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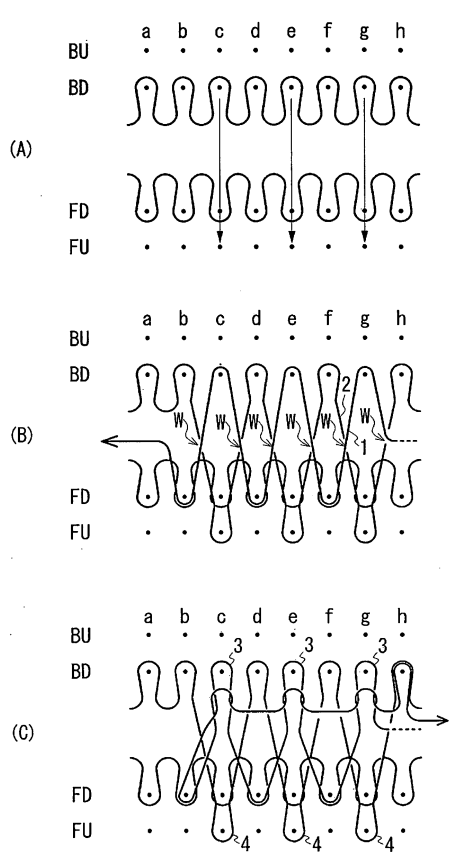
(54) METHOD OF KNITTING TUBULAR KNITTED FABRIC, AND TUBULAR KNITTED FABRIC

(57) A knitting method for strengthening a joining portion of tubular knitted fabrics and a knitted fabric knitted with the knitting method are provided. A knitting yarn intersecting step, a knit knitting step, and an intertwining step are performed. In the knitting yarn intersecting step, a pick up stitch and a tuck stitch are alternately formed at front and back needle beds, and a cross-over knitting yarn (cross-over knitting yarn portion 1) that connects to the pick up stitch and the tuck stitch and crosses between the front and back needle beds, and a knitting yarn (intersecting knitting yarn portion 2) of one part configuring the tubular knitted fabric are crossed. In the knit knitting step, the knit knitting is performed on the pick up stitch to form a new stitch 3 on the pick up stitch. In the intertwining step, one of the new stitch 3 and an opposing stitch 4 held on the needle bed opposed to the new stitch 3 is transferred to the opposing needle bed to intertwine the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2.

Fig. 1



EP 2 333 139 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a knitting method of a tubular knitted fabric for strengthening a joining portion when joining two tubular knitted fabrics, and a tubular knitted fabric in which the joining portion of the tubular knitted fabrics is strengthened.

BACKGROUND ART

[0002] When knitting a tubular knitted fabric such as a sweater using a flat knitting machine, the knitting for strengthening the joining portion is carried out while joining a body and a sleeve (see for example, Patent Document 1). In Patent Document 1, the side end of the body and the side end of the sleeve that oppose each other are joined by tubular knitting. In the tubular knitted fabric knitted in such a manner, the portion that is knitted by tubular knitting is mainly subjected to a tension when the body and the sleeve are pulled in directions of moving away from each other, and as the stitches of the relevant portion are contracted and the knitting yarn is fed out to the body and the sleeve, the joining portion of the body and the sleeve is maintained.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003] Patent Document 1: Japanese Patent No. 3968017

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] However, because of the diversification of needs in recent years, a thin knitting yarn and a weak knitting yarn other than an appropriate yarn count number with respect to a knitting needle are sometimes used placing an emphasis on an appearance of the knitted fabric, in which case, the joining portion needs to be strengthened. In the knitting method of Patent Document 1, a degree of strengthening can be enhanced by increasing the number of tubular knitting, but a reciprocating operation of a carriage of the flat knitting machine increases by the number of tubular knitting. Therefore, the joining portion is sometimes reinforced by sewing, but this increases a step of sewing task.

[0005] The present invention has been made in view of the above circumstances, and an object of the present invention is to provide a knitting method for strengthening a joining portion of tubular knitted fabrics with a simple knitting operation, and a knitted fabric knitted with the knitting method.

MEANS FOR SOLVING THE PROBLEMS

[0006] A knitting method of a tubular knitted fabric of the present invention is a method for knitting a tubular knitted fabric for strengthening a joining portion when joining two tubular knitted fabrics using a flat knitting machine having at least a pair of front and back needle beds so that stitches can be transferred between the front and back needle beds, and the method includes the following steps.

A knitting yarn intersecting step of alternately hooking a knitting yarn to the front and back needle beds so as to extend over the two tubular knitted fabrics to form a pick up stitch on an empty needle of one of the front and back needle beds and a tuck stitch on some knitting needles, on which stitches for forming the tubular knitted fabric are held, of the other needle bed, and intersecting a knitting yarn that connects the pick up stitch and the tuck stitch and that crosses the front and back needle beds and a knitting yarn of one part that configures the tubular knitted fabric so that one knitting yarn becomes a lower knitting yarn and the other knitting yarn becomes an upper knitting yarn.

A knit knitting step of forming a new stitch on the pick up stitch by performing knit knitting on the pick up stitch.

An intertwining step of sandwiching the upper knitting yarn with the lower knitting yarn from above and below and intertwining the lower knitting yarn and the upper knitting yarn by transferring the stitch of one of the new stitch and an opposing stitch held on the knitting needle of the needle bed opposing the new stitch so as to overlap the other stitch.

[0007] According to the knitting method of a tubular knitted fabric of the present invention, after a series of steps of the knitting yarn intersecting step, the knit knitting step, and the intertwining step is performed, the series of steps is preferably again performed with the front and the back changed with respect to the needle beds of the knitting needles used in the steps.

[0008] According to the method for knitting a tubular knitted fabric, in the knitting yarn intersecting step, some of the stitches of a stitch row configuring the tubular knitted fabric already held on the knitting needles of the needle bed are preferably transferred to the empty needles of the needle bed opposing the stitches before hooking the knitting yarn on the knitting needle of the front and back needle beds. In this case, the pick up stitch is formed on the knitting needle that has become an empty needle by the transfer.

[0009] The tubular knitted fabric of the present invention is a tubular knitted fabric comprising a joining portion where tubular knitted fabrics are joined, and knitted using a flat knitting machine having at least a pair of front and back needle beds so that stitches can be transferred between the front and back needle beds. The tubular knitted fabric includes a plurality of cross-over knitting yarn portions crossed between opposing front and back knitted fabric portions at the joining portion. At least one part of

the cross-over knitting yarn portion and at least one part of a knitting yarn portion configuring the tubular knitted fabric are intertwined so as to hook with each other, and positions of the two stitches connecting to the cross-over knitting yarn portion are shifted from each other in the wale direction.

EFFECTS OF THE INVENTION

[0010] According to the knitting method of a tubular knitted fabric of the present invention, the tubular knitted fabric of the present invention including a plurality of cross-over knitting yarn portions that cross between the opposing front and back knitted fabric portions at the joining portion of the two tubular knitted fabrics can be knitted. The cross-over knitting yarn portion intertwines with the knitting yarn portion which is one portion of the knitting yarn that configures the tubular knitted fabric when crossing between the front and back knitted fabric portions. Thus, when a tension acts on the joining portion, a point where the knitting yarns are intertwined moves with respect to the pulled direction thereby equalizing the tension, so that the tension can be dispersed to the entire joining portion. In the tubular knitted fabric knitted by the knitting method of the present invention, since the positions of the two stitches connecting to the cross-over knitting yarn portion are shifted from each other in the wale direction, the tension acting on the joining portion through the cross-over knitting yarn portion can be dispersed to different portions in the wale direction. Thus, in the tubular knitted fabric of the present invention, the tension does not concentrate at a specific area of the joining portion when pulled, thereby enhancing the strength of the joining portion.

[0011] After performing the knitting method of the present invention, the knitting method of the present invention is again performed with the front and the back changed with respect to the needle beds of the knitting needles used in the knitting thereby forming a symmetrically strengthened portion at the front and back knitted fabric portions of the tubular knitted fabric. The symmetrically formed strengthened portion has a satisfactory visual balance, and disperses the tension acting on the joining portion substantially equally over the front and back knitted fabric portions thereby enhancing the strength of the joining portion.

[0012] In the knitting yarn intersecting step, by transferring the stitches already held in advance before hooking the knitting yarn on the front and back needle beds, the state of the stitches at the joining portion can be made simple and the joining portion does not become thick as shown in a first embodiment, to be described later.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a knitting process diagram showing a knitting method for strengthening a joining portion of a tubular knitted fabric described in a first embodiment in sequence.

Fig. 2 is a knitting process diagram of the first embodiment continuing from Fig. 1.

Fig. 3 is a knitting process diagram showing a knitting method for strengthening a joining portion of a tubular knitted fabric described in a second embodiment in sequence.

Fig. 4 is a knitting process diagram of the second embodiment continuing from Fig. 3.

DETAILE DESCRIPTION OF THE PREFFERED EMBODIMENTS

[0014] Hereinafter, first and second embodiments of the present invention will be described using a case of joining a body and a sleeve of a sweater by way of example. Both embodiments will be described using a four-bed flat knitting machine having a pair of front and back needle beds extending in a transverse direction and disposed opposite to each other in a cross direction, the four-bed flat knitting machine capable of transferring stitches between the front and back needle beds. Hereinafter, the lower front needle bed arranged in the flat knitting machine is referred to as FD, the lower back needle bed as BD, the upper front needle bed as FU, and the upper back needle bed as BU.

First Embodiment

[0015] One example of a knitting method for strengthening a joining portion of a tubular knitted fabric using the flat knitting machine will be described in relation to joining the body and the sleeve based on knitting process diagrams of Figs. 1 and 2. Stitches held on knitting needles a to d specified with small alphabets in Figs. 1 and 2 are some of the stitches of the body, and the stitches held on knitting needles e to h are some of the stitches of the sleeve. In Figs. 1 and 2, the number of knitting needles is less than the number used for the actual knitting for the sake of convenience of the explanation.

[0016] Fig. 1(A) shows a state immediately after knit knitting is carried out, with the state the stitches held on the knitting needles d and e of the BD and the knitting needles d and e of the FD, which are stitches on the adjoining side ends of the body and the sleeve, are overlapped by the transfer of the entire sleeve, to form one tube. The stitches held on the knitting needles c, e, g of the BD are transferred to the knitting needles c, e, g of the opposing FU from such a state, as shown with a thin line arrow in Fig. 1 (A) .

[0017] A yarn feeder is then moved in the left direction to form pick up stitches on the knitting needles c, e, g of the BD, which are now empty needles after the transfer shown in Fig. 1(A), and tuck stitches are formed on the knitting needles b, d, f of the FD, on which the stitches forming the body and the sleeve are held (see Fig. 1(B)).

The pick up stitches of the BD and the tuck stitches of the FD are alternately formed in a rib form, in which case a cross-over knitting yarn portion 1 that connects the tuck stitch and the pick up stitch and crosses the BD and the FD intersects the knitting yarn portion (intersecting knitting yarn portion 2) which is one portion of the tube after the body and the sleeve are joined (see portion indicated with W in Fig. 1(B)). In this case, the cross-over knitting yarn portion 1 becomes an upper knitting yarn on the upper side in the vertical direction, and the intersecting knitting yarn portion 2 becomes a lower knitting yarn on the lower side of the cross-over knitting yarn portion 1.

[0018] The yarn feeder is then moved in the right direction to carry out the knit knitting on the pick up stitches held on the knitting needles c, e, g of the BD in Fig. 1(B) to form a stitch 3 (new stitch), and a tuck stitch is formed on the stitch held on the knitting needle h of the BD so that the cross-over knitting yarn portion 1 does not shift (see Fig. 1(C)). A stitch 4 (opposing stitch) which is a stitch transferred from the BD to the FU in Fig. 1(A) is held on the FU opposing the BD on which the stitch 3 is held.

[0019] Lastly, as shown in Fig. 2(D), the stitch 4 held on the knitting needles c, e, g of the FU is returned to the knitting needles c, e, g of the opposing BD to be in a state of Fig. 2(E). Since the stitch 3 formed in Fig. 1(C) is held on the knitting needles c, e, g of the BD, each stitch 4 held at the FU is overlapped on the stitch 3 at the opposing needle bed.

[0020] The intersecting knitting yarn portion 2 (lower knitting yarn) sandwiches the cross-over knitting yarn portion 1 (upper knitting yarn) from above and below by transferring the stitch 4 held at the FU to the knitting needles c, e, g of the BD, and thus the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2, which are merely intersected in Fig. 1(B), now intertwine with each other (see portion indicated with X of Fig. 2(E)).

[0021] At the joining portion of the body and the sleeve knitted in the above manner, the cross-over knitting yarn portion 1 is crossed in a zigzag manner between a front knitted fabric portion (portion held on the knitting needles of the FD) and the back knitted fabric portion (portion held on the knitting needles of the BD), and the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2 are intertwined so as to hook with each other. With the arrangement state in which the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2 are intertwined, since the intertwined point moves when the finished tubular knitted fabric is pulled, a tension acting on the joining portion can be received by the entire joining portion such as in the diagonal direction and not only in the front-back direction.

[0022] A stitch 10 of the front knitted fabric portion and a stitch 20 of the back knitted fabric portion connecting to the cross-over knitting yarn portion 1 have the respective position in the wale direction in the tubular knitted fabric shifted from each other by one stitch, since one stitch is added in the wale direction in the knit knitting carried out in Fig. 1(C). Therefore, the tension acting on the joining portion is not exerted on the portion of the same height in the wale direction in the tubular knitted fabric, but is dispersed to the portions of different heights, and hence a large tension does not locally act and an excessively large load does not apply on the knitting yarn.

[0023] After performing the knitting described with reference to Figs. 1 and 2, the knitting may be continuously carried out with the front and the back of the needle beds simply symmetrically changed with respect to the knitting needles used in the knitting. In this case, the stitches of the knitting needles c, e, g of the FD are transferred to the knitting needles c, e, g of the opposing BU so as to be front and back opposite to the knitting shown in Fig. 1(A). Subsequently, the symmetrically strengthened portion is formed in the front and back knitted fabric portions by carrying out knitting using the knitting needles that are front and back opposite from the knitting shown in Fig. 1 (B), Fig. 1(C), Fig. 2(D), and Fig. 2(E). Such knitting is preferably carried out since a satisfactory visual balance at the joining portion of the tubular knitted fabric can be obtained, and the tension acting on the joining portion can be dispersed substantially equally to the front and back knitted fabric portions.

Second Embodiment

[0024] In the second embodiment, one example of a knitting method in which the arrangement state where the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2 intertwine is different from the first embodiment will be described based on the knitting process diagrams of Figs. 3 and 4. The manner of looking at Figs. 3 and 4 is similar to Figs. 1 and 2.

[0025] First, in Fig. 3(A), the yarn feeder is moved in the left direction to form pick up stitches on the knitting needles b, d, f of the FU, and tuck stitches are formed on the knitting needles c, e, g, of the BU from a state in which one tube is formed as in Fig. 1(A). Such stitches are alternately formed in a rib form, and consequently, the cross-over knitting yarn portion 1 crossed between the front and back needle beds is formed.

[0026] The yarn feeder is then moved in the right direction to carry out the knit knitting on the stitches held on the knitting needles c, e, g of the FD which are the stitches of the body and the sleeve (see Fig. 3(B)). Through such knit knitting, the cross-over knitting yarn portion 1 crossed between the front and back knitted fabric portions intersects the knitting yarn portion (intersecting knitting yarn portion 2) which is one portion of the tube after the body and the sleeve are joined (see portion indicated with Y of Fig. 3(B)). In this case, the cross-over knitting yarn portion 1 becomes the lower knitting yarn, and the intersecting knitting yarn portion 2 becomes the upper knitting yarn.

[0027] Further, as shown in Fig. 3(C), the yarn feeder is moved in the left direction to carry out the knit knitting

on the pick up stitches formed on the knitting needles b, d, f of the FU and form a stitch 3 (new stitch) continuing in the wale direction of the relevant pick up stitches.

[0028] Lastly, as shown in Fig. 4(D), the stitches 3 formed on the knitting needles b, d, f of the FU in Fig. 3 (C) are transferred so as to overlap the stitches 4 (opposing stitch) held on the knitting needles b, d, f of the opposing BD to be in a state of Fig. 4(E). Through the series of knitting, the cross-over knitting yarn portion 1 is crossed between the front and back knitted fabric portions, and the cross-over knitting yarn portion 1 and the intersecting knitting yarn portion 2 intertwine so as to hook with each other (see portion indicated with Z of Fig. 4(E)), and thus the joining portion of the body and the sleeve is strengthened similar to the first embodiment. In the present embodiment as well, the stitch 10 and the stitch 20 connecting to the cross-over knitting yarn portion 1 have the respective positions in the wale direction in the tubular knitted fabric shifted from each other by one stitch, and hence the tension acting on the joining portion can be dispersed to portions of different heights of the tubular knitted fabric.

[0029] In the second embodiment as well, the visual balance at the joining portion of the body and the sleeve becomes satisfactory, and the tension acting on the joining portion can be dispersed substantially equally to the front and back knitted fabric portions by successively knitting with the front and the back of the needle beds simply symmetrically changed with respect to the knitting needles used in the knitting, after carrying out the knitting shown in Figs. 3 and 4.

[0030] In addition, in the first and second embodiments, the joining portion is strengthened by performing the knitting method of the present invention after joining the body and the sleeve to one tubular shape as shown in Fig. 1(A) and Fig. 3(A). Although not illustrated, the knitting method of the present invention can be used with the stitches at the side end of the body and the stitches at the side end of the sleeve simply overlapped or with the side end of the body and the side end of the sleeve simply brought adjoining to each other. In such cases, the joining portion can be strengthened at the same time as joining the body and the sleeve.

[0031] The present invention is not limited to the above embodiments, and may be appropriately modified within a scope not deviating from the gist of the invention. For example, the knitting shown in the embodiments may be carried out with a two-bed flat knitting machine. In this case, the knitting needle of the other needle bed opposed to the knitting needle on which the stitches are held in one needle bed becomes the empty needle so that transfer and the like can be carried out. In addition, the tuck stitch and the pick up stitch formed in the knitting yarn intersecting step may be formed not for every needle but for every plurality of needles.

DESCRIPTION OF REFERENCE NUMERALS

[0032]

1	cross-over knitting yarn portion
2	intersecting knitting yarn portion
3	stitch (new stitch)
4	stitch (opposing stitch)
10, 20	stitch connecting to cross-over knitting yarn portion

Claims

1. A knitting method of a tubular knitted fabric for strengthening a joining portion when joining two tubular knitted fabrics using a flat knitting machine having at least a pair of front and back needle beds so that stitches can be transferred between the front and back needle beds, the method comprising:

a knitting yarn intersecting step of alternately hooking a knitting yarn to the front and back needle beds so as to cross the two tubular knitted fabrics to form a pick up stitch on an empty needle of one of the front and back needle beds and a tuck stitch on some knitting needles, on which stitches for forming the tubular knitted fabric are held, of the other needle bed, and intersecting a knitting yarn that connects the pick up stitch and the tuck stitch and that crosses the front and back needle beds and a knitting yarn of one part that configures the tubular knitted fabric so that one knitting yarn becomes a lower knitting yarn and the other knitting yarn becomes an upper knitting yarn;

a knit knitting step of forming a new stitch on the pick up stitch by performing knit knitting on the pick up stitch; and

an intertwining step of sandwiching the upper knitting yarn with the lower knitting yarn from above and below and intertwining the lower knitting yarn and the upper knitting yarn by transferring the stitch of one of the new stitch and an opposing stitch held on the knitting needle of the needle bed opposing the new stitch so as to overlap the other stitch.

2. The knitting method of a tubular knitted fabric according to claim 1, wherein after a series of steps of the knitting yarn intersecting step, the knit knitting step, and the intertwining step is performed, the series of steps is again performed with the front and the back changed with respect to the needle beds of the knitting needles used in the steps.

3. The knitting method of a tubular knitted fabric according to claim 1 or 2, wherein

in the knitting yarn intersecting step, some of the stitches of a stitch row configuring the tubular knitted fabric already held on the knitting needles of the needle bed are transferred to the empty needles of the needle bed opposing the stitches before hooking the knitting yarn on the knitting needle of the front and back needle beds; and
the pick up stitch is formed with respect to the knitting needle that has become an empty needle by the transfer.

4. A tubular knitted fabric, including a joining portion where tubular knitted fabrics are joined, and knitted using a flat knitting machine having at least a pair of front and back needle beds so that stitches can be transferred between the front and back needle beds; the tubular knitted fabric comprising:

a plurality of cross-over knitting yarn portions crossed between opposing front and back knitted fabric portions at the joining portion, wherein at least one part of the cross-over knitting yarn portion and at least one part of a knitting yarn portion configuring the tubular knitted fabric are intertwined so as to hook with each other, and positions of two stitches connecting to the cross-over knitting yarn portion are shifted from each other in a wale direction.

Fig. 1

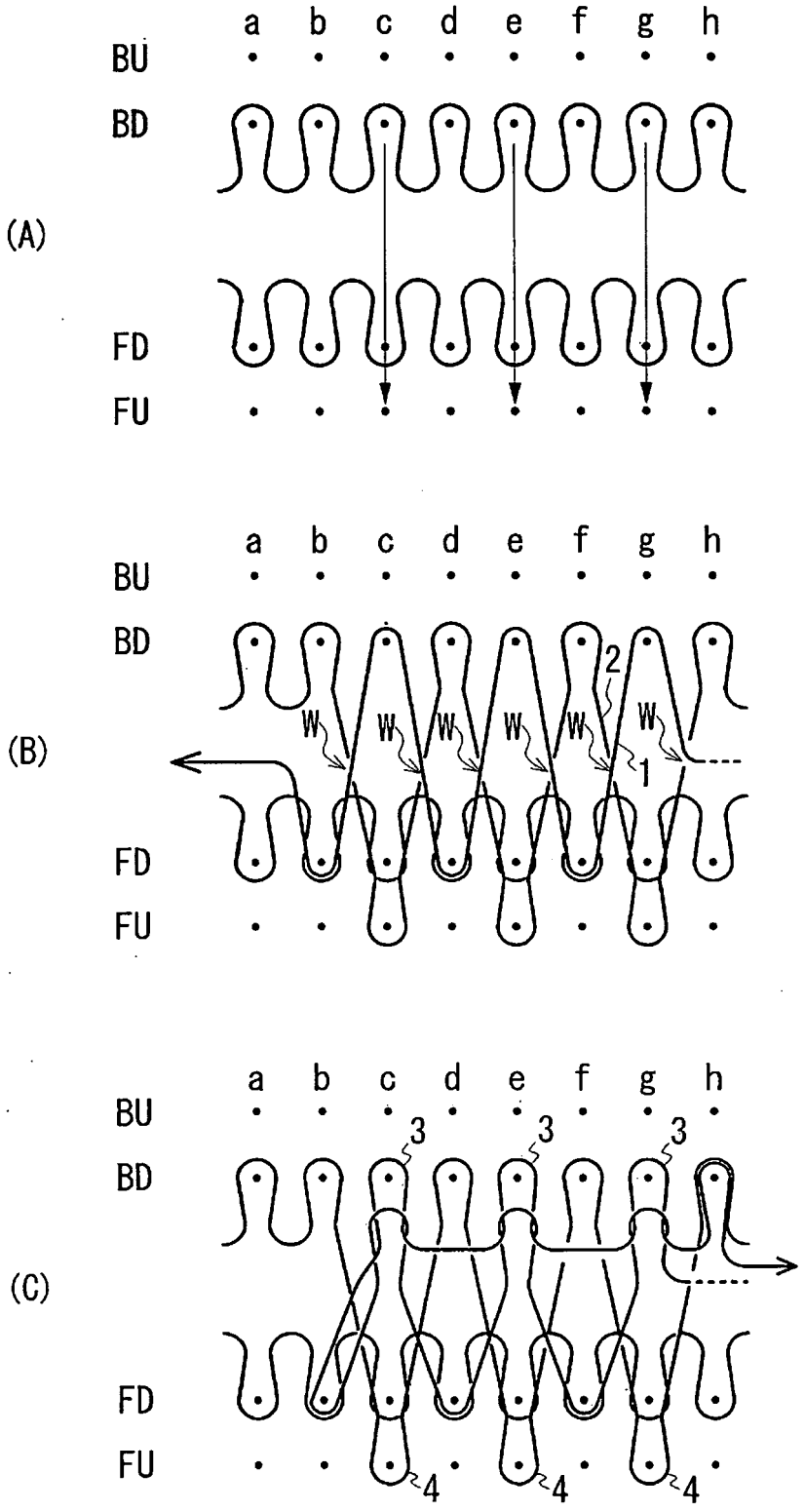

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Fig. 2

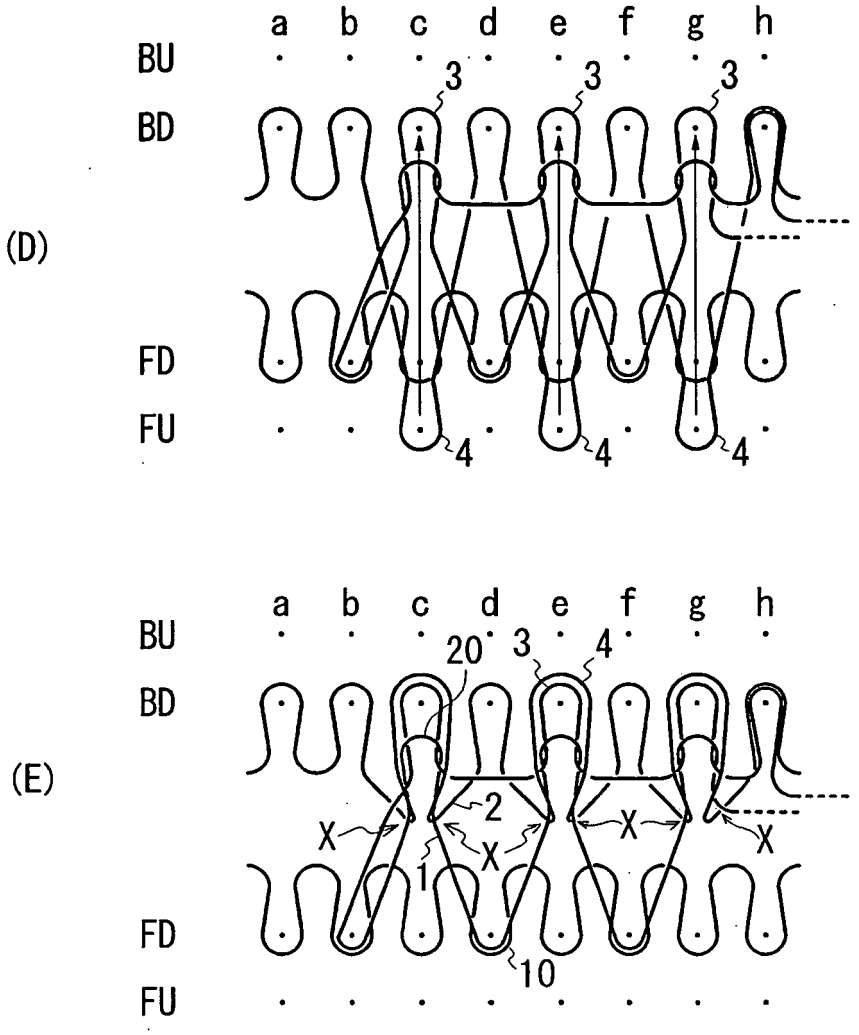
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Fig. 3

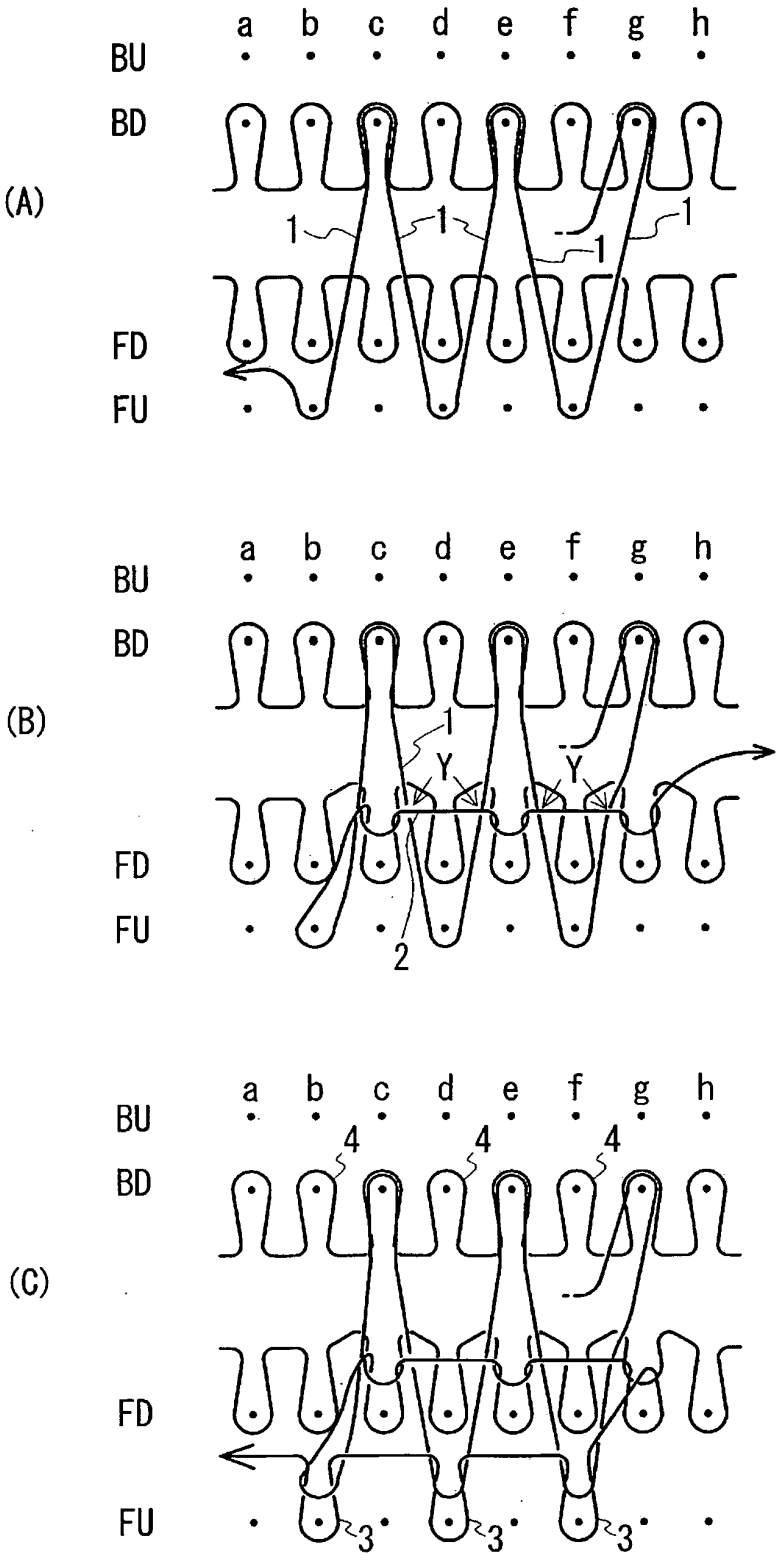
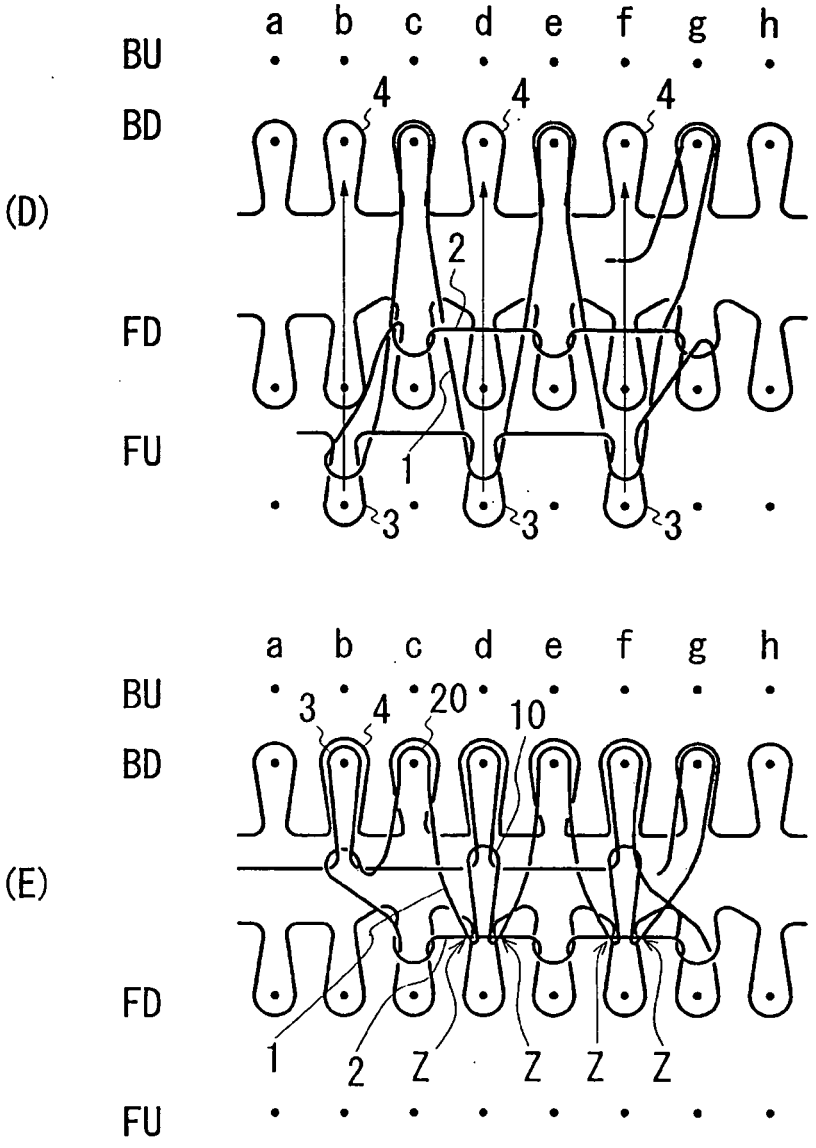


Fig. 4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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003597

A. CLASSIFICATION OF SUBJECT MATTER
D04B1/00(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)
D04B1/00-39/08

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 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2002/063085 A1 (Shima Seiki Mfg., Ltd.), 15 August 2002 (15.08.2002), claims & EP 1367162 A1 & US 2004/065123 A1	1-4
A	WO 2006/109782 A1 (Shima Seiki Mfg., Ltd.), 19 October 2006 (19.10.2006), claims & EP 1882763 A1 & US 2008/141729 A1	1-4
A	WO 2006/068151 A1 (Shima Seiki Mfg., Ltd.), 29 June 2006 (29.06.2006), claims & JP 2006-176912 A	1-4

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
04 November, 2009 (04.11.09)	17 November, 2009 (17.11.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003597

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006/059616 A1 (Shima Seiki Mfg., Ltd.), 08 June 2006 (08.06.2006), claims & JP 2006-152516 A & EP 1818436 A1 & US 2008/190147 A1	1-4
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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