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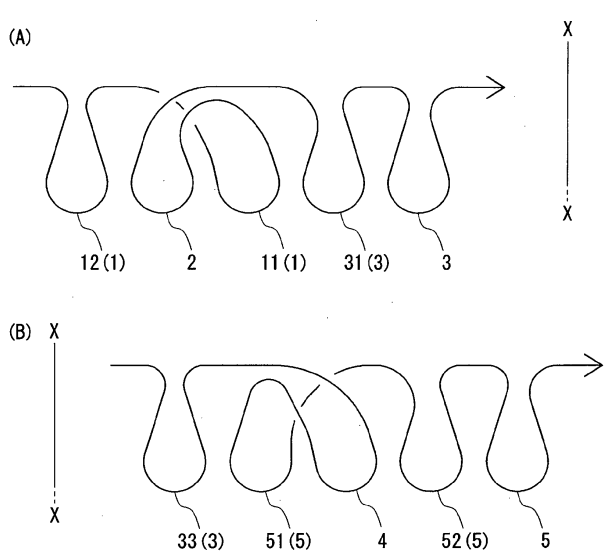
(54) Inner widening method and knitted fabric

(57) The present invention provides an inner widening method for effectively preventing a hole from being formed in a location where a widening stitch is formed when an inner widening operation is carried out in knitting a knitted fabric. When the inner widening operation is carried out using a flat knitting machine, a preceding stitch row 1, an intermediate stitch row 3 and a following stitch row 5 each including a plurality of stitches are knitted in this order. At this time, one side widening stitch 2 is formed after knitting the preceding stitch row 1 and before knitting the intermediate stitch row 3, and the other side widening stitch 4 is formed after knitting the intermediate stitch row 3 and before knitting the following stitch row 5. The widening stitches 2 and 4 are inserted into a knitting width of the preceding stitch row 1 and a knitting width of the following stitch row 5, respectively. With this configuration, the knitting widths of the knitted fabric are increased by the widening stitches 2 and 4, and holes are prevented from being formed in locations where the widening stitches 2 and 4 are formed.

Fig. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to an inner widening method for forming a widening stitch on an inner side of an end of a knitted fabric held on a needle bed in a longitudinal direction of the needle bed when knitting the knitted fabric using a flat knitting machine, and also relates to a knitted fabric which is knitted using this method.

BACKGROUND ART

[0002] Conventionally, in a process for knitting a knitted fabric using a flat knitting machine, a widening stitch is formed in some cases for knitting the knitted fabric into a desired shape. As a method for forming such a widening stitch, there is known an inner widening method in which plural stitches located at an end of the knitted fabric held on a needle bed in a longitudinal direction of the needle bed are moved to an outer side in the longitudinal direction of the needle bed to make an empty needle in a knitting region of the knitted fabric, and a pick up stitch is formed on the empty needle to increase a knitting width.

[0003] However, according to this inner widening method, since a yarn is fed on an empty needle having no stitch of a preceding course, a widening stitch of a pick up stitch is formed and therefore, a hole is likely to be made in a location where the widening stitch is formed. Hence, as the inner widening method for making a hole in the location where the widening stitch is formed less noticeable, the present applicant has carried out a split knitting for splitting one stitch into two stitches as described in Patent Document 1. However, since there is a flat knitting machine which cannot perform the split knitting, there is also proposed an inner widening method which is capable of making a hole in a location where a widening stitch is formed less noticeable even by a flat knitting machine which cannot perform the split knitting as shown below.

[0004] Fig. 8 is a part of a knitting step diagram of a general inner widening method for making a hole in a location where a pair of widening stitches are formed less noticeable by using a four-bed flat knitting machine having two pairs of mutually opposing front and back needle beds. The pair of widening stitches are formed at symmetric positions with respect to a reference line X-X dividing knitted fabric in two in a knitting width of the knitted fabric. In the drawing, a lower front needle bed, a lower back needle bed, an upper front needle bed and an upper back needle bed are called FD, BD, FU and BU, respectively. In the knitting step diagram in Fig. 8, the alphabet+number shown on the left side in the drawing indicates a step number, left and right arrows show a knitting direction or a moving direction of a yarn feeder 9, and upper, lower and diagonal arrows show transfer directions. Symbols A to R in the drawings indicate knitting needles of the front needle beds (FD, FU), and symbols a to r indicate knitting needles of back needle beds (BD, BU). In the drawing, O indicates a stitch, a symbol V indicates a pick up stitch, and actions that are actually carried out in each of the knitting steps are shown with thick lines. In Fig. 8, for the sake of convenience of explanation, the number of knitting needles is reduced as compared with the number of knitting needles used in the actual knitting operation, and it is assumed that all of the knitting operations are carried out by plain knitting. In the drawing, a racking action in a transfer of a stitch attended with racking is not shown. A manner of viewing the drawing is also the same in Fig. 1 and Figs. 3 to 6, which are the drawings of later-described embodiments.

[0005] Here, V1 shows a state where a tubular knitted fabric is knitted on knitting needles c to p of the BD and knitting needles P to C of the FD by circling knitting. From this state, in V2, stitches held on the knitting needles c to e and n to p of the BD are transferred to the knitting needles C to E and N to P of the opposing FU. Subsequently, in V3 and V4, stitches transferred to the knitting needles N to P and C to E of the FU in V2 are transferred to the knitting needles o to q and b to d of the opposing BD, thereby the knitting needles e and n of the BD become empty needles for forming widening stitches.

[0006] In V5 to V9, a back knitted fabric part of the knitted fabric is knitted while forming widening stitches as pick up stitches on the knitting needles which have become empty needles by V3 and V4. More specifically, in V5, a yarn feeder 9 is moved from left to right in the drawing, and stitches are formed on knitting needles b to d of the BD. In V6, the yarn feeder 9 is moved leftward, and a widening stitch of a pick up stitch is formed on the knitting needle e of the BD. In V7, the yarn feeder 9 is moved rightward, and stitches are formed on the knitting needles f to m of the BD. In V8, the yarn feeder 9 is moved leftward, and a widening stitch of a pick up stitch is formed on the knitting needle n of the BD. In V9, the yarn feeder 9 is moved rightward, and stitches are formed on the knitting needles o to q of the BD. While the knitting operations of V5 to V9 proceeds generally from left to right, pick up stitches are formed on the knitting needles e and n of the BD by feeding a yarn from right to left, and thus, the pick up stitch becomes a twisted stitch.

[0007] Since the widening stitch becomes the twisted stitch, a distance between stitches which sandwich the twisted stitch is shortened and thus, it is possible to make a hole in a location where the widening stitch is formed less noticeable.

PRIOR ART DOCUMENT

PATENT DOCUMENTS

[0008]

[Patent Document 1] Japanese Examined Patent Publication No. S62-52063

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0009] However, an effect of making the hole less noticeable may be insufficient in some cases depending upon kinds of knitting yarns used for knitting or a knitting structure near a location where the widening stitch is formed, and it is desired to develop an inner widening method in which a hole can be made less noticeable more effectively.

[0010] The present invention has been made in view of the above circumstances, and an object of the present invention is to provide an inner widening method for effectively preventing a hole from being formed in a location where a widening stitch is formed when an inner widening operation is carried out for knitting a knitted fabric, and also to provide a knitted fabric which is knitted by the inner widening method.

MEANS FOR SOLVING THE PROBLEMS

[0011] The present invention provides an inner widening method, using a flat knitting machine having at least a pair of front and back needle beds and a yarn feeder which feeds a knitting yarn to a plurality of knitting needles disposed on each of the needle beds, for forming a pair of widening stitches on both sides of an intermediate stitch row including a plurality of continuously knitted stitches when the widening stitches are formed on an inner side of an end of knitted fabric held on the needle bed in a longitudinal direction of the needle bed. The inner widening method of the present invention includes the following process, and the following operations 1 and 2 are carried out during or after the process.

[Process] Before the intermediate stitch row is knitted, a preceding stitch row including a plurality of stitches is knitted and then, one side widening stitch of a twisted stitch is formed on an empty needle of any of the front and back needle beds near a terminal stitch of the preceding stitch row. Next, the intermediate stitch row is knitted after knitting the preceding stitch row. The other side widening stitch of a twisted stitch is formed on an empty needle of any of the front and back needle beds near a terminal stitch of the intermediate stitch row and then, a following stitch row including a plurality of stitches is knitted.

[Operation 1] The one side widening stitch is inserted into a knitting width of the preceding stitch row or into a knitting width of the intermediate stitch row.

[Operation 2] When the one side widening stitch is inserted into the knitting width of the preceding stitch row, the other side widening stitch is inserted into the knitting width of the following stitch row. When the one side widening stitch is inserted into the knitting width of the intermediate stitch row, the other side widening stitch is inserted into the knitting width of the intermediate stitch row.

[0012] The inner widening method of the present invention can be utilized for forming a pair of widening stitches in a tubular knitted fabric. For example, when the inner widening method of the present invention is applied to increase a width of a body of a sweater, preferably, a reference line which divides the body in two in a knitting width direction is defined, and a pair of widening stitches are formed at bilaterally symmetric positions on both sides of the reference line in the same knitting course. The inner widening method of the present invention can also be utilized for forming a pair of widening stitches in a single knitted fabric which does not have front and back knitted fabric parts (hereinafter, referred to as a handkerchief knitted fabric for the sake of convenience). For example, a reference line which divides the handkerchief knitted fabric in two in the knitting width direction is defined, and a pair of widening stitches may be formed at bilaterally symmetric positions on both sides of the reference line in the same knitting course. Alternatively, a reference line may not be particularly set on the handkerchief knitted fabric, a first widening stitch may be formed in one knitting course, and the remaining widening stitche may be formed in a knitting course which is located immediately above the knitting course, or in a knitting course which located a plurality of courses above the knitting course. For example, a preceding stitch row and one side widening stitch are formed toward one end of the handkerchief knitted fabric in the knitting width direction, and an intermediate stitch row which is folded back at the end is knitted. The other side widening stitch is formed and then, the following stitch row is knitted. In this case, the intermediate stitch row is formed over two courses.

[0013] Various timings can be selected for carrying out the operations 1 and 2. For example, as will be shown in a first embodiment described later, the operation 1 and the operation 2 may be carried out after the above process is carried out. Alternatively, as shown in a second embodiment, the operation 1 may be carried out when the forming operation of the one side widening stitch in the above process is completed and then, the operation 2 may be carried out when all the process is completed. As shown in a modified embodiment described later, by forming a space for forming the one side widening stitch in the preceding stitch row at the time when the forming operation of the preceding stitch row in the above process is completed, and by forming the one side widening stitch in the space, the one side widening stitch may be formed and inserted at the same time.

[0014] According to one aspect of the inner widening method of the present invention, it is preferable that the other side widening stitch is formed by a needle bed opposed to a needle bed which forms the one side widening stitch.

[0015] According to one aspect of the inner widening method of the present invention, it is preferable that, before the one side widening stitch is formed, one or more stitches of the preceding stitch row, which are already

formed on the needle bed at least except an end stitch close to the intermediate stitch row, are transferred to the opposing needle bed so that transfer of the one side widening stitch is unnecessary during a process of carrying out the inner widening operation, and the one side widening stitch is formed on the knitting needle which becomes an empty needle by the transfer.

[0016] The knitted fabric of the present invention is knitted using a flat knitting machine having at least a pair of front and back needle beds, and a yarn feeder which feeds a knitting yarn to a plurality of knitting needles disposed on each of the needle beds, and the knitted fabric includes three stitch rows including a plurality of stitches defined as a preceding stitch row, an intermediate stitch row, and a following stitch row in the knitting order. The knitted fabric of the present invention includes one side widening stitch which is a twisted stitch directly connected to an end stitch of the preceding stitch row close to the intermediate stitch row and to an end stitch of the intermediate stitch row close to the preceding stitch row, and the other side widening stitch which is a twisted stitch directly connected to an end stitch of the following stitch row close to the intermediate stitch row and to an end stitch of the intermediate stitch row close to the following stitch row. The one side widening stitch is inserted into the knitting width of the preceding stitch row or the knitting width of the intermediate stitch row, and the other side widening stitch is inserted into the knitting width of the following stitch row or the knitting width of the intermediate stitch row.

EFFECTS OF THE INVENTION

[0017] According to the inner widening method of the present invention, the preceding stitch row, the one side widening stitch, and the intermediate stitch row are knitted in this order, and the one side widening stitch is inserted into the knitting width of the preceding stitch row or the knitting width of the intermediate stitch row. In this manner, a knitting yarn that connects the stitches sandwiching a position where the one side widening stitch is inserted extends so as to cross over the one side widening stitch. Therefore, it is possible to make a hole formed by the one side widening stitch less noticeable. Similarly, at a location where the other side widening stitch is formed, a knitting yarn that connects the stitches sandwiching a position where the other side widening stitch is inserted extends so as to cross over the other side widening stitch. Therefore, it is possible to make a hole formed by the other side widening stitch less noticeable. As a result, by using the inner widening method of the present invention, it is possible to obtain a knitted fabric of the present invention having an excellent appearance in which a hole is less noticeable.

[0018] In this case, by aligning both positions where the one side widening stitch and the other side widening stitch are inserted to the side of the intermediate stitch row or to the side separated away from the intermediate stitch row, the appearance of the knitted fabric can be improved. For example, as shown in the first embodiment, by inserting both the widening stitches in a direction separating away from the reference line when knitting a tubular knitted fabric which defines the reference line, the widening stitches are formed symmetrically with respect to the reference line, and the appearance of the knitted fabric is improved. In the case of the handkerchief knitted fabric in which a reference line is not set, by inserting both the widening stitches in a direction of the intermediate stitch row, the two widening stitches which span over two courses are inclined in the same direction and the appearance of the knitted fabric is improved.

[0019] By forming the other side widening stitch on a needle bed which is opposed to a needle bed which forms the one side widening stitch, formed states of both the widening stitches can be made the same. In particular, when the reference line which divides the knitted fabric in two in the knitting width direction is defined and both the widening stitches are formed at symmetric positions with respect to the reference line, states of the stitches near a location where the widening stitches are formed on both sides of the reference line can be made completely line symmetric. This point will be described in detail in the first embodiment with reference to Figs. 1 and 2.

[0020] When the transfer of the one side widening stitch in the process of the inner widening operation is not necessary, knitting efficiency of the inner widening operation can be greatly enhanced. This point will be described in detail in the modified embodiment with reference to Fig. 3.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig. 1 is a knitting step diagram of an inner widening method shown in a first embodiment;

Fig. 2(A) is a loop diagram near a location where a widening stitch located on the left side in the knitting step diagram in Fig. 1 is formed, and Fig. 2(B) is a loop diagram near a location where a widening stitch located on the right side in the knitting step diagram in Fig. 1 is formed;

Fig. 3 is a knitting step diagram of an inner widening method of a modified embodiment;

Fig. 4 is a first knitting step diagram of an inner widening method of a second embodiment;

Fig. 5 is a second knitting step diagram of the inner widening method of the second embodiment;

Fig. 6 is a knitting step diagram of an inner widening method of a third embodiment;

Fig. 7(A) is a loop diagram near a location where a widening stitch located on the left side in the knitting step diagram in Fig. 6 is formed, and Fig. 7(B) is a loop diagram near a location where a widening stitch located on the right side in the knitting step diagram in Fig. 6 is formed; and

Fig. 8 is a knitting step diagram of a conventional inner widening method.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Embodiments of the present invention will be described below with reference to a four-bed flat knitting machine having two pairs of front and back needle beds extending in a transverse direction and opposed to each other in a cross direction, capable of transferring a stitch between the front and back needle beds. In the following description, a lower front needle bed of the flat knitting machine is called FD, a lower back needle bed is called BD, an upper front needle bed is called FU and an upper back needle bed is called BU. The knitting operation of the following embodiments can also be carried out using a two-bed flat knitting machine having a transfer jack bed for transferring a stitch, or can be carried out by providing a two-bed flat knitting machine with an empty needle for transferring a stitch between adjacent stitches held on each needle bed.

<First Embodiment>

[0023] Fig. 1 is a knitting step diagram to which an inner widening method of the present invention is applied when an inner widening operation is carried out for increasing a body width in a torso portion which is knitted into a tubular shape such as a sweater or a cardigan. In this embodiment, a reference line X-X which divides a knitted fabric in two in a knitting width direction of the knitted fabric is defined (see dashed lines in Fig. 1).

[0024] S1 shows a knitting course immediately before the inner widening operation is carried out. A yarn feeder 9 is moved from left to right in the drawing, and stitches of a back body of the torso portion are formed on knitting needles c to p of the BD. Then, the yarn feeder 9 is reversed and moved leftward, and stitches of a front body of the torso portion are formed on knitting needles P to C of the FD. Subsequently, in S2 to S12, there will be described an example for forming a pair of widening stitches at symmetric positions with respect to the reference line X-X concerning the back body.

[0025] In S2, the yarn feeder 9 is moved rightward in the drawing, stitches of a part of the back body (preceding stitch row 1) are formed on knitting needles c to e of the BD. Next, in S3, all of the stitches formed in S2 are transferred to the knitting needles B to D of the opposing FU. By the transfer in S3, the knitting needle e of the BD becomes an empty needle.

[0026] Next, in S4, the yarn feeder 9 is reversed, and a pick up stitch 2 is formed on the knitting needle e of the BD which has become the empty needle while the yarn feeder 9 is moved leftward. Then, in S5, stitches of a part of the back body (intermediate stitch row 3) are formed on the knitting needles f to m of the BD while the yarn feeder 9 is moved rightward. The pick up stitch 2 formed on the knitting needle e of the BD is twisted by S4 and S5, and the twisted pick up stitch 2 is inserted into a knitting width of the preceding stitch row 1 as a one side widening stitch 2 in subsequent steps (S8 to S11).

[0027] In S6, the yarn feeder 9 is reversed, and a pick up stitch 4 is formed on a knitting needle M of the FU which is an empty needle while the yarn feeder 9 is moved leftward. In S7, remaining stitches of the back body (following stitch row 5) are formed on the knitting needles n to p of the BD while the yarn feeder 9 is moved rightward. The pick up stitch 4 formed on a stitch M of the FU is twisted by S6 and S7, and the twisted pick up stitch 4 is inserted into a knitting width of the following stitch row 5 in subsequent steps (S8, S9 and S12) as the other side widening stitch 4.

[0028] In S8, the pick up stitch 2 formed on the knitting needle e of the BD in S4 is transferred to the knitting needle E of the opposing FU, and stitches held on the knitting needles o and p of stitches of the following stitch row 5 formed on the knitting needles n to p of the BD in S7 are transferred to the knitting needles O and P of the opposing FU.

[0029] In S9, a stitch 11 which is held on the knitting needle D of the FU by the transfer in S3 is transferred to the knitting needle e of the BD, and stitches which are held on the knitting needles O and P of the FU by the transfer in S8 are transferred to the knitting needles p and q of the opposing BD. The stitch 11 which has been transferred in S9 (an end stitch of the preceding stitch row 1 which is close to the intermediate stitch row 3) is returned to the same position as that when knitted in S2. By S9, an empty needle (knitting needle o of the BD) is made between an end stitch 51 in the following stitch row 5 which is in the knitting width of the following stitch row 5 and which is close to the intermediate stitch row 3 and an adjacent stitch 52 which is adjacent to this end stitch 51.

[0030] In S10, stitches which are held on the knitting needles B and C of the FU by the transfer in S3 are transferred to the knitting needles b and c of the opposing BD. By S10, an empty needle (knitting needle d of the BD) is made between an end stitch 11 in the preceding stitch row 1 which is in the knitting width of the preceding stitch row 1 and which is close to the intermediate stitch row 3 and an adjacent stitch 12 which is adjacent to the end stitch 11.

[0031] Finally, in S11 and S12, the pick up stitch 2 which has been held on the knitting needle E of the FU in S8 and the pick up stitch 4 formed on the knitting needle M of the FU in S6 are transferred to the knitting needles d and o which have become the empty needles by S9 and S10, and are inserted between the end stitch 11 and the adjacent stitch 12, and between an end stitch 51 and an adjacent stitch 52. Accordingly, the pick up stitches 2 and 4 are formed in the knitting width of the back body as widening stitches.

[0032] Although not shown in the drawing, the same knitting operations as those in S2 to S12 may be carried

out for the front body while reversing the knitting direction.

[0033] Fig. 2 shows loop diagrams near a location where a widening stitch formed by the above-described knitting operation is formed. As shown in Fig. 2(A), the one side widening stitch 2 is a twisted stitch which is directly connected to the end stitch 11 of the preceding stitch row 1 and the end stitch 31 of the intermediate stitch row 3, a knitting yarn which connects the end stitch 11 and the adjacent stitch 12 of the preceding stitch row 1 with each other is bridged so as to cross over the one side widening stitch 2, and it is possible to make a hole in a location where the one side widening stitch 2 is formed less noticeable. Similarly, as shown in Fig. 2 (B), the other side widening stitch 4 is a twisted stitch which is directly connected to the end stitch 51 of the following stitch row 5 and the end stitch 33 of the intermediate stitch row 3, a knitting yarn which connects the end stitch 51 and the adjacent stitch 52 of the following stitch row 5 is bridged so as to cross over the other side widening stitch 4, and it is possible to make a hole in a location where the other side widening stitch 4 is formed less noticeable. As can be seen from comparison between Fig. 2(A) and Fig. 2(B), rows of stitches and knitting crossing states of the location where the one side widening stitch 2 is formed and the location where the other side widening stitch 4 is formed are completely symmetric with respect to the reference line X-X. Therefore, a visual qulity of a completed knitted fabric can be enhanced.

[0034] The steps shown in Fig. 1 may be changed within a range not departing from the gist of the present invention. For example, the order of S11 and S12 may be reversed. The present invention is not limited to the illustrated example, and knitting efficiency can be enhanced by appropriately changing the steps. A specific example will be shown in a next modified embodiment.

<Modified Embodiment>

[0035] In the modified embodiment, a formed one side widening stitch is not allowed to move in the inner widening process, thereby enhancing the knitting efficiency as compared with the first embodiment. This inner widening method will be described based on the knitting step diagram of Fig. 3. Since many parts of the knitting operation shown in Fig. 3 are common to those of the knitting operation shown in Fig. 1, only points that are different from those shown in Fig. 1 will mainly be described.

[0036] Here, S1' and S2' are the same as S1 and S2 in Fig. 1. Subsequent S3' is different from S3 in Fig. 1 in that all of stitches of the preceding stitch row 1 formed in S2' are not transferred, stitches held on the knitting needles c and d of the BD are transferred to the knitting needles B and C of the opposing FU, and an end stitch 11 is left on the knitting needle e of the BD as it is.

[0037] Next, in S4' , a pick up stitch 2 to be a twisted stitch is formed on the knitting needle d of the BD (knitting needle on which the adjacent stitch 12 was formed in S2') which has become the empty needle by S3' . This pick up stitch 2 is not moved in the subsequent steps, and becomes one side widening stitch 2 as it is.

[0038] In S5' to S7' , the same knitting operations as those in S5 to S7 in Fig. 1 are carried out, and an intermediate stitch row 3, a pick up stitch 4 which becomes the other side widening stitch and a following stitch row 5 are knitted.

[0039] In S8', stitches that are held on the knitting needles B and C of the FU by the transfer in S3' are transferred to the knitting needles b and c of the opposing BD, and stiches held on the knitting needles o and p of the BD of stitches of the following stitch row 5 formed in S7' are transferred to the knitting needles O and P of the opposing FU. By this S8', the one side widening stitch 2 is inserted between the end stitch 11 and an adjacent stitch 12 of the preceding stitch row 1.

[0040] In S9', the stitches held on the knitting needles O and P of the FU by the transfer in S8' are transferred to the knitting needles p and q of the opposing BD. In subsequent S10', the pick up stitch 4 formed in S6' is transferred to the knitting needle o of the opposing BD. By S9' and S10', the other side widening stitch 4 is inserted between the end stitch 51 and the adjacent stitch 52 of the following stitch row 5.

[0041] According to the knitting steps in this modified embodiment, the same knitted fabric as that knitted in the first embodiment can be knitted. Further, since the knitting steps are set such that the one side widening stitch 2 is not moved from its formed position, the knitting efficiency can be enhanced as compared with the first embodiment.

<Second Embodiment>

[0042] In a second embodiment, an example will be described with reference to Figs. 4 and 5. In this example, the inner widening method of the present invention is applied when the inner widening operation is carried out for increasing a sleeve width in a sleeve of a sweater or the like knitted into a tubular shape. In this case, in an inner side of the sleeve, in order to form widening stitches on front and back knitted fabric parts of the sleeve, a reference line which divides the sleeve into front and back knitted fabric parts is defined. That is, as shown in Figs. 4 and 5, the reference line X-X is set along a longitudinal direction of the needle bed such as to divide the front and back needle beds.

[0043] In Fig. 4, T1 shows a knitting course immediately before the inner widening operation is carried out, stitches of a front knitted fabric of the sleeve are formed on the knitting needles E to M of the FD, and stitches of a back knitted fabric of the sleeve are formed on the knitting needles e to m of the BD. From this state, a part of the back knitted fabric of the sleeve is set as the preceding stitch row, a part of the front knitted fabric of the sleeve is set as the following stitch row, and a remaining part of the back knitted fabric and the front knitted fabric is set as the intermediate stitch row, and knitting operations

shown in T2 to T15 are performed.

[0044] In T2, the yarn feeder 9 is moved rightward, stitches of the preceding stitch row 1 are formed on the knitting needles e to j of the BD. While the yarn feeder 9 is moved leftward and rightward in T3 and T4, respectively, a pick up stitch 2 is formed on the knitting needle J of the FU, and partial stitches of the intermediate stitch row 3 are formed on the knitting needles k to m of the BD. Subsequently, in T5 to T7, the pick up stitch 2 is inserted into the knitting width of the intermediate stitch row 3 as the one side widening stitch 2.

[0045] In T5 and T6, of the three stitches of the intermediate stitch row formed in T4, an end stitch 31 close to the preceding stitch row (stitch of the knitting needle k of the BD) is not moved, and remaining two stitches are transferred to the knitting needles m and n of the BD through the knitting needles L and M of the FU. As the results of T5 and T6, an empty needle (knitting needle 1 of the BD) is made between the end stitch 31 and the adjacent stitch 32 of the intermediate stitch row 3. Therefore, in T7, the pick up stitch 2 formed on the knitting needle J of the FU in T3 is transferred to the empty needle. By these series of operations, the one side widening stitch (pick up stitch) 2 is inserted between the end stitch 31 and the adjacent stitch 32 of the intermediate stitch row 3.

[0046] Next, in T8 of Fig. 5, the yarn feeder 9 which has been stopped on the right side in T6 is moved leftward, and the remaining stitches of the intermediate stitch row 3 which if half formed in T4 are formed on the knitting needles M to K of the FD. In subsequent T9, all of stitches formed in T8 are transferred to the knitting needles 1 to n of the BU.

[0047] In T10 and T11, while the yarn feeder 9 is reciprocated rightward and leftward, the pick up stitch 4 is formed on the knitting needle K of the FD, and stitches of the following stitch row 5 are formed on the knitting needles J to E of the FD. Subsequently, in T12 to T15, the pick up stitch 4 is inserted into the knitting width of the intermediate stitch row 3 as the other side widening stitch 4.

[0048] In T12, the pick up stitch 4 formed in T10 is held on the knitting needle k of the opposing BU, and in T13, the end stitch 33 of the intermediate stitch row 3 is returned to the knitting needle K of the FD located at a position where it has been formed (see T8) . In T14, the stitches of the intermediate stitch row 3 held on the BU in T9 are transferred to the knitting needles M and N of the opposing FD. In T15, the pick up stitch 4 is transferred to an empty needle (knitting needle L of the FD) made between the end stitch 33 and the adjacent stitch 34 of the intermediate stitch row 3. By T12 to T15, the other side widening stitch 4 is inserted between the end stitch 33 and the adjacent stitch 34 of the intermediate stitch row 3.

[0049] In a sleeve whose knitting width is increased according to the above-described knitting steps, it is also possible to form a pair of widening stitches which are completely bilaterally symmetric with respect to the reference line X-X, and it is possible to make holes in locations where the widening stitches are formed less noticeable.

<Third Embodiment>

[0050] In the above embodiments, the one side widening stitch and the other side widening stitch are knitted by the front and back different side needle beds. In a third embodiment, an example in which both the widening stitches are knitted by the front and back same side needle beds will be described with reference to Fig. 6.

[0051] In U1, a state where a front body and a back body are knitted by circling knitting is shown. From this state, in U2, stitches of the preceding stitch row 1 are formed on the knitting needles c to e of the BD while the yarn feeder 9 is moved rightward. Subsequently, in U3, the yarn feeder 9 is reversed, and a pick up stitch 2 is formed by the knitting needle E of the FU. Further, in U4, stitches of the intermediate stitch row 3 are formed on the knitting needles f to m of the BD while the yarn feeder 9 is moved rightward. Subsequently, in U5, the yarn feeder is reversed, and a pick up stitch 4 is formed by the knitting needle N of the FU. In U6, stitches of the following stitch row 5 are formed on the knitting needles n to p of the BD while the yarn feeder 9 is moved rightward. Both the pick up stitch 2 and pick up stitch 4 are formed on the knitting needles of the FU by the series of steps.

[0052] In U7, stitches of the preceding stitch row 1 (following stitch row 5) held on the knitting needles c and d (o and p) of the BD are transferred to the knitting needles C and D (O and P) of the opposing FU, and in next U8 (U9), the stitches are transferred to the knitting needles p and q (b and c) of the BU. By U7 to U9, empty needles (knitting needles d and o of the BD) are made between the end stitch 11 and the adjacent stitch 12 of the preceding stitch row 1, and between the end stitch 51 and the adjacent stitch 52 of the following stitch row 5.

[0053] Lastly, in U10 and U11, the pick up stitches 2 and 4 formed on the empty needles (knitting needles d and o of the BD) in U3 and U5 are inserted into knitting widths of the knitted fabric parts 1 and 5 as the widening stitches 2 and 4.

[0054] Fig. 7 shows loop diagrams near a location where the widening stitch formed by the knitting operation of the third embodiment is formed. As shown in Fig. 7(A), a knitting yarn which connects the end stitch 11 and the adjacent stitch 12 of the preceding stitch row 1 is bridged so as to cross over the one side widening stitch 2. As shown in Fig. 7(B), a knitting yarn which connects the end stitch 51 and the adjacent stitch 52 of the following stitch row 5 is bridged so as to cross over the other side widening stitch 4. Therefore, it is possible to make holes in the locations where the widening stitches 2 and 4 are formed less noticeable.

[0055] In the above-described embodiments, all of the knitted fabric parts are knitted by plain knitting for the

sake of convenience of explanation, but these knitted fabric parts may have a structure pattern.

DESCRIPTION OF SYMBOLS

[0056]

1 preceding stitch row 11 end stich 12 adjacent stitch
2 pick up stitch (one side widening stitch)
3 intermediate stitch row 31, 33 end stitch 32, 34 adjacent stitch
4 pick up stitch (the other side widening stitch)
5 following stitch low 51 end stitch 52 adjacent stitch
9 yarn feeder

Claims

1. An inner widening method, using a flat knitting machine having at least a pair of front and back needle beds and a yarn feeder which feeds a knitting yarn to a plurality of knitting needles disposed on each of the needle beds, for forming a pair of widening stitches on both sides of an intermediate stitch row including a plurality of continuously knitted stitches when the widening stitches are formed on an inner side of an end of knitted fabric held on the needle beds in a longitudinal direction of the needle beds, the method comprising the process of:

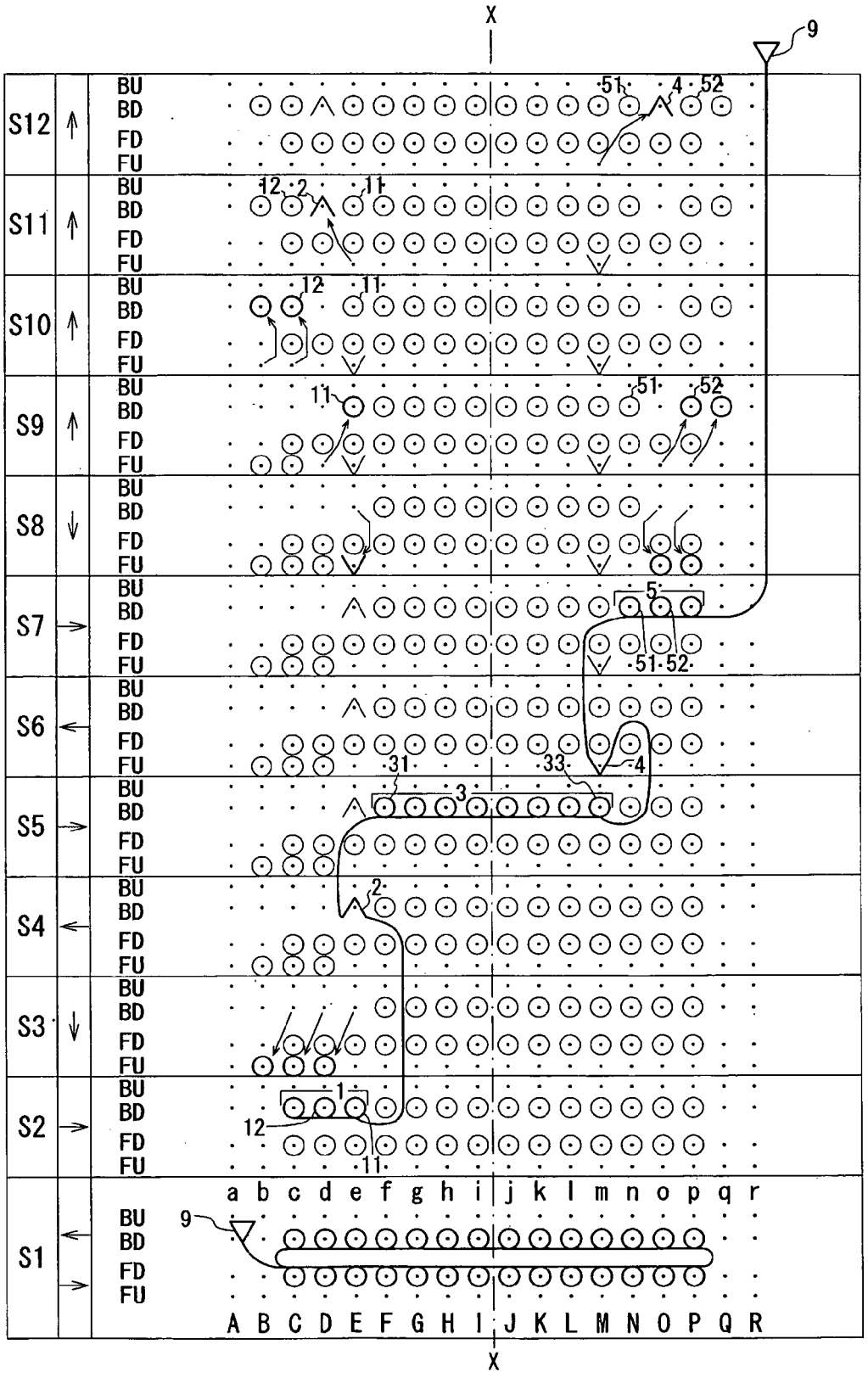
knitting a preceding stitch row including a plurality of stitches and forming one side widening stitch of a twisted stitch on an empty needle of any of the front and back needle beds near a terminal stitch of the preceding stitch row before knitting an intermediate stitch row;
knitting the intermediate stitch row after knitting the preceding stitch row; and
forming the other side widening stitch of a twisted stitch on an empty needle of any of the front and back needle beds near the terminal stitch of the intermediate stitch row, and then knitting a following stitch row including a plurality of stitches, wherein
during or after the process,
the one side widening stitch is inserted into a knitting width of the preceding stitch row or a knitting width of the intermediate stitch row, and the other side widening stitch is inserted into a knitting width of the following stitch row when the one side widening stitch is inserted into the knitting width of the preceding stitch row, and the other side widening stitch is inserted into the knitting width of the intermediate stitch row when the one side widening stitch is inserted into the knitting width of the intermediate stitch row.

2. The inner widening method according to claim 1, wherein the other side widening stitch is formed on the needle bed that is opposed to the needle bed which forms the one side widening stitch.

3. The inner widening method according to claim 1 or 2, wherein before the one side widening stitch is formed, one or more stitches of the preceding stitch row, which are already formed on the needle bed at least except an end stitch close to the intermediate stitch row, are transferred to the opposing needle bed so that transfer of the one side widening stitch is unnecessary during a process of carrying out an inner widening operation, and the one side widening stitch is formed on the knitting needle which becomes an empty needle by the transfer.

4. A knitted fabric knitted using a flat knitting machine having at least a pair of front and back needle beds, and a yarn feeder which feeds a knitting yarn to a plurality of knitting needles disposed on each of the needle beds, the knitted fabric comprising three stitch rows including a plurality of stitches defined as a preceding stitch row, an intermediate stitch row, and a following stitch row in a knitting order, wherein one side widening stitch is inserted into a knitting width of the preceding stitch row or a knitting width of the intermediate stitch row, the one side widening stitch being a twisted stitch which is directly connected to an end stitch of the preceding stitch row close to the intermediate stitch row and to an end stitch of the intermediate stitch row close to the preceding stitch row, and
the other side widening stitch is inserted into a knitting width of the following stitch row or the knitting width of the intermediate stitch row, the other side widening stitch being a twisted stitch which is directly connected to an end stitch of the following stitch row close to the intermediate stitch row and to an end stitch of the intermediate stitch row close to the following stitch row.

Fig. 1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52
12
2
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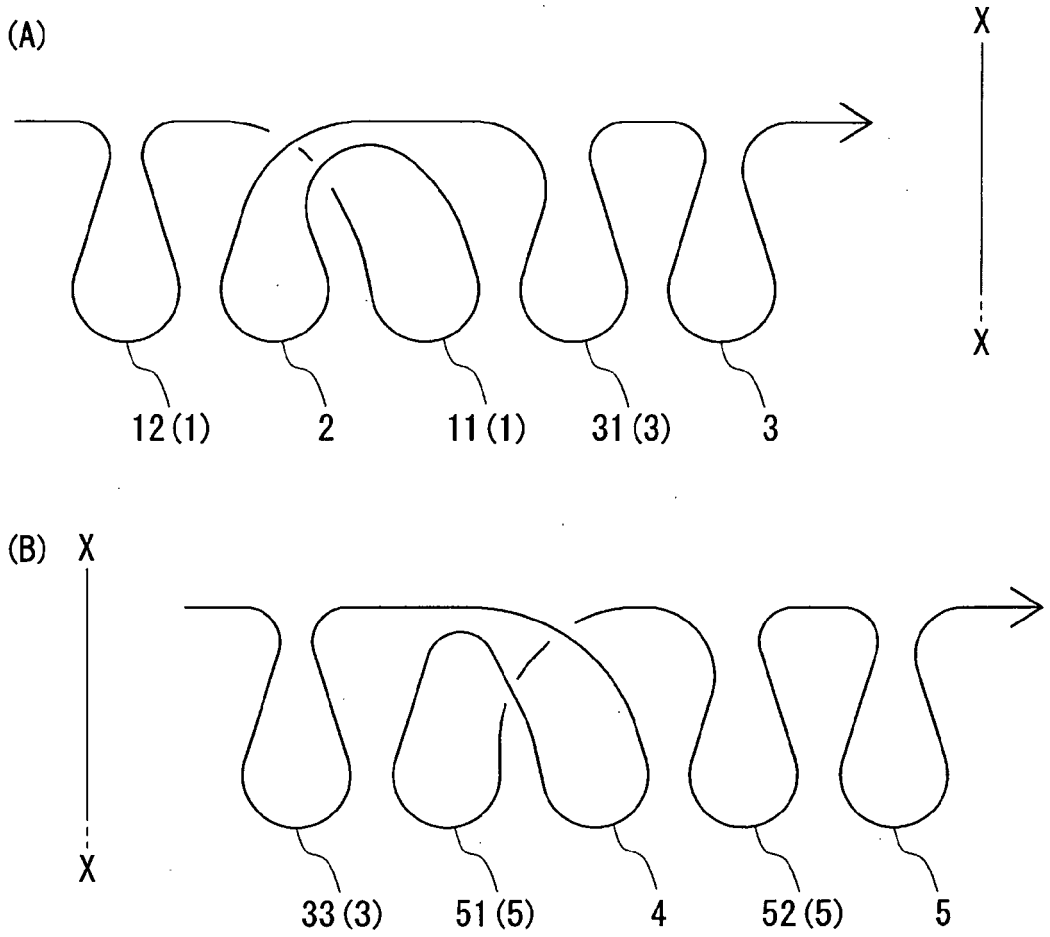
Fig. 2



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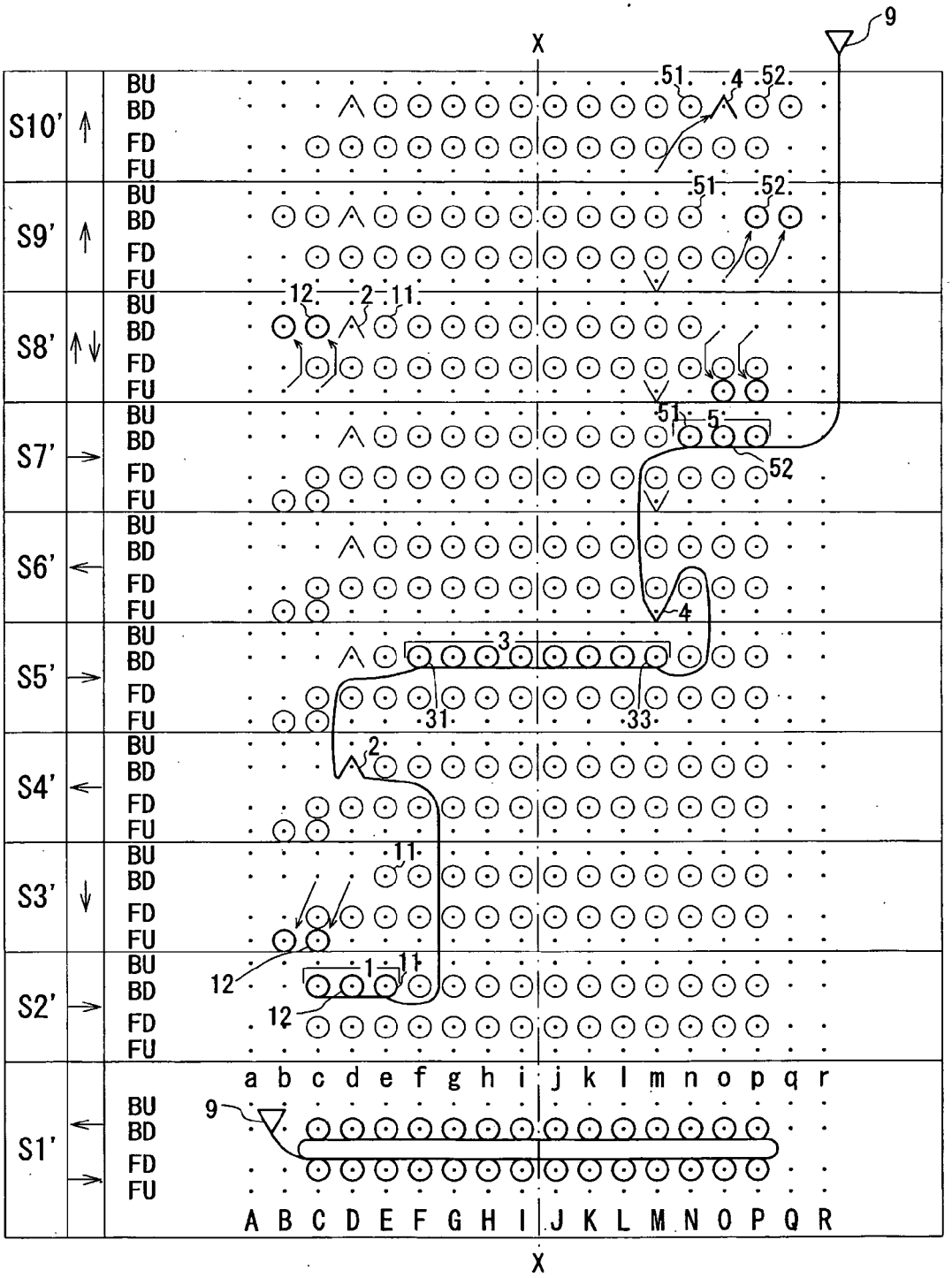
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2
11
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1
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A B C D E F G H I J K L M N O P Q R

Fig. 4

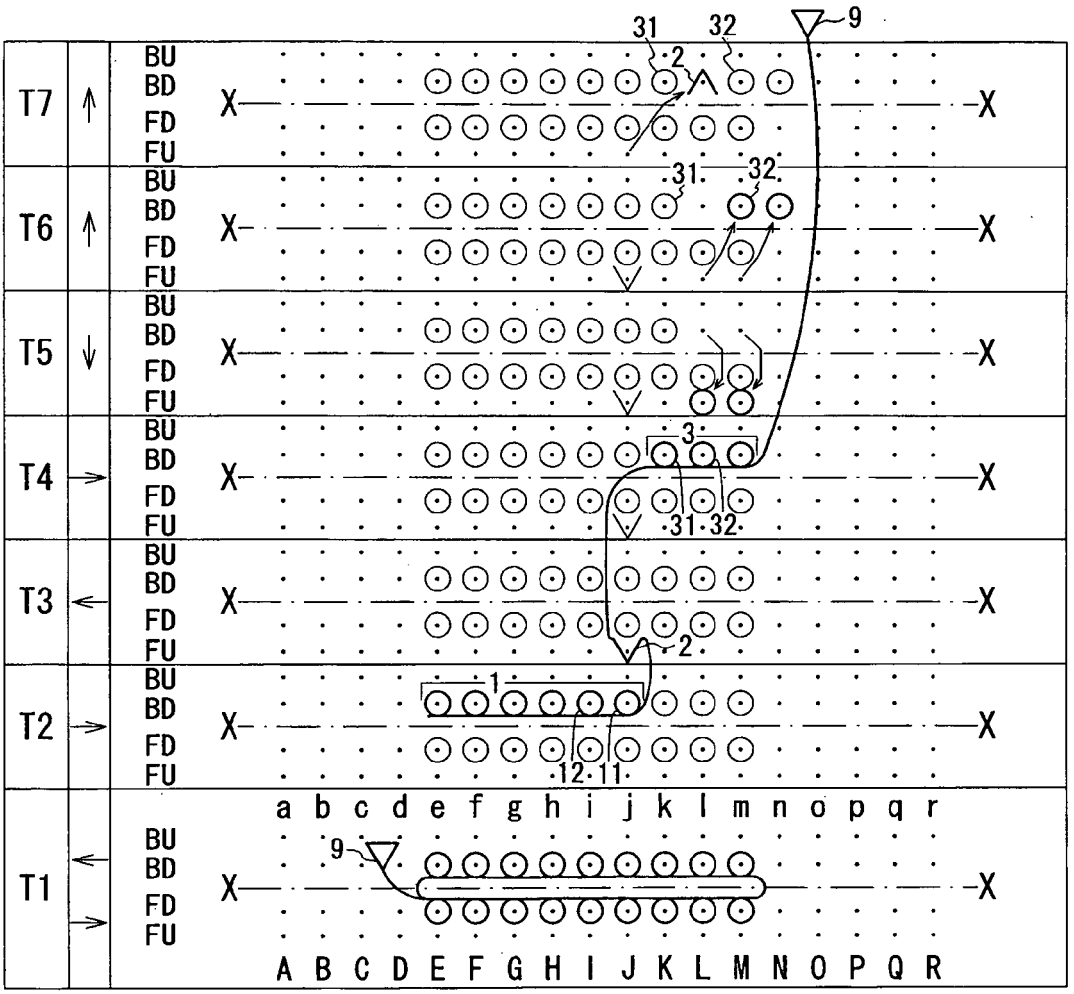
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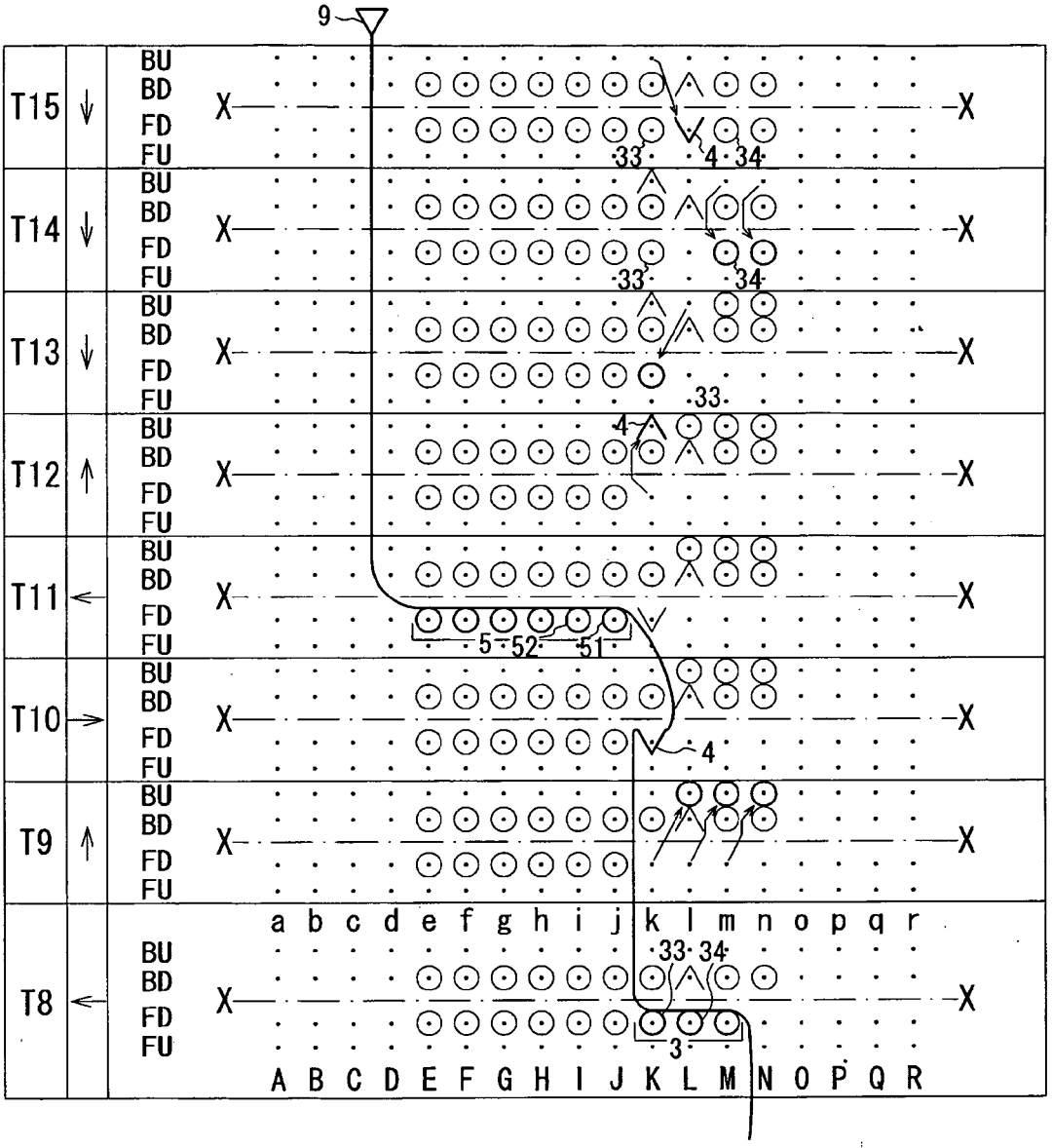
Fig. 5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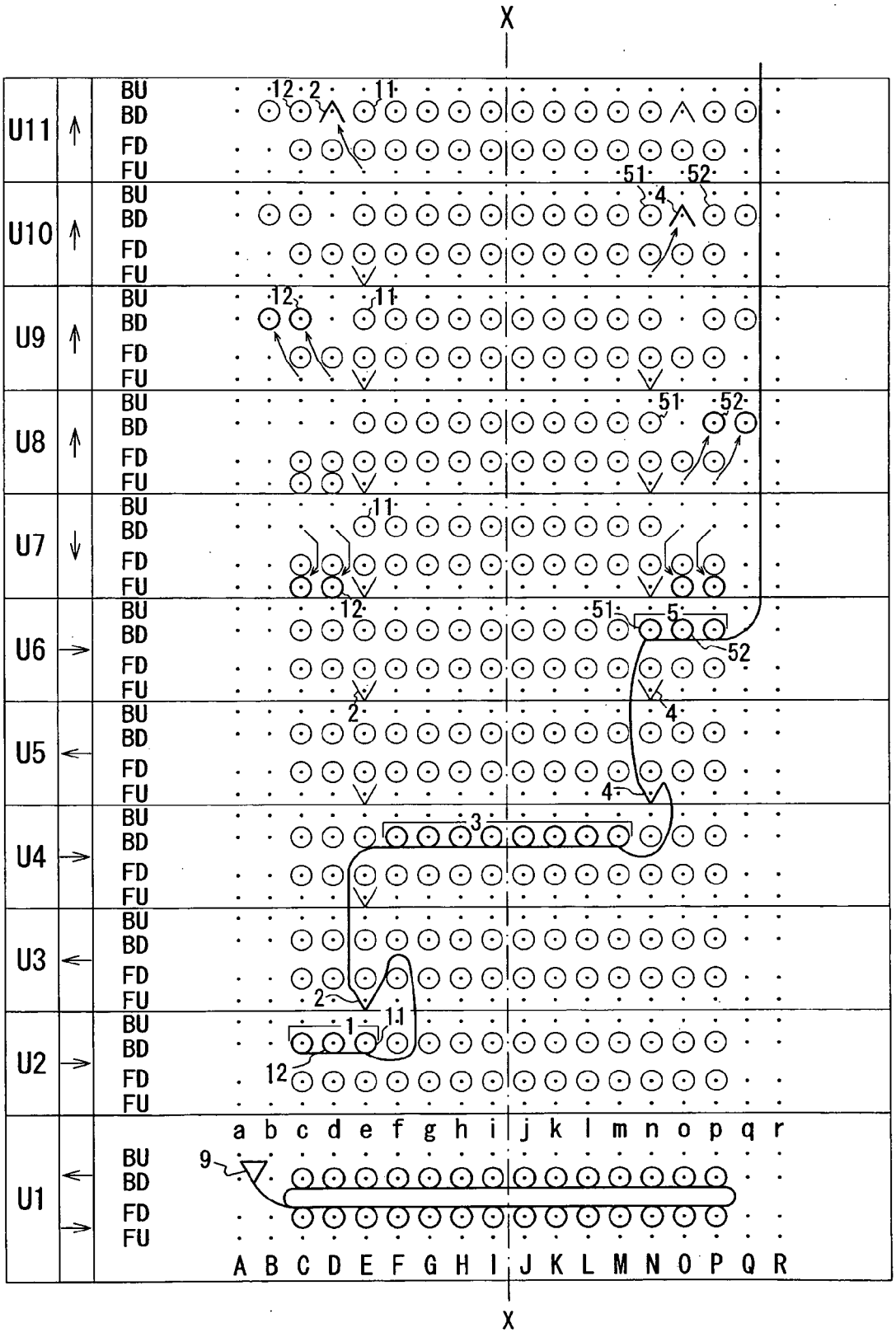
A B C D E F G H I J K L M N O P Q R

Fig. 6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A B C D E F G H I J K L M N O P Q R
X

Fig. 7

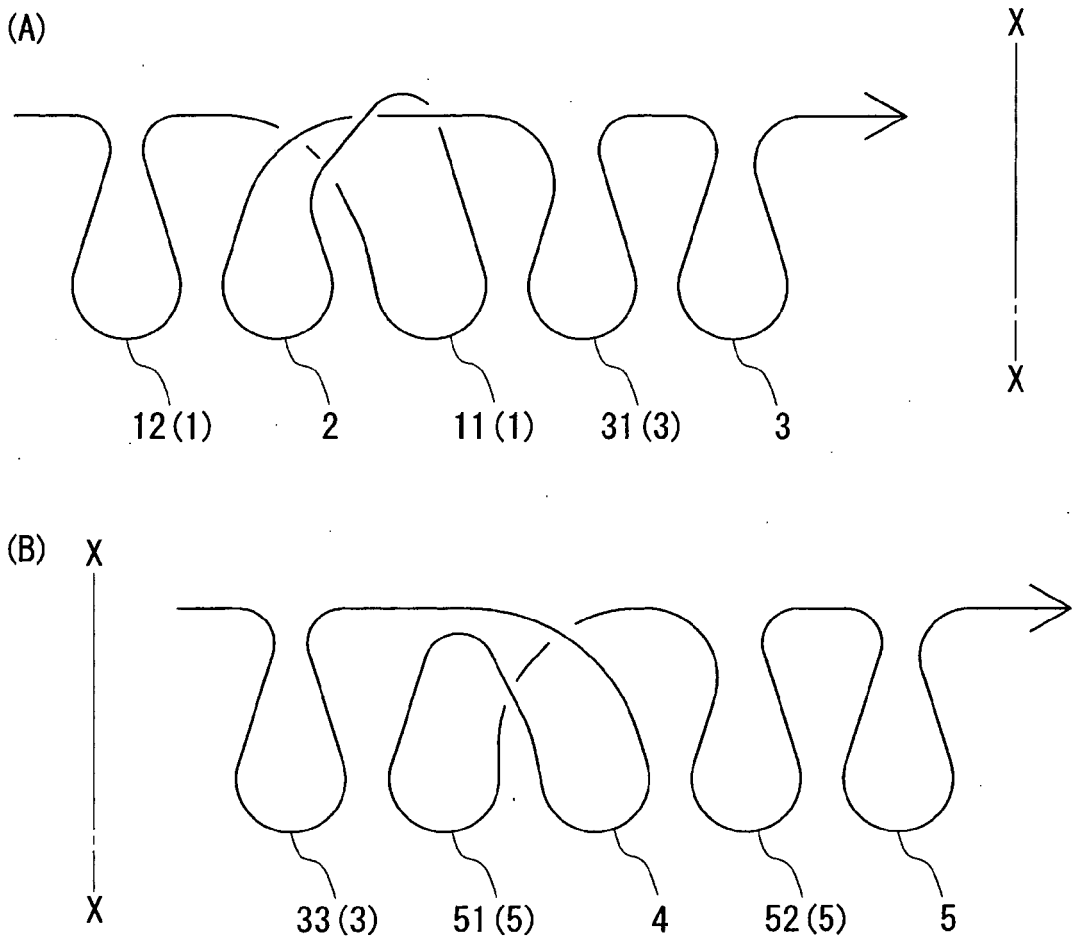
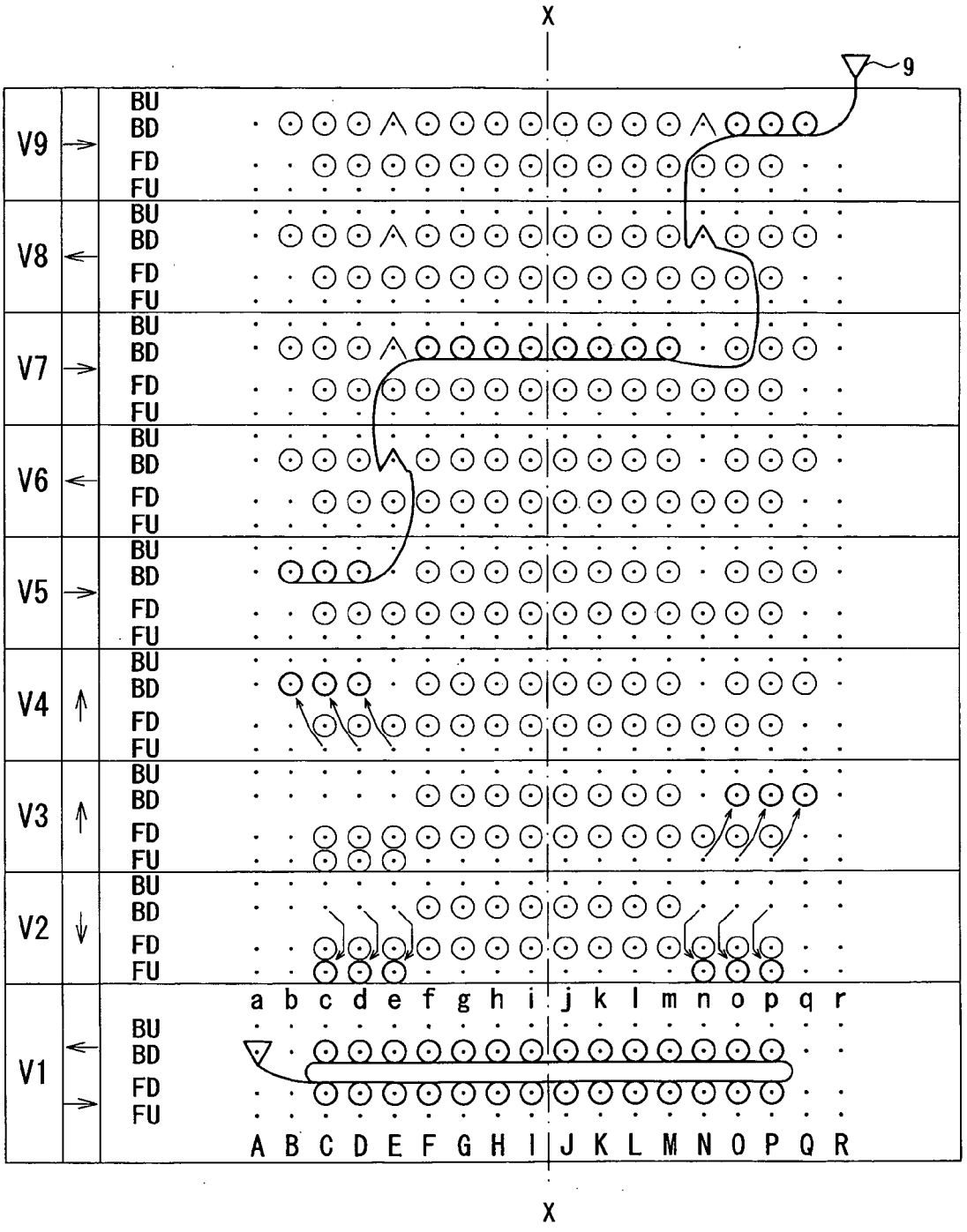


Fig. 8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X

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EUROPEAN SEARCH REPORT

Application Number
EP 11 00 2182

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			D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 October 2011	Zirkler, Stefanie

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