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(71) Applicant: **SHIMA SEIKI MFG. LTD.**
Wakayama-shi
Wakayama 641-8511 (JP)

(72) Inventor: **Okuno, Masao**
Wakayama-shi
Wakayama, 641-8511 (JP)

(74) Representative: **Wagner, Karl H.**
Wagner & Geyer
Gewürzmühlstrasse 5
80538 Munich (DE)

(54) **Method of joining knitted fabric and knitted fabric**

(57) To provide a joining method of a knitted fabric in which damages of a knitting yarn such as yarn break are less likely to occur when joining knitted fabric portions lined left and right in needle beds. A first knitted fabric portion 3L and a second knitted fabric portion 2 are knitted, and stitches of one part of the first knitted fabric portion 3L and stitches of one part of the second knitted fabric portion 2 are joined through tubular knitting using a first yarn feeder 8 used for knitting the first knitted fabric portion 3L. Thereafter, a step α of moving the tubular knitted portion and the first knitted fabric portion 3L toward the second knitted fabric portion 2, a step β of moving only the first knitted fabric portion 3L towards the second knitted fabric portion 2, and a step γ of performing tubular knitting having double stitches 61 to 64 formed in the step α and the step β as both ends are repeated. In the middle of the repetition, a flechage portion 4L of the first knitted fabric portion 3L is formed using the first yarn feeder 8 at least once.

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a joining method of a knitted fabric using a flat knitting machine for knitting a first knitted fabric portion and a second knitted fabric portion lined left and right in a longitudinal direction of a needle bed and joining stitches with a boundary portion of the knitted fabric portions in between, and a knitted fabric including a portion knitted by the joining method.

Description of the Related Art

[0002] When knitting a V-neck vest in a seamless manner with a flat knitting machine, a body is knitted to a tubular form from a hem with one yarn feeder, a plurality of yarn feeders is added to form an opening at arm holes and a V-neck, and stitches of the terminating ends of a front body and a back body are joined at left and right shoulder portions. Upon joining the shoulder, the stitches lined facing each other in the front and back bodies are subjected to a bind-off process (see patent document 1).

[0003] Fig. 3 is a schematic view of a V-neck vest (knitted fabric) 1. A central part of a front body 3 of the V-neck vest 1 shown in Fig. 3 is opened so as to divide the body into a right front body 3R and a left front body 3L. The right front body 3R and a back body 2 are joined at a right shoulder joining portion 6R, and the left front body 3L and the back body 2 are joined at a left shoulder joining portion 6L. A method of knitting the V-neck vest 1 includes a method of knitting the back body 2, the right front body 3R and the left front body 3L lined left and right in a knitting width direction, as shown in Fig. 4.

[0004] In the knitting shown in Fig. 4, each body 2, 3R, 3L is first knitted by return knitting up to a lower end of the arm holes of the V-neck vest 1. From above the lower end, each body 2, 3R, 3L is knitted by return knitting using different yarn feeders. From a position of an upper end of the arm holes, flechage knitting of sequentially reducing the knitting width is carried out, thus forming a right front flechage portion 4R of the right front body 3R, a left front flechage portion 4L of the left front body 3L, and a right back flechage portion 5R and a left back flechage portion 5L of the back body 2. Lastly, the right front flechage portion 4R and the right back flechage portion 5R are joined through the bind-off process, and the left front flechage portion 4L and the left back flechage portion 5L are joined through the bind-off process. That is, the bind-off process is sequentially performed on the stitches in a form indicated with arrows in Fig. 4 from the stitches close to the boundary portion to complete the V-neck vest 1 of Fig. 3.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0005] [Patent Document 1] Japanese Unexamined Patent Publication No. 2-91254

SUMMARY OF THE INVENTION

[0006] In the bind-off process, double stitches are formed by transferring stitches. The formed double stitches are sequentially removed from knitting needles by forming a new stitch following the double stitches. The other remaining stitches are repeatedly transferred to approach the stitch to become the double stitch until they themselves are subjected to the bind-off process. That is, the more outer side the stitch is positioned in the knitting width direction of the right front flechage portion 4R and the left front flechage portion 4L, the more times the transfer is carried out until the stitch is subjected to the bind-off process. As a result, damages such as yarn break may occur in the course of repeating the transfer.

[0007] In light of the foregoing, it is an object of the present invention to provide a joining method of a knitted fabric in which damages of the knitting yarn such as yarn break are less likely to occur when joining the knitted fabric portions lined left and right in the needle beds. It is another object of the present invention to provide a knitted fabric including a portion knitted with the joining method of the knitted fabric of the present invention.

[0008] A joining method of a knitted fabric according to the present invention is a joining method of a knitted fabric using a flat knitting machine, which includes at least a front and a back needle bed and a first yarn feeder and a second yarn feeder for supplying a knitting yarn to the needle beds and in which stitches are transferrable between the front and back needle beds, for sequentially joining a first knitted fabric portion, which is knitted using the first yarn feeder, and a second knitted fabric portion, which is knitted using the second yarn feeder in parallel to a wale direction of the first knitted fabric portion, from a side close to a boundary portion of the knitted fabric portions. In the joining method of the knitted fabric of the present invention, tubular knitting is carried out on the knitting needles of the front and back needle beds including the knitting needles, on which stitches of one part of the first knitted fabric portion and stitches of one part of the second knitted fabric portion located near the boundary portion are held, using the first yarn feeder to join one part of the knitted fabric portions, and then the following steps α to γ are repeated. In the middle of the repetition, a flechage knitting for forming a new stitch row following in a wale direction of the first knitted fabric portion is carried out using the first yarn feeder at least once.

[Step α] Move all the stitches formed by the tubular knitting and all the stitches of the first knitted fabric portion toward the second knitted fabric portion to

overlap some of the stitches formed by the tubular knitting with some of the stitches of the second knitted fabric portion.

[Step β] Move all the stitches of the first knitted fabric portion toward the second knitted fabric portion to overlap some of the stitches of the first knitted fabric portion with some of the stitches formed by the tubular knitting.

[Step γ] Perform tubular knitting having double stitches formed by the step α and double stitches formed by the step β as both ends using the first yarn feeder.

[0009] The number of times to perform the knitting of the flechage portion of the first knitted fabric portion in the middle of the repetition of the steps α to γ is appropriately selected depending on the extent of the angle of inclination to be formed by the flechage portion. For instance, the flechage portion of the first knitted fabric portion may be knitted every time the steps α to γ are carried out, or the flechage portion of the first knitted fabric portion may be knitted every time the steps α to γ are carried out plural times. The timing at which the flechage portion of the first knitted fabric portion is knitted is not particularly limited, but is preferably after the steps α, β are carried out and before the step γ is carried out, as shown in the first embodiment to be described later.

[0010] According to one aspect of the joining method of the knitted fabric of the present invention, when moving the stitches in the step α and the step β, the stitches formed by the tubular knitting are preferably overlapped on a front side of the first knitted fabric portion and the second knitted fabric portion. The front side of the first knitted fabric portion and the second knitted fabric portion is the side that becomes the front side of the knitted fabric when the finished knitted fabric is worn. This will be specifically described in the second embodiment.

[0011] According to one aspect of the joining method of the knitted fabric of the present invention, the first knitted fabric portion and the second knitted fabric portion are preferably knitted through double knitting respectively. The double knitting is a knitting in which the first knitting, in which stitches are alternately formed on every other knitting needles of the front needle bed and every other knitting needles of the back needle bed, and a second knitting, in which stitches are alternately formed on the knitting needles of the front needle bed and the back needle bed that are not used in the first knitting, are alternately repeated. The first knitted fabric portion and the second knitted fabric portion may be knitted with plain knitting or may be knitted with rib knitting.

[0012] A knitted fabric of the present invention is a knitted fabric knitted using a flat knitting machine, which includes at least a front and a back needle bed and a plurality of yarn feeders for supplying a knitting yarn to the needle beds and in which stitches are transferrable between the front and back needle beds, the knitted fabric including a first knitted fabric portion having a flechage portion in which a knitting width sequentially becomes narrower towards an upper side in a wale direction, a second knitted fabric portion and a joining portion for sequentially joining the first knitted fabric portion and the second knitted fabric portion from a lower side in the wale direction. The flechage portion of the first knitted fabric portion and the joining portion in the knitted fabric of the present invention are knitted with a common knitting yarn, and the second knitted fabric portion is knitted with a knitting yarn different from the knitting yarn of the first knitted fabric portion and the joining portion is formed by a tubular knitting carried out every time at least one part of the flechage portion of the first knitted fabric portion is knitted.

[0013] According to the joining method of the knitted fabric of the present invention, the knitted fabric in which the first knitted fabric portion having the flechage portion and the second knitted fabric portion are joined through tubular knitting can be knitted. In the joining method of the knitted fabric of the present invention, when joining the first knitted fabric portion and the second knitted fabric portion, the first knitted fabric portion is moved towards the second knitted fabric portion (towards boundary portion) without moving the second knitted fabric portion to join the knitted fabric portions. Furthermore, the number of transfers carried out on the same stitch is reduced since the flechage portion of the first knitted fabric portion is formed by the flechage knitting in the middle of the joining of the first knitted fabric portion and the second knitted fabric portion. As a result, the possibility of damages of the knitting yarn caused by the transfer can be greatly lowered.

[0014] In the joining method of the knitted fabric of the present invention, the appearance of the tubular knitted portions and the position of the boundary of the knitted fabric portions can be improved by overlapping the stitches formed by the tubular knitting on the front side of the first knitted fabric portion and the second knitted fabric portion.

[0015] In the joining method of the knitted fabric of the present invention, a knitted fabric with thickness and satisfactory appearance can be knitted by knitting the first knitted fabric portion and the second knitted fabric portion by double knitting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a knitting step diagram according to a joining method of a knitted fabric shown in a first embodiment;

Fig. 2 is a view showing a partially enlarged photograph of a shoulder joining portion of a V-neck vest knitted according to the knitting steps of Fig. 1;

Fig. 3 is a schematic diagram of a V-neck vest opened at the front; and

Fig. 4 is a schematic diagram showing a procedure of a conventional method of knitting the V-neck vest

of Fig. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] An embodiment of the present invention will be hereinafter described based on the drawings. The knitting described in the embodiment describes a knitting example using a four-bed flat knitting machine including a lower front needle bed (FB) and a lower back needle bed (BB) extending in a transverse direction and disposed opposite to each other in a cross section, and an upper front needle bed and an upper back needle bed arranged above the FB and the BB. The flat knitting machine to use may be a two-bed flat knitting machine, or a two-bed flat knitting machine including a transfer jack bed. In the case of the two-bed flat knitting machines, a half gauge knitting in which an empty needle is provided between adjacent stitches is carried out.

<First embodiment>

[0018] In the present embodiment, an example in which a joining method of a knitted fabric of the present invention is applied to the formation of a right shoulder joining portion 6R and a left shoulder joining portion 6L in a V-neck vest 1 shown in Fig. 3 will be described. As described above, joining by a bind-off process is carried out after knitting all flechage portions 4R, 4L, 5R, 5L in a conventional knitting procedure shown in Fig. 4. In the joining method of the knitted fabric of the present invention, on the other hand, the flechage portions 5R, 5L of the back body 2 are knitted before starting the joining, but the flechage portions 4R, 4L of the right front body 3R and the left front body 3L are not yet knitted. The flechage portions 4R, 4L are knitted while joining. The joining of the left front body (first knitted fabric portion) 3L and the back body (second knitted fabric portion) 2 will be described below with reference to Fig. 1. The joining of the right front body 3R and the back body 2 is carried out similarly to Fig. 1, and thus the description thereof will be omitted.

[0019] In Fig. 1, "S + number" indicates the number of the knitting step, black dots indicate the knitting needles arranged in the FB and the BB, A to V indicate the positions of the knitting needles of the FB and the BB, and a chain dashed line X-X indicates a boundary portion of the first knitted fabric portion 3L and the second knitted fabric portion 2. In Fig. 1, the stitches actually knitted or transferred in each knitting step are shown. The knitting needles of the upper front needle bed and the upper back needle bed are only used in transferring the stitches, and thus are not illustrated.

[0020] In S1 and S2, a state of knitting the left front body (first knitted fabric portion) 3L using a yarn feeder (first yarn feeder) 8 through double knitting is shown. The double knitting includes alternately repeating a first knitting (see S1) of alternately forming stitches on every other knitting needles of the FB and every other knitting needles of the BB, and a second knitting (see S2) of alternately forming stitches on the knitting needles of the FB and the BB that are not used in the first knitting. Assume that the knitting of the back body (second knitted fabric portion) 2 is finished up to the flechage portion 5L. This flechage portion 5L is also knitted with the double knitting so as to be held on both the FB and the BB in S1.

[0021] In S3, S4, a tubular knitting is carried out using knitting needles of the FB and the BB including the knitting needles on which stitches of one part of the first knitted fabric portion 3L are held and knitting needles on which the stitches of the second knitted fabric portion 5L are held, the stitches being located near a boundary portion X of the first knitted fabric portion 3L and the flechage portion 5L of the second knitted fabric portion 2. Specifically, in S3, the first yarn feeder 8 is moved in a right direction in the plane of drawing to form a new stitch following the stitches of the flechage portion 5L of the second knitted fabric portion 2 held on the knitting needles J, K of the BB and the stitches of the first knitted fabric portion 3L held on the knitting needles L, M of the BB. The first yarn feeder 8 is moved in the left direction in the plane of drawing in S4 to form a new stitch following the stitches of the first knitted fabric portion 3L held on the knitting needles M, L of the FB and the stitches of the flechage portion 5L of the second knitted fabric portion 2 held on the knitting needles K, J of the FB.

[0022] In S5, the stitches of the tubular knitted portion (joining portion 6L) and the stitches of the first knitted fabric portion 3L held on the knitting needles J to V of the FB and the knitting needles J to V of the BB are moved by one needle toward the second knitted fabric portion 2. As a result, a double stitch 61 is formed on the knitting needle I of the FB and a double stitch 62 is formed on the knitting needle I of the BB. S5 corresponds to a first step α in the joining method of the knitted fabric of the present invention.

[0023] The movement of the stitches is shown only with an arrow in the figure, but the upper needle beds and a racking are actually used. For instance, when moving the stitch held on the knitting needle of the FB to the adjacent knitting needle, the relevant stitch is once transferred to the upper back needle bed (BU), the BU is racked, and then the stitch at the BU is transferred to the FB.

[0024] In S6, the stitches of the first knitted fabric portion 3L held on the knitting needles M to U of the FB and the knitting needles M to U of the BB are moved by one needle toward the second knitted fabric portion 2. As a result, a double stitch 63 is formed on the knitting needle L of the FB and a double stitch 64 is formed on the knitting needle L of the BB. S6 corresponds to a first step β in the joining method of the knitted fabric of the present invention.

[0025] In S7 and S8, the tubular knitting is carried out with the double stitches 61, 62 formed in S5 and the double stitches 63, 64 formed in S6 as both ends. S7 and S8 correspond to a first step γ in the joining method of

the knitted fabric of the present invention.

[0026] Similar to S5, in S9, the stitches of the tubular knitted portion (joining portion 6L) and the stitches of the first knitted fabric portion 3L held on the knitting needles I to T of the FB and the knitting needles I to T of the BB are moved by one needle toward the second knitted fabric portion 2. As a result, the double stitches 61, 62 are formed on the knitting needle H of the FB and the knitting needle H of the BB. S9 corresponds to a second step α in the joining method of the knitted fabric of the present invention.

[0027] Similar to S6, in S10, the stitches of the first knitted fabric portion 3L held on the knitting needles L to S of the FB and the knitting needles L to S of the BB are moved by one needle toward the second knitted fabric portion 2. As a result, the double stitches 63, 64 are formed on the knitting needle K of the FB and the knitting needle K of the BB. S10 corresponds to a second step β in the joining method of the knitted fabric of the present invention.

[0028] In S11 and S12, a new stitch row following the first tubular knitted fabric portion 3L is knitted by the double knitting. Specifically, the first yarn feeder 8 is moved in the right direction in the plane of drawing to alternately form stitches on the knitting needles L, N, P, R of the BB and the knitting needles M, O, Q of the FB, and then the first yarn feeder 8 is moved in the left direction in the plane of drawing to alternately form stitches on the knitting needles R, P, N, L of the FB and the knitting needles Q, O, M of the BB. The new stitch row becomes one part of the left front flechage portion (flechage portion of the first knitted fabric portion) 4L in Fig. 4.

[0029] In S13 and S14, the tubular knitting is carried out with the double stitches 61, 62 formed in S9 and the double stitches 63, 64 formed in S10 as both ends. S13 and S14 correspond to a second step γ in the joining method of the knitted fabric of the present invention.

[0030] In the present embodiment, the formation of the flechage portion 4L is carried out once every time the joining by the tubular knitting is carried out twice, but the ratio of the joining and the knitting of the flechage portion 4L may be appropriately selected depending on the extent of inclination of the flechage portion 4L. For example, the formation of the flechage portion 4L may be carried out once every time the joining is carried out once. Alternatively, the formation of the flechage portion 4L may be carried out once every time the joining is carried out three times or more.

[0031] Thereafter, the joining of the first knitted fabric portion 3L and the second knitted fabric portion 2 by the tubular knitting and the knitting of the flechage portion 4L of the first knitted fabric portion 3L are repeated. At the time point S14 is finished, the stitches subjected to the transfer in S5, S6, S9, and S10 are all removed from the FB and the BB. That is, at the time point of S14, all the stitches held on the FB and the BB are the stitches that are not transferred even once. Thus, even if the transfer of the stitches is carried out for joining after S14, the knitting yarn configuring the stitches to be transferred is less likely to break.

[0032] A partially enlarged photograph of the shoulder joining portion 6L of the V-neck vest 1 formed by the joining method of the knitted fabric described above is shown in Fig. 2. As shown in Fig. 2, the flechage portion 4L of the first knitted fabric portion 3L and the flechage portion 5L of the second knitted fabric portion 2 are joined by the shoulder joining portion (joining portion) 6L formed by the tubular knitting. As described with reference to Fig. 1, the joining portion 6L is knitted with a knitting yarn common with the knitting yarn configuring the flechage portion 4L of the first knitted fabric portion 3L and different from the knitting yarn configuring the flechage portion 5L of the second knitted fabric portion 2.

<Second embodiment>

[0033] In the second embodiment, a joining method of a knitted fabric of the present invention that enables all the stitches formed by the tubular knitting to be arranged on the front side of the knitted fabric will be described.

[0034] In S6 of Fig. 1 of the first embodiment, the first knitted fabric portion 3L is moved without moving the tubular knitted portion to form the double stitches 63, 64, so that the stitches formed by the tubular knitting are arranged on the front side of the double stitches 63, 64 (i.e., front side of the V-neck vest 1). In S5 of Fig. 1, on the other hand, the stitches formed by the tubular knitting is moved without moving the second knitted fabric portion 2 to form the double stitches 61, 62, so that the stitches formed by the tubular knitting are arranged on the back side of the double stitches 61, 62 (i.e., back side of the V-neck vest 1). By uniforming the overlapping manner at the double stitches 61 to 64 so that the stitches formed by the tubular knitting are on the front side of the V-neck vest 1, the appearance of the left shoulder joining portion (joining portion) 6L can be improved.

[0035] In order to uniform the overlapping manner as described above, S5 of Fig. 1 is to be changed as below. First, the stitch of the second knitted fabric portion 2 held on the knitting needle I of the FB, the stitches formed by the tubular knitting held on the knitting needles J to M of the FB, and the stitches of the first knitted fabric portion 3L held on the knitting needles N to V of the FB are transferred to the upper back needle bed. Next, only the stitch of the second knitted fabric portion 2 is left on the upper back needle bed, and the remaining stitches are transferred to the knitting needles I to U of the FB. Thereafter, the stitch of the second knitted fabric portion 2 left on the upper back needle bed is transferred to the knitting needle I of the FB. As a result, the double stitch 61 in which the stitch formed by the tubular knitting is arranged on the front side (i.e., front side of the V-neck vest 1) is formed on the knitting needle I of the FB. The stitches held on the BB are transferred similarly to the stitches held on the FB described above, where the needle bed to transfer the stitches is changed to the upper front nee-

dle bed.

<Third embodiment>

[0036] In the first and second embodiments, the flechage portion having an inclination is formed in both the first knitted fabric portion and the second knitted fabric portion to be joined. However, the joining method of the knitted fabric of the present invention can be applied even if the second knitted fabric portion does not include the flechage portion having an inclination. In this case, the second knitted fabric portion 2 held on the knitting needles A to K of the FB and the BB is formed to be flat without inclination in S1 of Fig. 1, for example, and the subsequent knitting is carried out similar to Fig. 1.

[0037] The first knitted fabric portion and the second knitted fabric portion may be knitted with plain knitting or may be knitted with rib knitting. In the case of plain knitting, the first knitted fabric portion and the second knitted fabric portion are held on only either one of the FB or the BB. Thus, a pickup stitch is formed on an empty needle in the tubular knitting of first connecting the first knitted fabric portion and the second knitted fabric portion.

Claims

1. A joining method of a knitted fabric using a flat knitting machine, which includes at least a front and a back needle bed and a first yarn feeder (8) and a second yarn feeder for supplying a knitting yarn to the needle beds and in which stitches are transferrable between the front and back needle beds, for sequentially joining a first knitted fabric portion (3L), which is knitted using the first yarn feeder (8), and a second knitted fabric portion (2), which is knitted using the second yarn feeder in parallel to a wale direction of the first knitted fabric portion (3L), from a side close to a boundary portion (X) of the knitted fabric portions; the method **characterized in that**,
after performing tubular knitting on the knitting needles of the front and back needle beds including the knitting needles, on which stitches of one part of the first knitted fabric portion (3L) and stitches of one part of the second knitted fabric portion (2) located near the boundary portion (X) are held, using the first yarn feeder (8) to join one part of the knitted fabric portions (3L, 2),
step α of moving all the stitches formed by the tubular knitting and all the stitches of the first knitted fabric portion (3L) toward the second knitted fabric portion (2) to overlap some of the stitches formed by the tubular knitting with some of the stitches of the second knitted fabric portion (2);
step β of moving all the stitches of the first knitted fabric portion (3L) toward the second knitted fabric portion (2) to overlap some of the stitches of the first knitted fabric portion (3L) with some of the stitches formed by the tubular knitting; and
step γ of performing tubular knitting having double stitches (61, 62) formed by the step α and double stitches (63, 64) formed by the step β as both ends using the first yarn feeder (8) are repeated,
wherein a flechage knitting for forming a new stitch row following in a wale direction of the first knitted fabric portion 3L is carried out using the first yarn feeder (8) at least once in the middle of the repetition.

2. The joining method of the knitted fabric according to claim 1, **characterized in that** when moving the stitches in the step α and the step β, the stitches formed by the tubular knitting are overlapped on a front side of the first knitted fabric portion (3L) and the second knitted fabric portion (2).

3. The joining method of the knitted fabric according to claim 1 or 2, **characterized in that** the first knitted fabric portion (3L) and the second knitted fabric portion (2) are respectively knitted through double knitting.

4. A knitted fabric knitted using a flat knitting machine, which includes at least a front and a back needle bed and a plurality of yarn feeders for supplying a knitting yarn to the needle beds and in which stitches are transferrable between the front and back needle beds, the knitted fabric including a first knitted fabric portion (3L) having a flechage portion (4L) in which a knitting width sequentially becomes narrower towards an upper side in a wale direction, a second knitted fabric portion (2), and a joining portion (6L) for sequentially joining the first knitted fabric portion (3L) and the second knitted fabric portion (2) from a lower side in the wale direction; **characterized in that**
the flechage portion (4L) of the first knitted fabric portion (3) and the joining portion (6L) are knitted with a common knitting yarn, and the second knitted fabric portion (2) is knitted with a knitting yarn different from the knitting yarn of the first knitted fabric portion (3L); and
the joining portion (6L) is formed by a tubular knitting carried out every time at least one part of the flechage portion (4L) in the first knitted fabric portion 3L is knitted.

Fig. 1

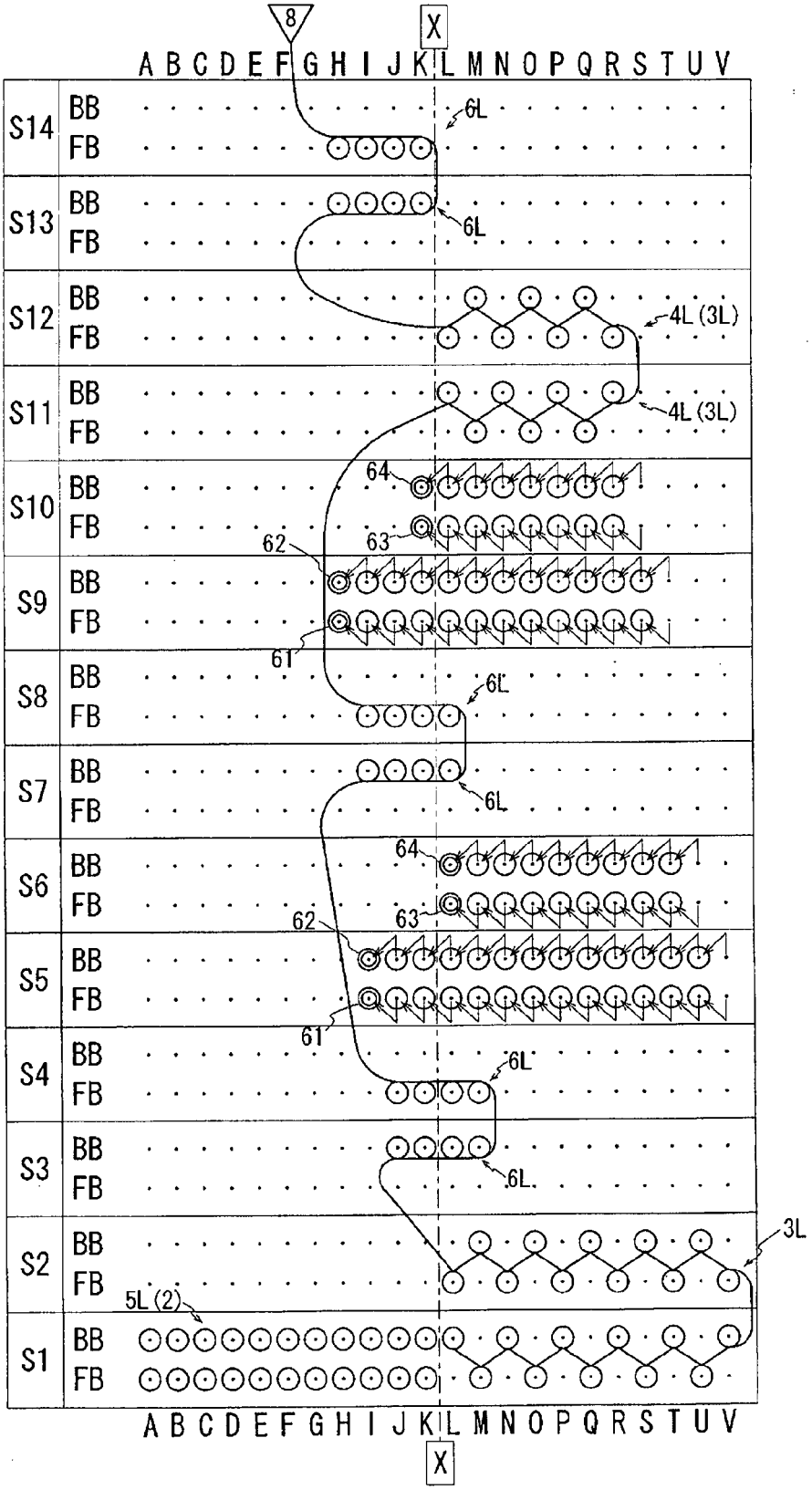

8
X
A B C D E F G H I J K L M N O P Q R S T U V
S14
S13
S12
S11
S10
S9
S8
S7
S6
S5
S4
S3
S2
S1
BB
FB
6L
4L (3L)
64
63
62
61
3L
5L (2)

Fig. 2

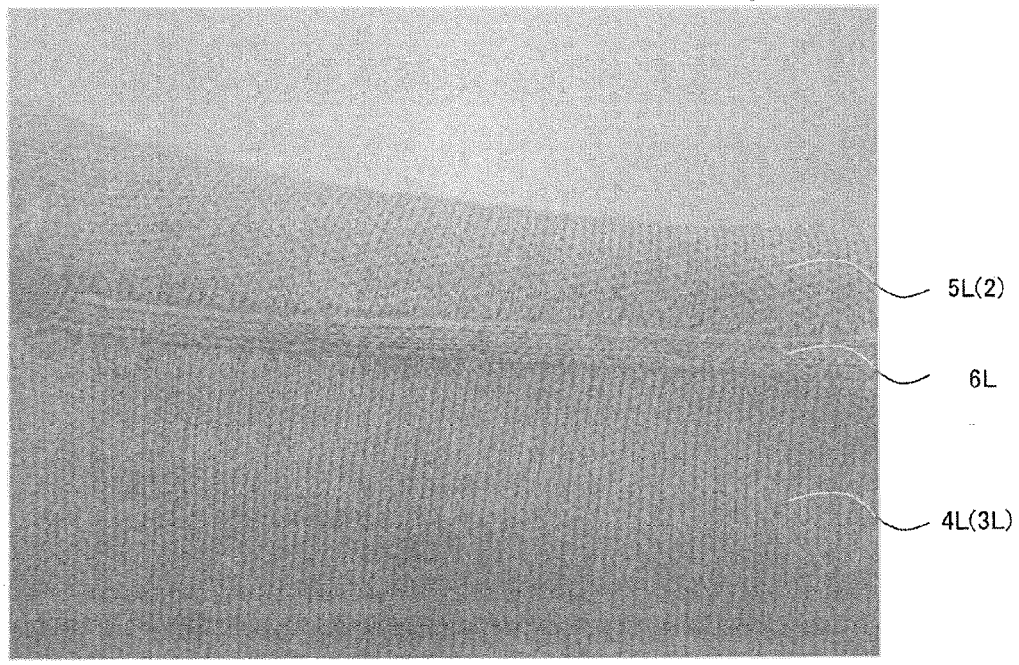


Fig. 3

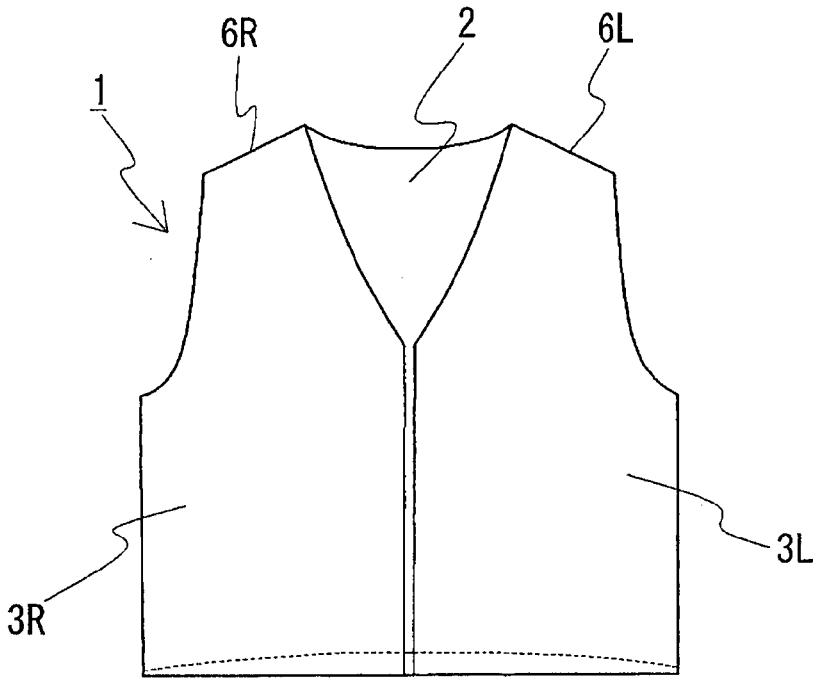
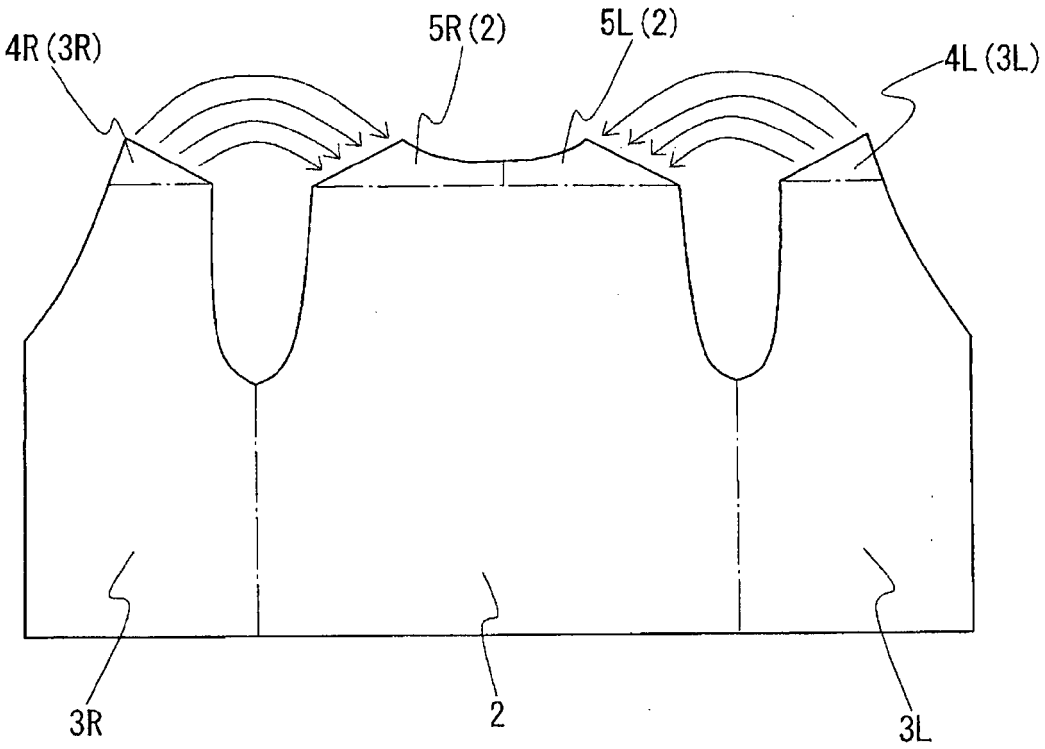


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 12 00 6474

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 116 807 A1 (SHIMA SEIKI MFG [JP]) 18 July 2001 (2001-07-18) * paragraphs [0006] - [0019]; figures 1,4-8 *	1-4	INV. D04B1/24
A	EP 1 371 767 A1 (SHIMA SEIKI MFG [JP]) 17 December 2003 (2003-12-17) * paragraphs [0008], [0009], [0022] - [0024]; figures 4,5 *	1-4	
A	GB 2 309 981 A (SHIMA SEIKI MFG [JP]) 13 August 1997 (1997-08-13) * pages 9,10; figures 1,4-8 * * pages 13-15 * * pages 20-30 *	1-4	
A	EP 0 781 880 A1 (SHIMA SEIKI MFG [JP]) 2 July 1997 (1997-07-02) * column 5, line 31 - column 12, line 33; figures 3-11 *	1-4	
A,D	JP 2 091254 A (SHIMA SEIKI MFG) 30 March 1990 (1990-03-30) * the whole document *	1-4	TECHNICAL FIELDS SEARCHED (IPC) D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 March 2013	Wendl, Helen

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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