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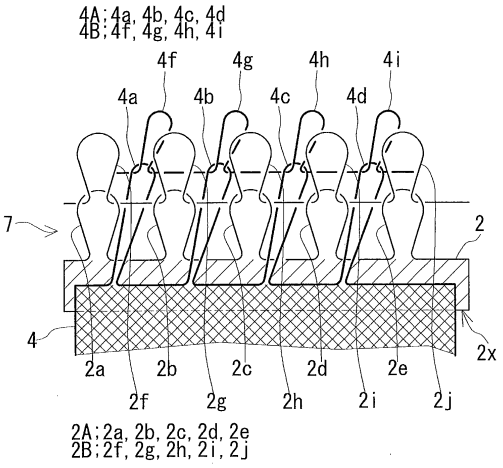
(54) KNITTED FABRIC AND METHOD FOR JOINING KNITTED FABRIC

(57) Provided is a knitted fabric in which a first knitted fabric portion and a second knitted fabric portion that overlap each other in the thickness direction are joined to each other so as to be easily rotated about a joint position of the two knitted fabric portions, which serves as a rotation axis. The knitted fabric includes: a passage location (7) at which stitches (4a to 4d) of the n-th knitting course (4A) of the second knitted fabric portion (4) are passed through gaps between stitches in the first knitted fabric portion (2) from one surface side to the other surface side, so that the up and down positions in the thickness direction of the first knitted fabric portion (2) and the second knitted fabric portion (4) are reversed with respect to each other. Furthermore, a terminal portion (4y) of the second knitted fabric portion (4) is subjected to an unravel treatment in the vicinity of the passage location at which the second knitted fabric portion (4) is passed through the first knitted fabric portion (2), so that the first knitted fabric portion (2) and the second knitted fabric portion (4) are joined to each other at the passage location (7). Here, the gaps are each surrounded by two adjacent stitches (2a and 2b through 2d and 2e) in the m-th knitting course (2A) of the first knitted fabric portion (2), a sinker loop that connects the adjacent stitches, and a sinker loop in the (m+1)-th knitting course (2B).

Fig. 2B



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Description

TECHNICAL FIELD

[0001] The present invention relates to a knitted fabric in which a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state are joined to each other, and a knitted fabric joining method for joining a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state.

BACKGROUND ART

[0002] Flat knitting machines have been used to join a first knitted fabric portion and a second knitted fabric portion that are knitted using different yarn feeders. If the first knitted fabric portion and the second knitted fabric portion are lined up in a knitting width direction, such-methods include one in which stitches of the first knitted fabric portion and stitches of the second knitted fabric portion are overlapped with each other to join the two knitted fabric portions to each other, and one in which knitting yarn of the first knitted fabric portion and knitting yarn of the second knitted fabric portion are crossed with each other, as described in Patent Document 1.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003] [Patent Document 1] Japanese Patent No. 5695859B

DISCLOSURE OF THE INVENTION

PROMELS TO BE SOLVED BY THE INVENTION

[0004] On the other hand, if the first knitted fabric portion and the second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state are joined to each other, typically, stitches of the first knitted fabric portion and stitches of the second knitted fabric portion are overlapped with each other, and stitches are knitted to follow the resultant double stitches in a wale direction, whereby fixing the double stitches.

[0005] Here, like a tongue (second knitted fabric portion) of a shoe upper (first knitted fabric portion), and a pocket flap (second knitted fabric portion) of knitwear (first knitted fabric portion), it is sometimes preferable that the second knitted fabric portion is easily rotated with respect to the first knitted fabric portion about a joint position of the first knitted fabric portion and the second knitted fabric portion, which serves as a rotation axis. However, in the case where the two knitted fabric portions are joined to each other using double stitches, two stitches of the double stitch mutually restrain from moving, and thus the second knitted fabric portion is not easily rotated with respect to the first knitted fabric portion.

[0006] The present invention was made in view of the above-described circumstances, and it is an object thereof to provide a knitted fabric in which a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction are joined to each other so as to be easily rotated about a joint position of the two knitted fabric portions, which serves as a rotation axis. Furthermore, it is another object of the present invention to provide a knitted fabric joining method for joining a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction so that they can be easily rotated about a joint position of the two knitted fabric portions, which serves as a rotation axis.

MEANS OF SOLVING THE PROBLEMS

[0007] An aspect of the present invention relates to a knitted fabric in which a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state are joined to each other. When n and m are suitable natural numbers, the knitted fabric includes a passage location at which stitches in an n-th knitting course of the second knitted fabric portion are passed through gaps between stitches in the first knitted fabric portion from one surface side to another surface side, so that up and down positions in the thickness direction of the first knitted fabric portion and the second knitted fabric portion are reversed with respect to each other. Furthermore, a terminal portion of the second knitted fabric portion is subjected to an unravel treatment in the vicinity of the passage location at which it is passed through the first knitted fabric portion, so that the first knitted fabric portion and the second knitted fabric portion are joined to each other at the passage location. Here, the gaps are each surrounded by two adjacent stitches in an m-th knitting course of the first knitted fabric portion, a sinker loop that connects the adjacent stitches, and a sinker loop in an (m+1) -th knitting course. The sinker loop in the (m+1)-th knitting course is a sinker loop that connects two stitches that follow the two adjacent stitches in the m-th knitting course in the wale direction.

[0008] According to another aspect of the knitted fabric of the present invention, the stitches in the n-th knitting course may be respectively passed through the plurality of gaps lined up in a predetermined range of the m-th knitting course.

[0009] According to another aspect of the knitted fabric of the present invention, the first knitted fabric portion may be a shoe upper, and the second knitted fabric portion may be a tongue, and a start portion of the shoe upper may be formed in the vicinity of the passage location.

[0010] An aspect of the present invention relates to a knitted fabric joining method for joining a first knitted fab-

ric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state, using a flat knitting machine with two needle beds. The knitted fabric joining method of the present invention includes: when n and m are suitable natural numbers, the following steps;

- a step of holding an m-th knitting course of the first knitted fabric portion on one needle bed, and holding an n-th knitting course of the second knitted fabric portion on the other needle bed;
- a step of moving stitches in the m-th knitting course to the other needle bed and moving stitches in the n-th knitting course to the one needle bed, so that the front and back positions of the first knitted fabric portion and the second knitted fabric portion are reversed with respect to each other in a state in which the stitches in the n-th knitting course are passed through spaces between the stitches in the m-th knitting course;
- a step of subjecting the n-th knitting course to an unravel treatment, or knitting several knitting courses that follow the n-th knitting course in a wale direction and then performing an unravel treatment; and
- a step of knitting several knitting courses that follow them-th knitting course.

EFFECTS OF THE INVENTION

[0011] In the knitted fabric according to the present invention, the first knitted fabric portion and the second knitted fabric portion are joined to each other by reversing the up and down positions in the thickness direction of the first knitted fabric portion and the second knitted fabric portion, and thus it is possible to easily rotate the second knitted fabric portion with respect to the first knitted fabric portion about the passage location at which the up and down positions of the two knitted fabric portions are reversed, which serves as a rotation axis. Furthermore, in the knitted fabric of the present invention, the terminal portion of the second knitted fabric portion is provided in the vicinity of the above-described passage location, and thus the part of the second knitted fabric portion that is arranged on the other surface side of the first knitted fabric portion is small. In a knitted fabric for use in a case where one surface side of the first knitted fabric portion is located on the front surface side, it is difficult to rotate the second knitted fabric portion if the part of the second knitted fabric portion that is arranged on the other surface side (back surface side) of the first knitted fabric portion is large. Such a problem is unlikely to occur if the part of the second knitted fabric portion that is arranged on the other surface side of the first knitted fabric portion is small.

[0012] By passing the stitches in the n-th knitting course respectively through the plurality of gaps lined up in a predetermined range of the m-th knitting course, it is possible to improve the joint intensity of the first knitted fabric portion and the second knitted fabric portion.

[0013] By reversing the up and down positions in the thickness direction of the shoe upper and the tongue to join the shoe upper and the tongue to each other, a comfortable shoe upper can be obtained. This is because the foot insertion opening is enlarged by rotating the tongue when a wearer wears the shoe upper.

[0014] According to the knitted fabric joining method of the present invention, it is possible to knit the knitted fabric of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a schematic view illustrating a shoe upper of an embodiment.

FIG. 2A is a cross-sectional view of the shoe upper taken along a line II-II.

FIG. 2B is a loop diagram schematically illustrating the vicinity of a joint position of the shoe upper and a tongue.

FIG. 3 is a knitting image diagram schematically illustrating an example of a procedure for knitting the shoe upper.

FIG. 4 is a knitting step diagram illustrating an example of a procedure for forming the vicinity of the joint position.

MODE FOR CARRYING OUT THE INVENTION

<Embodiment 1>

[0016] Embodiment 1 will describe a shoe upper 1 (see FIG. 1) that includes a portion knitted by a knitted fabric joining method according to the present invention. The position to which the knitted fabric joining method of the present invention is applied is a portion in which an instep cover 2 and a tongue 4, which will be described later, are joined to each other. The following will describe constituent components of the shoe upper 1, then a procedure for manufacturing the shoe upper 1, and lastly a specific procedure for joining the instep cover 2 and the tongue 4.

<<Shoe Upper>>

[0017] The shoe upper 1 is a knitted fabric knitted using a flat knitting machine, and includes an instep cover 2 that covers a portion on the instep side of a wearer, and a sole cover 3 that covers the sole portion of the wearer. A shoe opening 5 is formed in the upper portion of the instep cover 2, and the shoe opening 5 includes a foot insertion opening 5i through which the wearer inserts his or her foot, and a slit 5s that extends from the foot insertion opening 5i toward the toe side. The tongue 4 is provided at a position in the slit 5s, and eyelets 6 are formed at positions of the instep cover 2 near the slit 5s.

[0018] The shoe upper 1 of the present example differs from conventional ones in the configuration of joining the

instep cover (first knitted fabric portion) 2 and the tongue (second knitted fabric portion) 4. The following will describe a configuration of a joint position of the instep cover 2 and the tongue 4 in detail with reference to a cross-sectional view of FIG. 2A taken along a line II-II, and a loop diagram of FIG. 2B.

[0019] In FIG. 2A, the left side in the drawing shows the front surface side (one surface side) of the instep cover 2, the right side shows the back surface side (the other surface side) of the instep cover 2, the upper side shows the toe side, and the lower side shows the heel side. As shown in FIG. 2A, the joint position of the present example includes, between a start portion 2x and a terminal portion 2y in a wale direction of the instep cover 2, a passage location 7 at which stitches in a knitting course between a start portion 4x and a terminal portion 4y in a wale direction of the tongue 4 are passed through the instep cover 2 from the one surface side to the other surface side. The shorter the part of the tongue 4 that is arranged on the back surface side of the instep cover 2, the less likely the tongue 4 is to come into contact with the instep of the wearer, and the shoe upper 1 of FIG. 1 will provide good foot comfort.

[0020] The state of stitches in the vicinity of the joint position including the passage location 7 will be described with reference to the loop diagram of FIG. 2B. In FIG. 2B, the instep cover 2 is denoted by thin lines and the tongue 4 is denoted by thick lines. As shown in the drawing, in the passage location 7, stitches 4a to 4d in an n-th (where n is a suitable natural number) knitting course 4A of the tongue 4 are passed through gaps between stiches in the instep cover 2, and there is no overlap of stitches between the instep cover 2 and the tongue 4. The gaps through which the stitches 4a to 4d are passed are gaps each surrounded by two adjacent stitches in an m-th (where m is a suitable natural number) knitting course 2A of the first knitted fabric portion 2, namely, two adjacent stitches 2a and 2b through stitches 2d and 2e, a sinker loop that connects the corresponding adjacent stitches, namely, the stitches 2a and 2b through stitches 2d and 2e, and a corresponding sinker loop in an (m+1) -th knitting course 2B. In the present example, all the stitches 4a to 4d of the tongue 4 are passed through different positions, and thus the stitches of the instep cover 2 and the stitches of the tongue 4 are crossed with each other one by one in the front-back direction, like comb teeth meshing with each other. Here, a plurality of stitches (for example, the stitches 4a and 4b) can also be passed through a single gap.

[0021] The (m+1)-th knitting course 2B constituted by new stitches 2f to 2j is formed to follow the stitches 2a to 2e of the instep cover 2 in the wale direction, and an (n+1)-th knitting course 4B constituted by new stitches 4f to 4i is formed to follow the stitches 4a to 4d of the tongue 4 in the wale direction. With the knitting courses 2B and 4B, the instep cover 2 and the tongue 4 are joined to each other so as not to disengage. For example, subjecting the (n+1)-th knitting course 4B of the tongue 4 to an unravel treatment will prevent the tongue 4 from disengaging from the instep cover 2 even if the tongue 4 is pulled forward, because sinker loops of the knitting course 4B are caught by the instep cover 2. Note that the knitting course of the tongue 4 that is subjected to an unravel treatment is not limited to the (n+1)-th knitting course 4B.

[0022] As described above, in the shoe upper 1 of the present example, the instep cover 2 and the tongue 4 are joined to each other in the passage location 7 by reversing the up and down positions in the thickness direction of the instep cover 2 and the tongue 4 with respect to each other. Accordingly, the tongue 4 can easily be rotated about the passage location 7 in which the tongue 4 is passed through the instep cover 2, which serves as a rotation axis. In the case of the shoe upper 1 of the present example shown in FIG. 1, the tongue 4 can easily be rotated toward the near side in the drawing, and thus a shoe upper 1 into which a foot can easily be inserted is obtained.

[0023] Moreover, by reversing the positions of the instep cover 2 and the tongue 4 in the thickness direction with respect to each other to join the instep cover 2 and the tongue 4, it is also possible to achieve an effect of suppressing color mingling in the vicinity of the passage location 7 even if the instep cover 2 and the tongue 4 are knitted with knitting yarn of different colors.

<<Shoe Upper Manufacturing Procedure>>

[0024] The shoe upper 1 of the present example is obtained by knitting, using the flat knitting machine, the instep cover 2 to which the tongue 4 is joined, and attaching the sole cover 3 prepared separate from the instep cover 2 to the instep cover 2. Unlike the present example, the instep cover 2 and the sole cover 3 may also be knitted as one piece. As the flat knitting machine, a two-bed flat knitting machine provided with two need beds opposite to each other in a front-back direction, or four-bed flat knitting machine may be used. Knitting yarn including heat-fusible yarn or the like can be used for knitting the instep cover 2 and the tongue 4. Preferably, the instep cover 2 and the tongue 4 have at least partially a thick knitting pattern obtained by knitting (such as a knitting pattern obtained by combining tubular knitting and rib knitting) using front and back needle beds.

[0025] The instep cover 2 and the tongue 4 can be knitted in the procedure shown in a knitting image diagram of FIG. 3. In the drawing, white arrows show the direction in which knitting advances (wale direction), and horizontal lines in the components 2 and 4 show the knitting width direction (direction in which stitches are lined up). Furthermore, in FIG. 3, small letters are added to positions important for knitting.

[0026] First, a heel cover portion 20, which is a part of the instep cover 2, is knitted. The heel cover portion 20 is used to form the portion on the heel side of the instep cover 2 in a shape conforming to the shape of the foot

of wearers, and the knitting width thereof decreases toward the shoe opening 5 side. In the drawing, a line a-b is a knitting start portion of the heel cover portion 20, a line c-d is a knitting end portion, and a line b-d and a line a-c are side edges in the knitting width direction.

[0027] Then, following the side edge a-c (stitches denoted by signs "V") of the heel cover portion 20, a left portion of the body portion 21 is started to be knitted, and following the side edge b-d of the heel cover portion 20, a right portion of the body portion 21 is started to be knitted. The left end portion and the right portion of the body portion 21 are knitted using different yarn feeders. The left portion and the right portion of the body portion 21 are knitted in a state in which they are lined up side by side on the needle beds. Furthermore, independently from the body portion 21, the tongue 4 is knitted using a yarn feeder different from those for the body portion 21 (tongue 4 starts from a line e-f). Then, the instep cover 2 and the tongue 4 are joined to each other on a line g-h, and the instep cover 2 is complete.

<<Joining Method>>

[0028] The procedure for joining the instep cover 2 (first knitted fabric portion) and the tongue 4 (second knitted fabric portion) will be described with reference to the knitting step diagram of FIG. 4. In FIG. 4, "S + numeric character" denotes the knitting step number, and black points in the right column denote needles of the front needle bed (FB) and the back needle bed (BB). The reference signs in the drawing correspond to the reference signs of FIG. 2B.

[0029] Step S0 shows the state in which the n-th knitting course 4A (including the stitches 4a to 4d) of the tongue 4 is held on the needles of the FB, and the m-th knitting course 2A (including the stitches 2a to 2e) of the instep cover 2 is held on the needles of the BB. From the state, the front and back positions of the tongue 4 and the instep cover 2 are to be reversed with respect to each other. Here, the n-th knitting course 4A is preferably the last knitting course of the tongue 4 or the knitting course one to five courses before the last knitting course. Furthermore, the m-th knitting course 2A is preferably any of the first to fifth knitting courses from the knitting start portion (start portion 2x) of the instep cover 2. With this, as shown in FIG. 2A, the terminal portion 4y of the tongue 4 and the start portion 2x of the instep cover 2 are arranged in the vicinity of the passage location 7.

[0030] In Step S1, the BB is racked by one pitch in the rightward direction, and the stitch 2e at the right end of the instep cover 2 that is held on the BB is moved to the FB. Then, in Step S2, the stitch 4d at the right end of the tongue 4 that is held on the FB is moved to the needle of the BB that has become empty due to the movement of the stitch 2e of the instep cover 2 in Step S1.

[0031] In Step S3, the stitch 2d at the right end of the instep cover 2 that is held on the BB is moved to the needle of the FB that has become empty due to the movement of the stitch 4d of the tongue 4 in Step S2. Then, in Step S4, the stitch 4c at the right end of the tongue 4 that is held on the FB is moved to the needle of the FB that has become empty due to the movement of the stitch 2d of the instep cover 2 in step S3.

[0032] Thereafter, moving the stitch on one end side (right end side) of the instep cover 2 to the needle of the FB that has become empty due to the movement of the stitch of the tongue 4 (knitting corresponding to Step S3), and moving the stitch on one end side (right end side) of the tongue 4 to the needle of the BB that has become empty due to the movement of the stitch of the instep cover 2 (knitting corresponding to Step S4) are repeated. As a result, as shown in Step S5, the front and back positions of the instep cover 2 and the tongue 4 are reversed with respect to each other, and the state as shown in FIG. 2B is obtained in which the stitches 4a to 4d of the tongue 4 are respectively passed through the spaces between adjacent stitches 2a and 2b through stitches 2d and 2e of the instep cover 2 from the one surface side of the instep cover 2 to the other surface side.

[0033] After Step S5, the (n+1)-th knitting course 4B (see FIG. 2B) is knitted to follow the n-th knitting course 4A of the tongue 4 that is held on the needles of the BB, and the (m+1)-th knitting course 2B (see FIG. 2B) is knitted to follow the m-th knitting course 2A of the instep cover 2 that is held on the needles of the FB. The two new knitting courses 2B and 4B are knitted independently. The (n+1)-th knitting course 4B of the tongue 4 may be subjected to an unravel treatment using bind-off stitches or the like, or several (for example one to five) knitting courses may be knitted to follow the (n+1)-th knitting course 4B in the wale direction, and then the last knitting course may be subj ected to an unravel treatment. With the unravel treatment, the joint of the instep cover 2 and the tongue 4 are fixed.

[0034] Here, it is also possible to subject the n-th knitting course 4A of the tongue 4 in Step S5 to a binding-off treatment. Furthermore, as an example of an unravel treatment other than the binding-off treatment, a measure is also possible in which the last knitting course of the tongue 4 is knitted with heat-shrinkable knitting yarn, and the tongue 4 is subjected to a heat treatment.

<<Modifications>>

[0035] In FIG. 4, the front and back positions of all the stitches of the instep cover 2 and the tongue 4 are reversed with respect to each other, and then the joint of the instep cover 2 and the tongue 4 is fixed. In contrast, each time the front and back positions of a stitch of the instep cover 2 and a stitch of the tongue 4 are reversed with respect to each other, a new stitch may be knitted to follow the stitch of the tongue 4. Furthermore, each time the front and back positions of a stitch of the instep cover 2 and a stitch of the stitches of the tongue 4 are reversed with respect to each other, the stitch of the tongue 4 may be subjected to a binding-off treatment.

Alternatively, the front and back positions of all the stitches of the instep cover 2 and the tongue 4 may be reversed at once with respect to each other.

[0036] Moreover, it is also possible to form a joint position similar to that in FIG. 2B by crossing knitting yarn based on the front-back positional relationship between the yarn feeders. By feeding the FB with knitting yarn from the yarn feeder on the BB side, and feeding the BB with knitting yarn from the yarn feeder on the FB side, the knitting yarns fed from the two yarn feeders are crossed with each other between the FB and the BB. Accordingly, by operating the two yarn feeders so that the stitches of the tongue 4 are passed through the spaces between adjacent stitches of the instep cover 2, it is possible to form a joint position similar to that in FIG. 2B.

<Embodiment 2>

[0037] The scope to which the knitted fabric joining method of the present invention is applied is not limited to a shoe upper. For example, when forming a pocket flap of knitwear, the knitted fabric joining method of the present invention can be applied to join the flap to a body. Furthermore, the knitted fabric joining method of the present invention may also be used for knitting industrial materials other than shoe uppers and knitwear.

DESCRIPTION OF REFERENCE NUMERALS

[0038]

1 Shoe upper (knitted fabric)
2 Instep cover (first knitted fabric portion)
2x Start portion
2y Terminal portion
20 Heel cover portion
21 Body portion
3 Sole cover
4 Tongue (second knitted fabric portion)
4x Start portion
4y Terminal portion
5 Shoe opening
5i Foot insertion opening
5s Slit
6 Eyelet
7 Passage location
2A m-th knitting course
2B (m+1)-th knitting course
2a to 2e, 2f to 2j Stitches of instep cover
4A n-th knitting course
4B (n+1)-th knitting course
4a to 4d, 4f to 4i Stitches of tongue

Claims

1. A knitted fabric in which a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state are joined to each other, comprising:

when n and m are suitable natural numbers,
a passage location at which stitches in an n-th knitting course of the second knitted fabric portion are passed through gaps between stitches in the first knitted fabric portion from one surface side to another surface side, so that up and down positions in the thickness direction of the first knitted fabric portion and the second knitted fabric portion are reversed with respect to each other,
wherein a terminal portion of the second knitted fabric portion is subjected to an unravel treatment in the vicinity of the passage location, so that the first knitted fabric portion and the second knitted fabric portion are joined to each other at the passage location, and
the gaps are each surrounded by two adjacent stitches in an m-th knitting course of the first knitted fabric portion, a sinker loop that connects the adj acent stitches, and a sinker loop in an (m+1) -th knitting course.

2. The knitted fabric according to claim 1,
wherein the stitches in the n-th knitting course are respectively passed through the plurality of gaps lined up in a predetermined range of the m-th knitting course.

3. The knitted fabric according to claim 1 or 2,
wherein the first knitted fabric portion is a shoe upper, and the second knitted fabric portion is a tongue, and
a start portion of the shoe upper is formed in the vicinity of the passage location.

4. A knitted fabric joining method for joining a first knitted fabric portion and a second knitted fabric portion that overlap each other in a thickness direction in a two-layer independent state, using a flat knitting machine with two needle beds, comprising:

when n and m are suitable natural numbers,
a step of holding an m-th knitting course of the first knitted fabric portion on one needle bed, and holding an n-th knitting course of the second knitted fabric portion on the other needle bed;
a step of moving stitches in the m-th knitting course to the other needle bed and moving stitches in the n-th knitting course to the one needle bed, so that the front and back positions of the first knitted fabric portion and the second knitted fabric portion are reversed with respect to each other in a state in which the stitches in the n-th knitting course are passed through spaces between the stitches in the m-th knitting course;

a step of subjecting the n-th knitting course to an unravel treatment, or knitting several knitting courses that follow the n-th knitting course in a wale direction and then performing an unravel treatment; and

a step of knitting several knitting courses that follow the m-th knitting course.

Fig. 1

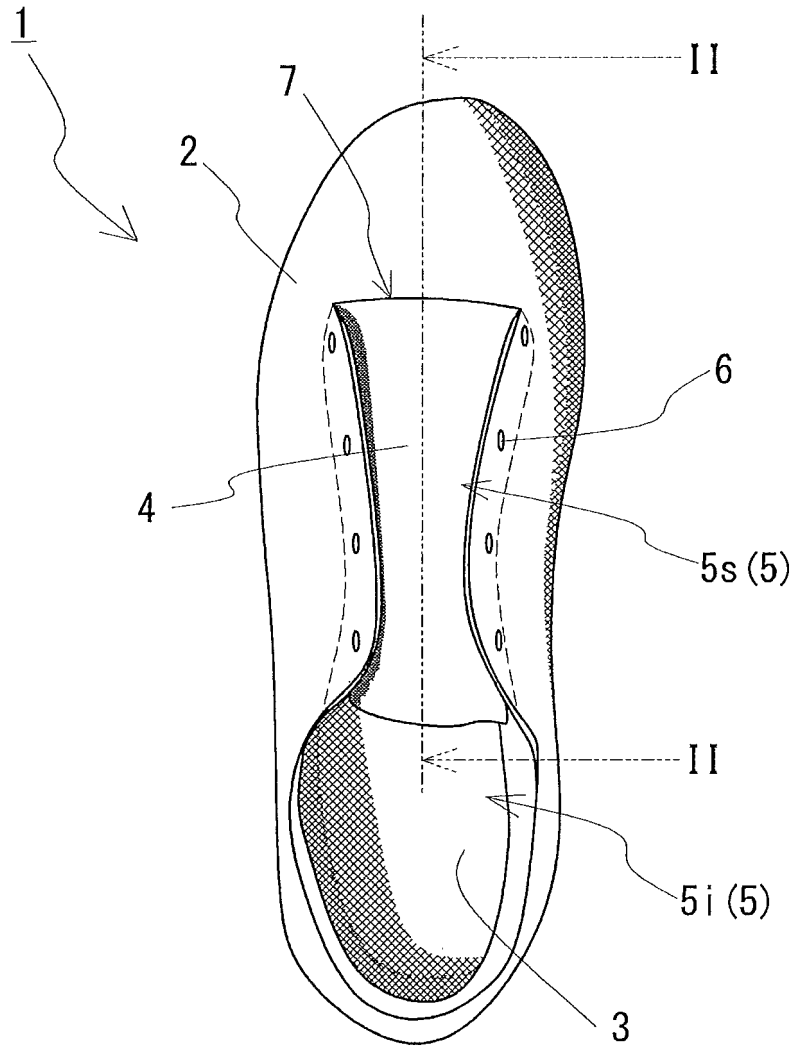
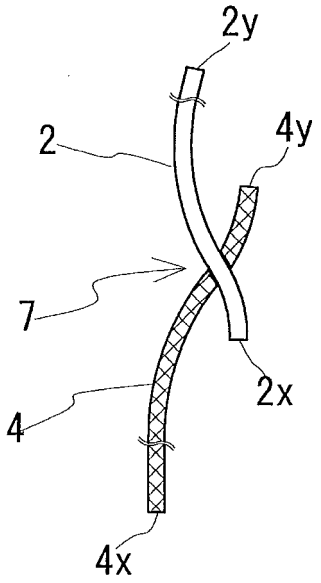


Fig. 2A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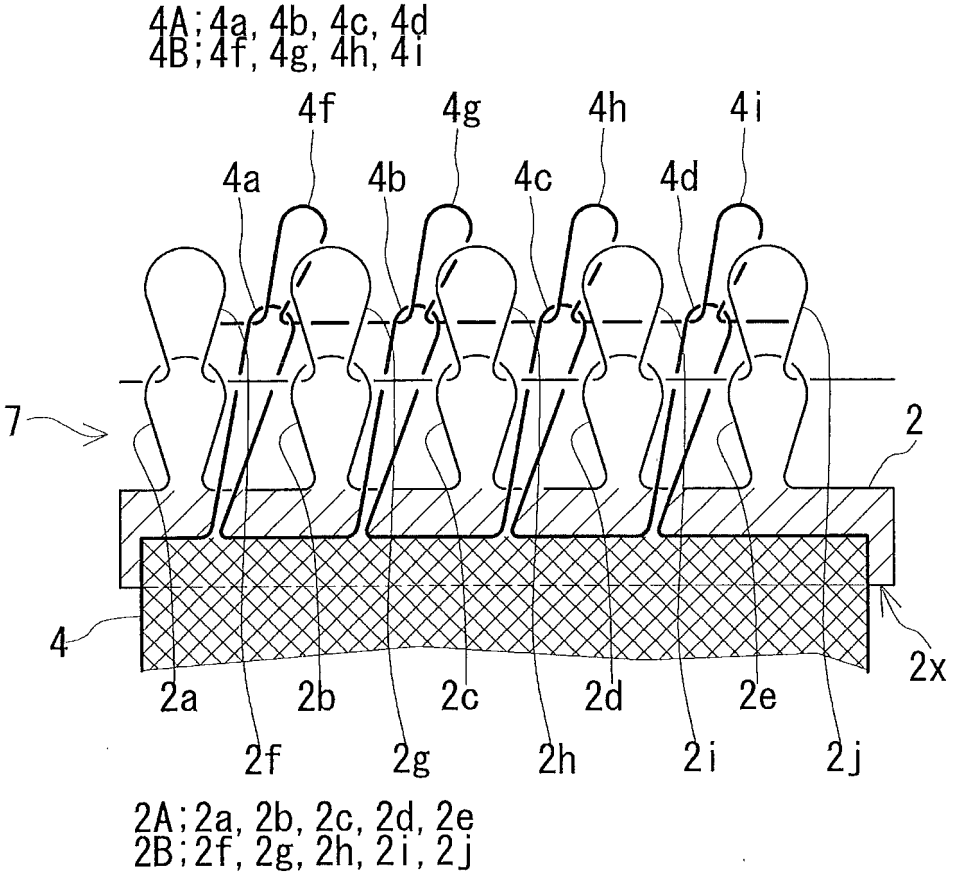
2
4y
7
2x
4
4x

Fig. 2B


4A;4a, 4b, 4c, 4d
4B;4f, 4g, 4h, 4i
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4g
4h
4i
4a
4b
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2c
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2e
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Fig. 3

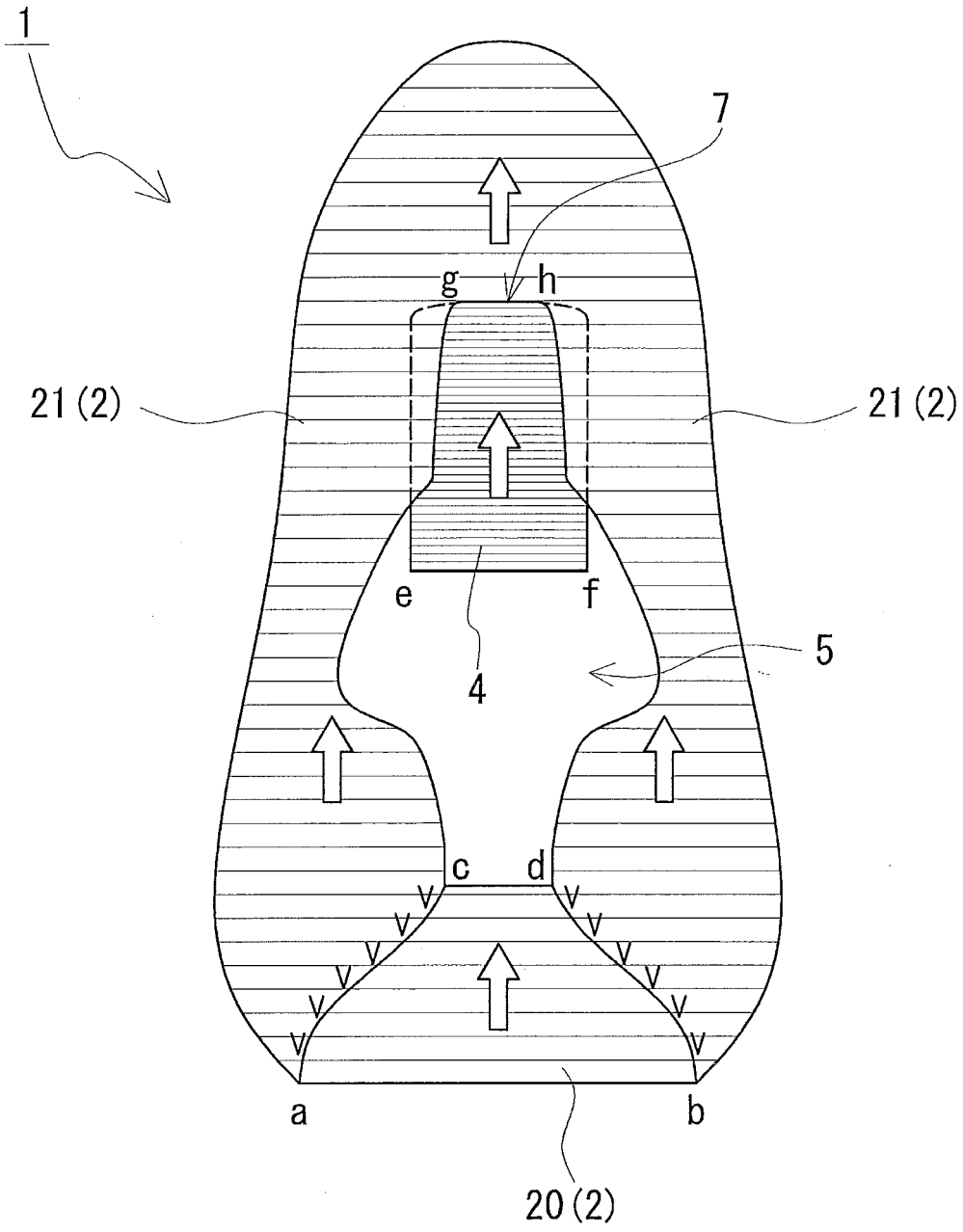
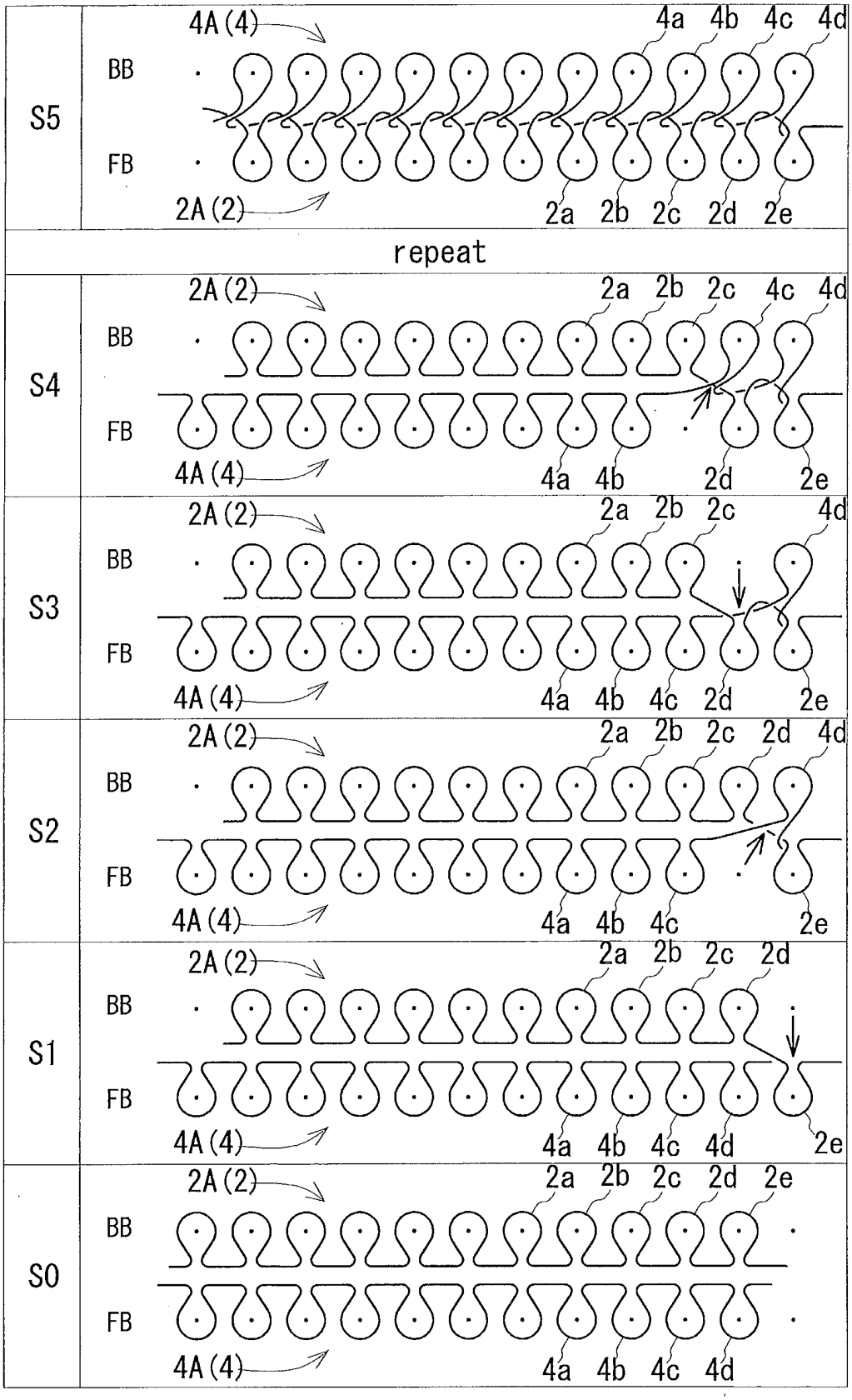


Fig. 4


S5
4A(4)
4a 4b 4c 4d
BB
FB
2A(2)
2a 2b 2c 2d 2e
repeat
S4
2A(2)
2a 2b 2c 4c 4d
BB
FB
4A(4)
4a 4b 2d 2e
S3
2A(2)
2a 2b 2c 4d
BB
FB
4A(4)
4a 4b 4c 2d 2e
S2
2A(2)
2a 2b 2c 2d 4d
BB
FB
4A(4)
4a 4b 4c 2e
S1
2A(2)
2a 2b 2c 2d
BB
FB
4A(4)
4a 4b 4c 4d 2e
S0
2A(2)
2a 2b 2c 2d 2e
BB
FB
4A(4)
4a 4b 4c 4d

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/070193

A. CLASSIFICATION OF SUBJECT MATTER
D04B1/22(2006.01)i, *A43B23/02*(2006.01)i, *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)
A43B1/00-23/30, A43C1/00-19/00, A43D1/00-999/00, B29D35/00-35/14, 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 1996-2016
Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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 2012-036542 A (Shima Seiki Mfg., Ltd.), 23 February 2012 (23.02.2012), & EP 2418310 A2 & CN 102373563 A	1-4
A	JP 60-215802 A (Hayashi Knit Co., Ltd.), 29 October 1985 (29.10.1985), (Family: none)	1-4
A	WO 2015/037540 A1 (Shima Seiki Mfg., Ltd.), 19 March 2015 (19.03.2015), & US 2016/0213097 A1 & EP 3045067 A1 & CN 105636470 A & TW 201524395 A & KR 10-2016-0055249 A	1-4

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 October 2016 (03.10.16)	11 October 2016 (11.10.16)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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