 06-2250 (1994), for example). Colored pattern knitting has been also disclosed in which knitting yarns of different colors are pieced into each other in knitting gloves (see Japanese Unexamined Patent Publication JP-A 2004-149941, for example).

[0003] Fig. 4 shows a state in which in a conventional method commonly used for piecing, end portions of different yarns are pieced into each other by forming a knot. More specifically, a yarn 1 and a yarn 2 are pieced into each other by forming a knot 3 at end portions thereof. Tip ends 1a and 2a of the respective yarns 1 and 2 project from the knot 3. It is possible to shorten the tip ends 1a and 2a by cutting after forming the knot 3, but it is difficult to completely remove the tip ends 1a and 2a. In a case where the yarns 1 and 2 are knitting yarns for knitting a knit fabric, a knotting apparatus is used in order to form the knot 3. The method for piecing by forming the knot 3 is widely used for not only spun yarns but also for ropes, for example.

[0004] Fig. 5 shows a state in which the yarns 1 and 2 are joined to each other using a method for piecing without forming a knot. This piecing method is effective in a case where the yarns 1 and 2 are spun yarns. According to this method, fibers on the tip end side in the two yarns 1 and 2 that are opposed to each other are once untwisted, and then intertwined, and thus a joint 4 is formed that appears in the shape of an "I". It should be noted that a slight amount of the tip ends 1a and 2a of the respective yarns 1 and 2 remains in an untwisted state. The piecing by forming the joint 4 can be quickly performed, for example, by squirting compressed air (see Japanese Unexamined Patent Publication JP-B2 60-39767 (1985), for example).

[0005] Fig. 6 shows another method in which piecing is performed without forming a knot. This method is also effective in a case where the yarns 1 and 2 are spun yarns. The yarns 1 and 2 are arranged side by side such that tip ends thereof are in the same direction. The tip ends are intertwined, and thus an envelope portion 5 is formed (see Japanese Unexamined Patent Publication JP-A 2004-27463, for example). The envelope portion 5 formed by this method appears in the shape of a "T", and the portion corresponding to the vertical line of the shape T projects outward in the radial direction from the portion of the yarns 1 and 2 corresponding to the transversal line of the shape T. The tip ends 1a and 2a of the yarns 1 and 2 in an untwisted state project from the tip end of the envelope portion 5. This piecing method is used also in JP-A 2004-149941.

[0006] When the piecing by forming the knot 3 as shown in Fig. 4 using a knotting apparatus or the like is applied to knitting yarns, the knot 3 has a diameter that is approximately several times as large as the thickness of the yarns 1 and 2. Thus, the knot 3 may become an obstacle when forming stitches, or may be caught on a knitting needle and break the yarns. In the joint 4 formed by intertwining the two yarns 1 and 2 as shown in Fig. 5, in a case where colors of the yarns 1 and 2 are different from each other, color mixture is caused, and thus a boundary between the colors becomes vague. In a case where colored patterns are knitted, when color mixture is caused at a joint 4 formed by joining the yarns 1 and 2 of different colors, a portion of an unintended color is formed, and thus the appearance of the knit fabric is degraded. In the method in which the tip ends of the two yarns 1 and 2 are intertwined as shown in Fig. 6, there is the problem of how to process the envelope portion 5. When the envelope portion 5 projects outward from the knit fabric, the appearance is degraded. When the envelope portion 5 is tucked into the knit fabric, a portion is formed in which three knitting yarns including the envelope portion 5 are used. When the envelope portion 5 can be hidden by being tucked into the internal portion of the knit fabric, the yarns 1 and 2 linked to each other at the envelope portion 5 are switched without causing color mixture, and thus colored patterns and the like having a good appearance can be knitted. However, it is difficult to process the envelope portion 5 well. Furthermore, in the methods shown in Figs. 5 and 6, the yarns 1 and 2 that are different from each other are intertwined, and thus in a case where the properties of the yarns 1 and 2 are different from each other, it may be necessary to consider the combination.

Disclosure of Invention

[0007] It is an object of the invention to provide a spun yarn piecing method, in which a knot is not formed during piecing, and color mixture and projection of the spun yarn ends are prevented, thereby improving quality and appearance of the pieced portion, and a knit fabric comprising a pieced portion of yarn.

[0008] The invention is directed to a spun yarn piecing method for piecing end portions of two spun yarns, comprising:

turning back an end portion of each of the spun yarns, and arranging the turned-back portions so as to be opposite to each other for linking; and

intertwining tip end sides in the spun yarns with base end sides in the turned-back portions, thereby respectively joining the tip end sides to the base end sides.

[0009] Furthermore, in the invention, it is preferable that the two spun yarns differ from each other in appearance.

[0010] Furthermore, in the invention, it is preferable that the two spun yarns have different colors.

[0011] Furthermore, in the invention it is preferable that the two spun yarns have different thicknesses.

[0012] Furthermore, in the invention, it is preferable that the two spun yarns have different shapes.

[0013] Furthermore, in the invention, it is preferable that the turned-back portions on the tip end sides in the spun yarns are intertwined with the base end sides in the two spun yarns simultaneously.

[0014] Furthermore, in the invention, it is preferable that the spun yarn piecing method is applied to intarsia knitting.

[0015] Moreover, the invention is directed to a knit fabric comprising a pieced portion of yarn, wherein in the pieced portion of yarn, different yarns are pieced into each other by the spun yarn piecing method according to any one of the above.

Brief Description of Drawings

[0016] Other and further objects, features, and advantages of the invention will be more explicit from the following detailed description taken with reference to the drawings wherein:

Figs. 1A and 1B are view schematically showing the shape of a joint portion formed by piecing in an embodiment of the invention;

Fig. 2 is a view schematically showing a knit fabric 20 knitted while forming a piecing portion 10 shown in Figs. 1A and 1B;

Fig. 3 is a flow chart schematically showing the procedure for forming the piecing portion 10 as shown in Figs. 1A and 1B;

Fig. 4 is a view schematically showing a state in which in a conventional method commonly used for piecing, end portions of different yarns are pieced into each other by forming a knot;

Fig. 5 is a view schematically showing a state in which the yarns 1 and 2 are joined to each other using a method for piecing without forming a knot according to the related art; and

Fig. 6 is a view schematically showing another method in which piecing is performed without forming the knot according to the related art.

Best Mode for Carrying out the Invention

[0017] Now referring to the drawings, preferred embodiments of the invention are described below.

[0018] Figs. 1A and 1B show the shape of a joint portion formed by piecing in an embodiment of the invention. At a piecing portion 10, end portions of two spun yarns 11 and 12 are joined to each other. The spun yarns 11 and 12 are arranged opposite to each other such that tip end sides 11a and 12a face each other. The tip end sides 11a and 12a in the spun yarns 11 and 12 are respectively turned back toward base ends. The spun yarns 11 and 12 are pieced into each other by linking turned-back portions 11b and 12b to each other. More specifically, the turned-back portion 12b of the spun yarn 12 passes through the turned-back portion 11b of the spun yarn 11, and the turned-back portion 11b of the spun yarn 11 passes through the turned-back portion 12b of the spun yarn 12. The tip end sides 11a and 12a in the spun yarns 11 and 12 are untwisted, and respectively intertwined to be joined to base end sides 11c and 12c in the turned-back portions 11b and 12b.

[0019] More specifically, in order to join the tip end sides 11a and 12a serving as the end portions of the two spun yarns 11 and 12, the tip end sides 11a and 12a in the respective spun yarns 11 and 12 are turned back in the shape of a "J", the turned-back portions 11b and 12b are arranged opposite to each other so as to be linked, and the tip end sides 11a and 12a in the spun yarns 11 and 12 are respectively intertwined to be joined to the base end sides 11c and 12c in the turned-back portions 11b and 12b. Since the tip end sides 11a and 12a in the respective spun yarns 11 and 12 are turned back, and the turned-back portions 11b and 12b are arranged opposite to each other so as to be linked, the end portions can be targeted for piecing. Since the tip end sides 11a and 12a in the spun yarns 11 and 12 are respectively intertwined to be joined to the base end sides 11c and 12c in the turned-back portions 11b and 12b, the tip end sides 11a and 12a in the spun yarns 11 and 12 are respectively intertwined to be linked to the base end sides 11c and 12c in the turned-back portions 11b and 12b, and thus piecing can be reliably performed by intertwining each yarn with itself. Since no knot is formed, the possibility can be lowered that a portion of knitting yarns becomes an obstacle when forming stitches, or is caught on a knitting needle and breaks the yarns. Since the yarns are linked to each other at the turned-back portions 11b and 12b, color mixture is not caused even when the colors of the yarns are different from each other, and thus quality and appearance can be improved. Since the tip end sides 11a and 12a are intertwined with the base end sides 11c and 12c, the tip end sides 11a and 12a can be suppressed to the extent that leading tip ends 11d and 12d are fuzzy.

[0020] Fig. 2 schematically shows a knit fabric 20 knitted while forming the piecing portion 10 shown in Figs. 1A and 1B. The knit fabric 20 is provided with colored patterns 21, 22, and 23 that are formed by intarsia knitting

or the like. Thus, in knitting, it is necessary to switch knitting yarns for knitting base patterns of the knit fabric 20, and knitting yarns for knitting the colored patterns 21, 22, and 23. The colored patterns 21, 22, and 23 can be knitted using different yarn feeding members respectively for knitting yarns of different colors. Furthermore, different yarn feeding members are used also for base patterns 20a and 20b of the knit fabric 20 having the colored patterns 21, 22, and 23 interposed therebetween. Accordingly, five yarn feeding members are used in order to knit the colored patterns 21, 22, and 23, and the base patterns 20a and 20b of the knit fabric 20.

[0021] When piecing knitting yarns into each other by forming the piecing portion 10 as shown in Figs. 1A and 1B, it is possible, with one yarn feeding member, to knit the colored patterns 21, 22, and 23 by switching a plurality of knitting yarns, and to connect the boundaries of the colored patterns 21, 22, and 23 at the piecing portion 10. At the piecing portion 10, colors can be switched without causing color mixture even when the colors of knitting yarns are different from each other.

[0022] Fig. 3 schematically shows the procedure for forming the piecing portion 10 as shown in Figs. 1A and 1B. For example, when knitting yarns are fed that are predicted to be used for knitting at a switching portion between the base pattern of the knit fabric 20 and the colored patterns 21 and 22 in Fig. 2, the knitting yarns are pieced into each other on the feeding path. The knitting prediction can be performed by calculating, based on data such as the loop length, the length of knitting yarns that are to be consumed for knitting the knit fabric 20 based on knit data, and measuring the amount of the knitting yarns fed, as disclosed in JP-A 06-2250. When piecing is necessary, piecing is started in step s0. In a case where a knitting yarn that has been fed before piecing sufficiently remains, the knitting yarn is cut. At the time of cutting, a slight amount of the tailing end is left. In step s1, two spun yarns are arranged opposite to each other such that the tip end side in a knitting yarn used for piecing is arranged opposite to the tailing end of the cut knitting yarn. In step s2, the tip ends of the two spun yarns are turned back, and the turned-back portions are linked to each other. When joining the spun yarns, it is also possible to use an apparatus having a principle similar to that of an apparatus for untwisting and then enclosing the tip ends with a current of compressed air as disclosed in JP-A 2004-149941, JP-B2 60-39767, and JP-A 2004-27463. Herein, it is necessary to join the spun yarns at both sides, and to make the states for setting to the apparatus different from each other. In step s3, the tip end side and the base end side in the turned-back portion are joined to each other. In step s4, the procedure ends.

[0023] Although the tip end sides 11a and 12a in the two spun yarns 11 and 12 are simultaneously turned back and linked in step s2, and the tip end sides 11a and 12a are simultaneously joined to the base end sides 11c and 12c in step s3, the tip end sides 11a and 12a may be processed at different times. More specifically, the tip end side 11a in the yarn 11 on one side is joined in advance to the base end side 11c in the turned-back portion 11b. The turned-back portion 11b is in the shape of a ring. Thus, the tip end side 12a in the yarn 12 on the other side may be inserted into this ring and then turned back for forming the turned-back portion 12b, and the tip end side 12a may be joined to the base end side 12c in the turned-back portion 12b. Since the spun yarns are joined at one side at a time, the apparatuses disclosed in JP-A 2004-149941, JP-B2 60-39767, and JP-A 2004-27463 can be used without any modification.

[0024] Furthermore, when the two spun yarns 11 and 12 that are switched by forming the piecing portion 10 differ in appearance, such as in color or other aspects of appearance, the effect can be achieved that the boundary becomes clear. Not only the knit fabric 20 in which the colored patterns 21, 22, and 23 are to be formed, but also a knit fabric in which the thicknesses of knitting yarns are to change or a knit fabric in which fuzz and the like of knitting yarns is to change, can be knitted by performing piecing that provides clear boundaries and forms no knot, thereby improving quality and appearance. Furthermore, when knitting a knit fabric, switching of knitting yarns is not limited by factors such as the number of available yarn feeding members, and thus a knit fabric having higher commercial value can be knitted by properly using many colors, for example.

[0025] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and the range of equivalency of the claims are therefore intended to be embraced therein.

Industrial Application

[0026] According to the invention, when joining end portions of two spun yarns, the end portions of the spun yarns are turned back, and turned-back portions are arranged opposite to each other so as to be linked. Thus, the tip end of each yarn is intertwined with the base end side in the turned-back portion. Since each yarn is intertwined with itself, piecing can be reliably performed regardless of the yarn into which piecing is to be performed. The piecing can be easily performed even into a yarn having different material properties or different thickness. Since no knot is formed, the possibility can be eliminated that a portion of knitting yarns becomes an obstacle when forming stitches, or is caught on a knitting needle and breaks the yarns. Since the yarns are linked to each other at the turned-back portions, color mixture is not caused even when the colors of the yarns are different from each other, and thus quality and appearance of the linked portion can be improved.

[0027] Furthermore, according to the invention, two

spun yarns that differ in appearance such as color, thickness, or shape can be pieced into each other without forming a knot or a portion of color mixture.

[0028] Furthermore, according to the invention, two spun yarns can be pieced into each other quickly and efficiently.

[0029] Furthermore, according to the invention, when this method is applied to intarsia knitting, it is possible to knit colored patterns with one yarn feeding member by switching a plurality of knitting yarns.

[0030] Furthermore, according to the invention, in a knit fabric and the like in which colored patterns are to be formed, piecing in which a knot or a portion of color mixture is not formed is performed in the knitting of a switching portion between the patterns, and thus a knit fabric of improved quality and appearance can be knitted.

Claims

1. A spun yarn piecing method for piecing end portions of two spun yarns, comprising:

   turning back an end portion of each of the spun yarns, and arranging the turned-back portions so as to be opposite to each other for linking; and intertwining tip end sides in the spun yarns with base end sides in the turned-back portions, thereby respectively joining the tip end sides to the base end sides.

2. The spun yarn piecing method of claim 1, wherein the two spun yarns differ from each other in appearance.

3. The spun yarn piecing method of claim 2, wherein the two spun yarns have different colors.

4. The spun yarn piecing method of claim 2, wherein the two spun yarns have different thicknesses.

5. The spun yarn piecing method of claim 2, wherein the two spun yarns have different shapes.

6. The spun yarn piecing method of any one of claims 1 to 5, wherein the turned-back portions on the tip end sides in the spun yarns are intertwined with the base end sides in the two spun yarns simultaneously.

7. The spun yarn piecing method of any one of claims 1 to 6, wherein the spun yarn piecing method is applied to intarsia knitting.

8. A knit fabric comprising a pieced portion of yarn, wherein in the pieced portion of yarn, different yarns are pieced into each other by the spun yarn piecing method according to any one of claims 1 to 7.

FIG. 1A

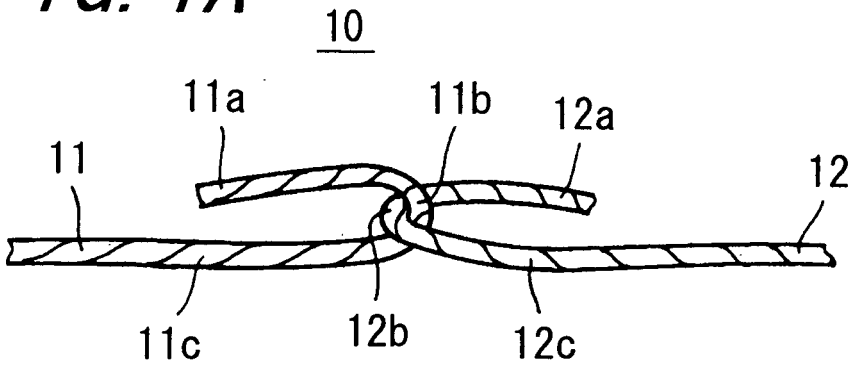

10
11a
11b
12a
11
12
11c
12b
12c

FIG. 1B

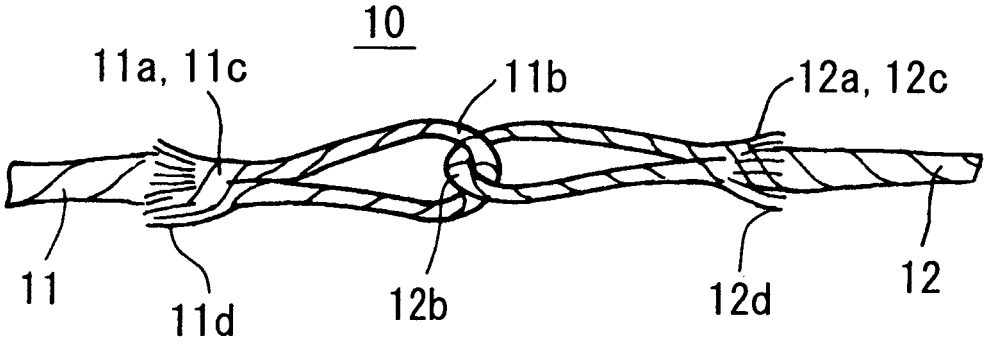

10
11a, 11c
11b
12a, 12c
11
11d
12b
12d
12

FIG. 2

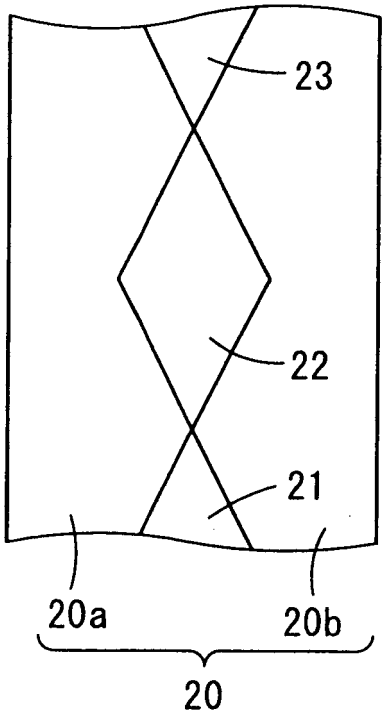


FIG. 3

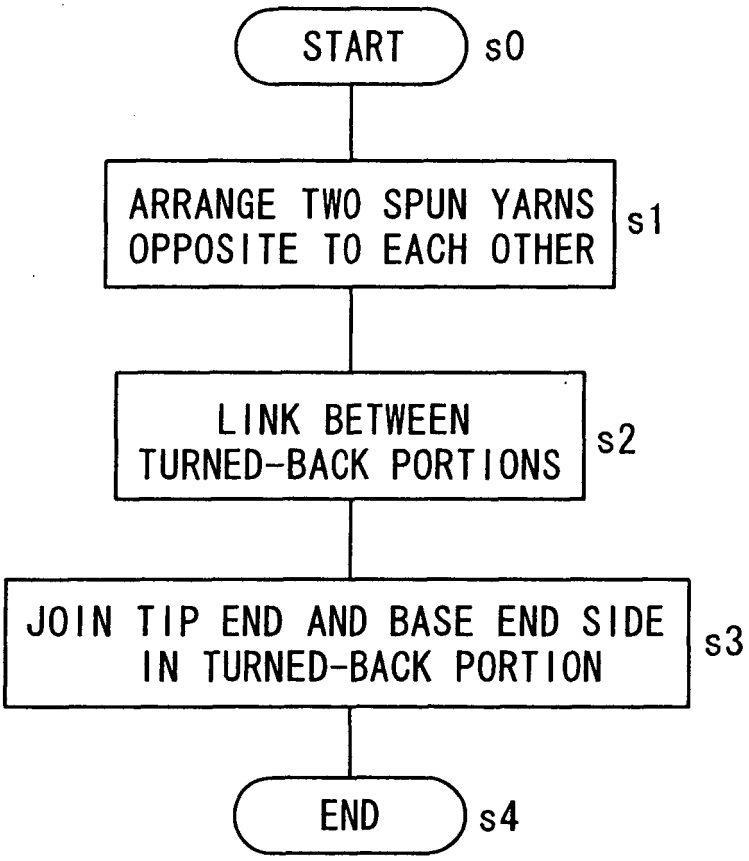

START
s0
ARRANGE TWO SPUN YARNS OPPOSITE TO EACH OTHER
s1
LINK BETWEEN TURNED-BACK PORTIONS
s2
JOIN TIP END AND BASE END SIDE IN TURNED-BACK PORTION
s3
END
s4

FIG. 4

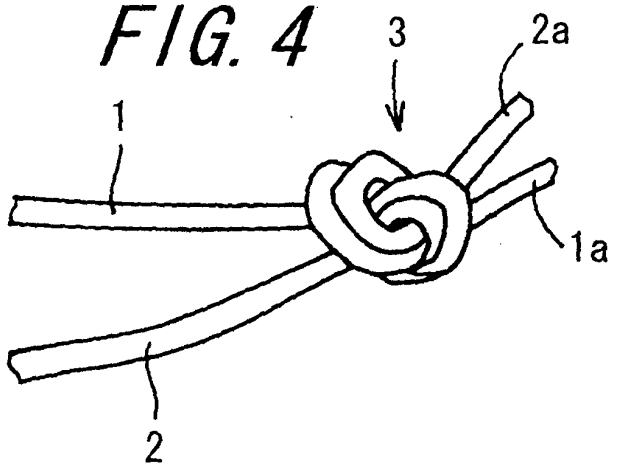


FIG. 5

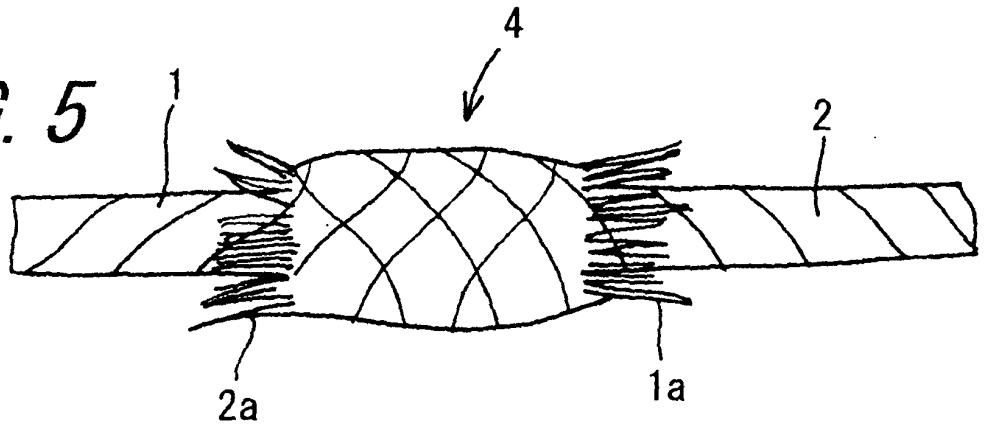
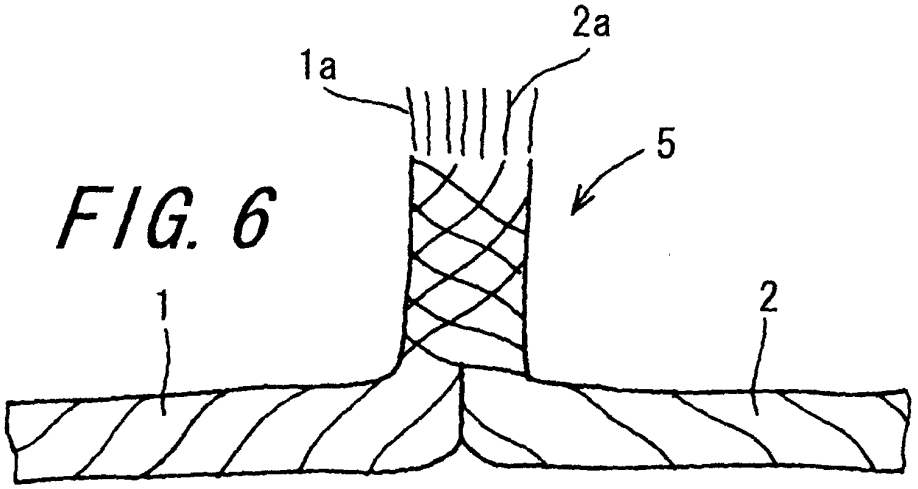


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/301866

A. CLASSIFICATION OF SUBJECT MATTER
B65H69/06(2006.01), ***B65H69/00***(2006.01), ***D01H15/00***(2006.01), ***D04B1/14***(2006.01), ***D04B15/62***(2006.01), ***D04B21/00***(2006.01)

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)
B65H69/06(2006.01), ***B65H69/00***(2006.01), ***D01H15/00***(2006.01), ***D04B1/14***(2006.01), ***D04B15/62***(2006.01), ***D04B21/00***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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.
A	JP 57-209175 A (Millard P. SAYLOR), 22 December, 1982 (22.12.82), Fig. 2 & US 4450763 A & US 4498379 A & GB 2101021 A & DE 3222252 A1	1-8
A	JP 7-32528 Y2 (Toray Monofilament Co., Ltd.), 26 July, 1995 (26.07.95), Figs. 2 to 3 (Family: none)	1-8

☐ 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
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"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
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"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	Date of mailing of the international search report
30 March, 2006 (30.03.06)	11 April, 2006 (11.04.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2004149941 A **[0002] [0005] [0022] [0023]**
- JP 60039767 B **[0004] [0022] [0023]**
- JP 2004027463 A **[0005] [0022] [0023]**
- JP 6002250 A **[0022]**