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(54) JOINING METHOD OF NEIGHBORING KNITTED FABRIC PIECES, AND KNITTED FABRIC

VERBINDUNGSVERFAHREN FÜR BENACHBARTE MASCHENWARENTEILE UND
MASCHENWARE

PROCÉDÉ D'ASSEMBLAGE DE PIÈCES DE TISSU TRICOTÉES VOISINES, ET TISSU TRICOTÉ

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(56) References cited:

EP-A1- 2 390 393

WO-A1-2009/031321

JP-A- S5 653 247

JP-A- 56 053 247

JP-A- 2000 199 156

JP-A- 2000 199 156

US-A- 5 467 616

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Description

TECHNICAL FIELD

[0001] The present invention relates to a joining method of adjacent knitted fabric portions for joining a plurality of knitted fabric portions, which are lined in a knitting width direction and knitted independently, and a knitted fabric knitted by applying the joining method of the adjacent knitted fabric portions.

BACKGROUND ART

[0002] Conventionally, a plurality of knitted fabric portions, which are lined in the knitting width direction and knitted independently, are joined using a flat knitting machine including at least a pair of a front and a back needle bed. In the conventional joining method of the adjacent knitted fabric portions, the adjacent knitted fabric portions are typically joined by tuck knitting. For example, as shown in Figs. 1, 3, and 4 of Patent Document 1, two knitted fabric portions are connected by tucking a knitting yarn of one of the adjacent knitted fabric portions to the stitches of the other knitted fabric portion.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003] [Patent Document 1] Japanese Unexamined Patent Publication No. 56-53247

[0004] Prior art document EP 2 390 393 A1 describes a method of knitting a knitting yarn that exhibits sufficient unraveling prevention effect with a simple step. Feeding a knitting yarn to a knitting needle to form a first holding point and a second holding point while moving a yarn feeder in a direction opposite to an advancing direction after moving the yarn feeder in the advancing direction. Transferring at least one of the first holding point, the second holding point and two proximate stitches held proximate to each other in either a front or a back needle bed from before the formation of the holding points to overlap the first holding point on an upper side of the proximate stitch and overlap the second holding point on a lower side of the proximate stitch. Moving the yarn feeder after overlapping of the proximate stitch and each holding point is terminated to carry out yarn out.

[0005] The method of prior art document US 5 467 616 A includes the steps of looping a new yarn strand in the vicinity of an Intarsia knit region edge of the knit goods with needles of a first and second needle bed to form at least one loop having legs; during successive carriage displacements, crossing both legs of at least one loop formed in the first needle bed to form a crossed-over yarn portion associated with the at least one loops; and looping the at least one loop having the legs crossed over on a needle of the second needle bed via the crossed-over portion.

[0006] Prior art document JP 2000 199156 A discloses a method for knitting an intarsia knitted fabric on a flat knitting machine. A yarn-feeding opening is reversed and moved from the forward direction to the backward direction, a first and a second loop are formed on a back needle bed, then the yarn feed opening is transferred in the forward direction and the first loop is transferred to a front needle bed, and a face stitch is knitted on the first loop and the face stitch transferred on the knit stitch on the front needle bed and the knitting yarn is trapped.

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007] However, in the conventional joining method of the adjacent knitted fabric portions, since the knitted fabric portions are joined by tuck, there may arise drawbacks such as a split occurring at a boundary portion of the knitted fabric portions or the line of the boundary portion getting disturbed, depending on the knitting yarn to be used and the conditions of knitting. Such drawbacks do not stand out if the boundary portion of the adjacent knitted fabric portions is extended diagonally as in an argyle pattern, for example, but stand out if the boundary portion is extended straightly upward.

[0008] For example, the photographs shown in Figs. 9 and 10 are respectively an enlarged photograph seen from the front side and an enlarged photograph seen from the back side of the boundary portion of the adjacent knitted fabric portions in the knitted fabric knitted by applying the conventional joining method. As is apparent by looking at the back side of the boundary portion shown in Fig. 10, the knitting yarn of one knitted fabric portion is extended and tucked to the other knitted fabric portion. As is apparent by looking at the front side of the boundary portion shown in Fig. 9, the state of the stitches in the vicinity of the boundary portion is disturbed as compared to the other portions due to the tuck, and the boundary portion is in a slightly zigzag state.

[0009] The present invention has been made in view of such circumstances, and an object thereof is to provide a joining method of adjacent knitted fabric portions capable of finishing the boundary portion of the adjacent knitted fabric portions more beautifully than the conventional joining method of the adjacent knitted fabric portions, and a knitted fabric knitted by applying the joining method of the adjacent knitted fabric portions.

MEANS FOR SOLVING THE PROBLEMS

[0010] This and other objects are solved by a joining method for joining a plurality of knitted fabric portions, the joining method having the features as set forth in claim 1. Preferred embodiments of this method are stated in the dependent claims 2 to 4.

[0011] Thus, a joining method of adjacent knitted fabric portions of the present invention is a joining method of

adjacent knitted fabric portions for joining a plurality of knitted fabric portions, which are lined in a knitting width direction of a knitted fabric and knitted independently, using a flat knitting machine including at least a pair of a front and a back needle bed disposed opposite to each other and a plurality of yarn feeders for feeding a knitting yarn to a knitting needle. In the joining method of the adjacent knitted fabric portions of the present invention, when increasing the number of courses of the knitted fabric portions by alternately repeating a step of knitting two adjacent knitted fabric portions one course at a time while reversing the knitting direction for every course, in at least some knitting courses, at least one of (1) or (2) is carried out.

(1) Forming a terminating end holding stitch in form of a pickup stitch or a stitch to become a terminating end of at least one of the adjacent knitted fabric portions on a knitting needle, which is located at a position overlapping a knitting region of the other knitted fabric portion different from the knitted fabric portion including the terminating end holding stitch, of the needle bed opposing the needle bed on which the stitch before the terminating end holding stitch is formed, so that a knitting yarn, which connects the terminating end holding stitch and the stitch before the terminating end holding stitch, crosses between the front and back needle beds so as to intersect a knitting yarn of the other knitted fabric portion.

(2) Forming a starting end holding stitch in form of a pickup stitch or a stitch to become a starting end of at least one of the adjacent knitted fabric portions on a knitting needle, which is located at a position overlapping a knitting region of the other knitted fabric portion different from the knitted fabric portion including the starting end holding stitch, of the needle bed opposing the needle bed on which the stitch after the starting end holding stitch is formed, so that a knitting yarn, which connects the starting end holding stitch and the stitch after the starting end holding stitch, crosses between the front and back needle beds so as to intersect a knitting yarn of the other knitted fabric portion.

[0012] When increasing the knitting course of the knitted fabric portions in the above manner, a plurality of cross-over yarns crossed between the front and back needle beds are formed so that some of these cross-over yarns and the knitting yarn of the knitted fabric portion different from the knitted fabric portion including the cross-over yarns are entangled to couple the adjacent knitted fabric portions.

[0013] In the joining method of the adjacent knitted fabric portions of the present invention, it is preferable that the two adjacent knitted fabric portions are knitted in the same knitting direction and both (1) and (2) are carried out for at least every one course. If the knitting directions of both knitted fabric portions are the same, the terminat-

ing end holding stitch is formed within the knitting region of the knitted fabric portion on the far side in the knitting direction when knitting the knitted fabric portion on the near side in the knitting width direction, and the starting end holding stitch is formed within the knitting region of the knitted fabric portion on the near side when knitting the knitted fabric portion on the far side, as shown in the first embodiment to be described later.

[0014] In the joining method of the adjacent knitted fabric portions of the present invention, in the knitting course after the knitting course in which (1) is carried out, miss knitting is preferably performed on the terminating end holding stitch formed in (1).

[0015] In the joining method of the adjacent knitted fabric portions of the present invention, a knitted fabric having an intarsia pattern may be knitted by differing the colors of the knitting yarns for knitting the adjacent knitted fabric portions.

[0016] The mentioned objects are also solved by a knitted fabric as set forth in claim 5.

[0017] A knitted fabric of the present invention is a knitted fabric including a plurality of knitted fabric portions, which are lined in a knitting width direction and knitted independently. In this knitted fabric, other than when using a back stitch for a pattern, the stitch at the boundary portion side end of some knitting courses in at least one knitted fabric portion of the adjacent knitted fabric portions configured mainly from front stitches is a back stitch. A knitting yarn connecting the back stitch and the front stitch next to the back stitch in the knitting courses including the back stitch is entangled with a knitting yarn connecting a front stitch, which is closest to the boundary portion in the other knitted fabric portion, and a front stitch following in a wale direction of the front stitch to couple the knitted fabric portions.

[0018] In the knitted fabric of the present invention, when back stitches are formed in both adjacent knitted fabric portions, for example, as shown in Fig. 2 of the first embodiment to be described later, the knitting yarn (shown with thick line in the figure) connecting the back stitch 3 at the end of the knitted fabric portion β and the stitch 4 next to the back stitch 3 is entangled with the knitting yarn (shown with thick line in the figure) connecting the front stitch 1 closest to the boundary portion in the knitted fabric portion α and the front stitch 6 following in the wale direction of the front stitch 1 to couple the knitted fabric portions α , β . Even when the back stitches are formed in one of the adjacent knitted fabric portions, the knitting yarns of the adjacent knitted fabric portions α , β are entangled to couple the knitted fabric portions α , β , as shown with a thick line in Fig. 6 of the second embodiment and Fig. 8 of the third embodiment.

EFFECTS OF THE INVENTION

[0019] According to the joining method of the adjacent knitted fabric portions of the present invention, the knitted fabric of the present invention can be knitted. In the knit-

ted fabric of the present invention, if the back stitches are formed at the boundary portion side end of the knitted fabric portions, such back stitches rotate to the back side of the knitted fabric portion different from the knitted fabric portion including the back stitches (see Fig. 4 of the first embodiment to be described later). The stitches next to the back stitches in the knitting courses with the back stitches are aligned at the boundary portion of the knitted fabric portions when the knitted fabric is seen from the front side (see Fig. 3 of the first embodiment to be described later). Furthermore, in the knitted fabric of the present invention, the knitted fabric portions are coupled by the entanglement of the knitting yarns configuring the adjacent knitted fabric portions, so that a force that would pull the stitches proximate to the boundary of the knitted fabric portions is not applied and the stitches will not be disturbed as in the case of using the conventional tuck knitting (see Fig. 3). Moreover, if the knitted fabric portions are coupled by the entanglement of the knitting yarns without using the tuck, the coupling portion of the knitted fabric portions will not become tense when the knitted fabric is pulled in the knitting width direction, and the stretchability of the coupling portion can be made the same extent as the other portions.

[0020] In the joining method of the adjacent knitted fabric portions of the present invention, the yarn feeders for knitting respective knitted fabric portion are less likely to interfere with each other if the two adjacent knitted fabric portions are knitted in the same knitting direction. The adjacent knitted fabric portions can be strongly coupled by forming the terminating end holding stitch and the starting end holding stitch in the same course of the two adjacent knitted fabric portions at least for every course. According to the knitting described above, the number of cross-over yarns formed in the same course becomes greater than when only one of the terminating end holding stitch or the starting end holding stitch is formed in the same course. As a result, the cross-over yarns can cross so as to fill the hole formed at the boundary portion of the knitted fabric portions when the knitted fabric is pulled so that the hole does not stand out.

[0021] In the joining method of the adjacent knitted fabric portions of the present invention, when knitting the adjacent knitted fabric portions, the adjacent knitted fabric portions can be smoothly knitted by performing miss knitting in the knitting course after the knitting course in which the terminating end holding stitch is formed. The reasons therefor will be described in detail in the modifications to be described later.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a knitting step diagram related to a joining method of adjacent knitted fabric portions shown in a first embodiment.

Fig. 2 is a loop diagram of a knitted fabric knitted

according to the knitting step diagram of Fig. 1.

Fig. 3 is an enlarged photograph seen from a front side of the vicinity of a boundary portion of adjacent knitted fabric portions in the knitted fabric shown in the first embodiment.

Fig. 4 is an enlarged photograph seen from a back side of the vicinity of the boundary portion of adjacent knitted fabric portions in the knitted fabric shown in the first embodiment.

Fig. 5 is a knitting step diagram related to a joining method of adjacent knitted fabric portions shown in a second embodiment.

Fig. 6 is a loop diagram of a knitted fabric knitted according to the knitting step diagram of Fig. 5.

Fig. 7 is a knitting step diagram related to a joining method of adjacent knitted fabric portions shown in a third embodiment.

Fig. 8 is a loop diagram of a knitted fabric knitted according to the knitting step diagram of Fig. 7.

Fig. 9 is an enlarged photograph seen from a front side of the vicinity of a boundary portion of adjacent knitted fabric portions in a knitted fabric knitted by applying a conventional joining method of the adjacent knitted fabric portions.

Fig. 10 is an enlarged photograph seen from a back side of the vicinity of the boundary portion of the adjacent knitted fabric portions in the knitted fabric knitted by applying the conventional joining method of the adjacent knitted fabric portions.

MODES FOR CARRYING OUT THE INVENTION

[0023] Embodiments of the present invention will be hereinafter described based on the drawings. The knitting described in the embodiments all describe a knitting example using a two-bed flat knitting machine including a pair of a front and a back needle bed disposed opposite to each other and a plurality of yarn feeders for feeding a knitting yarn to the knitting needles of each needle bed. This flat knitting machine includes a carriage mounted with a plurality of cam systems for driving the knitting needles of the needle beds. In the following description, a cam system preceding in the knitting direction is referred to as C1 and a cam system following in the knitting direction is referred to as C2.

<First Embodiment>

[0024] An example of knitting a knitted fabric having an intarsia pattern with knitted fabric portions knitted independent from each other with knitting yarns of different colors using a joining method of adjacent knitted fabric portions of the present invention will be described based on Figs. 1 and 2.

[0025] Fig. 1 is a knitting step diagram related to the joining method of the adjacent knitted fabric portions. "S + number" described on the left side of Fig. 1 indicates the number of the knitting step, FB indicates the front

needle bed, BB indicates the back needle bed, a triangle mark indicates a yarn feeder, alphabets A to O indicate positions of needles of the needle beds, a circle mark indicates a stitch, and an inverted V-letter indicates a pickup stitch. Signs are given to some stitches or pickup stitches in Fig. 1 in the formed order in the knitting steps. Fig. 2 is a loop diagram of a knitted fabric knitted with the knitting steps of Fig. 1, where the numbers and alphabets in the figure are the same as the numbers and alphabets in Fig. 1. The manner of looking at the figures described above also applies to Figs. 5 to 8 to be described later.

[0026] In Fig. 1, S0 shows a state in which stitches are held on the needles A to O of the FB. Three knitted fabric portions α , β , γ are knitted from this state with knitting yarns fed from three different yarn feeders X, Y, Z according to the knitting steps described below.

[0027] In S1, the carriage is moved in a right direction in a plane of drawing from the state of S0, and the yarn feeders X, Y are entrained by the carriage such that the yarn feeder X precedes and the yarn feeder Y follows. First, the preceding cam system C1 forms stitches on the knitting needles A to E of the FB, and then forms a pickup stitch 2 on the knitting needle F of the BB following thereto. With such knitting, the first course of the knitted fabric portion α having the pickup stitch (terminating end holding stitch) 2 held on the knitting needle F of the BB as the terminating end is formed. The pickup stitch 2 is arranged on a back side of the knitted fabric portion β in the finished knitted fabric, as will be described later. After the formation of the pickup stitch 2 is finished, the carriage stops entraining the yarn feeder X on the right side, in the plane of drawing, of the pickup stitch 2 and stops the yarn feeder X at such a position.

[0028] The following cam system C2 uses the yarn feeder Y entrained from within a knitting region of the knitted fabric portion α by the carriage to form a pickup stitch (starting end holding stitch) 3 to become the starting end of the knitted fabric portion β on the knitting needle E of the BB, and then form stitches on the knitting needles F to J of the FB, and lastly, form a pickup stitch to become the terminating end of the knitted fabric portion β on the knitting needle K of the BB. After the formation of the pickup stitch on the knitting needle K is finished, the carriage stops the yarn feeder Y on the right side, in the plane of drawing, of the pickup stitch of the knitting needle K. The pickup stitch 3 to become the starting end of the knitted fabric portion β is formed after the pickup stitch 2 of the terminating end of the knitted fabric portion α . Thus, a cross-over yarn of the knitted fabric portion β that crosses between the FB and the BB from the pickup stitch 3 of the knitting needle E of the BB towards the stitch 4 of the knitting needle F of the FB intersects the upper side (perpendicular direction in plane of drawing, upper side of needle bed gap) of a cross-over yarn of the knitted fabric portion α that crosses between the FB and the BB from the stitch 1 of the knitting needle E of the FB towards the pickup stitch 2 of the knitting needle F of the BB.

[0029] Furthermore, in S1, the knitted fabric portion γ

is formed by using a new yarn feeder Z by the cam system C1. In this case, the cam system C1 forms stitches on the knitting needles K to O of the FB after forming a pickup stitch to become a starting end on the knitting needle J of the BB. The cam system C1 that knits the knitted fabric portion γ precedes the cam system C2 that knits the knitted fabric portion β , and hence the pickup stitch (knitting needle J of the BB) at the starting end of the knitted fabric portion γ is formed before the pickup stitch (knitting needle K of the BB) at the terminating end of the knitted fabric portion β described above. Thus, a cross-over yarn of the knitted fabric portion β that crosses between the FB and the BB from the stitch of the knitting needle J of the FB towards the pickup stitch of the knitting needle K of the BB intersects the upper side of a cross-over yarn of the knitted fabric portion γ that crosses between the FB and the BB from the pickup stitch of the knitting needle J of the BB towards the stitch of the knitting needle K of the FB.

[0030] In S2, the next knitting course of each knitted fabric portion α , β , γ is knitted with the knitting direction made opposite to that in S1. In this case, the starting end and the terminating end of each knitted fabric portion α , β , γ are set at the positions of the pickup stitches formed in S1. First, the knitted fabric portion γ is knitted by the cam system C1 using the yarn feeder Z, and the knitted fabric portion β is knitted by the cam system C2 using the yarn feeder Y. When the knitting of the knitted fabric portion γ is finished, the carriage stops the yarn feeder Z on the left side, in the plane of drawing, of the stitch (knitting needle J of the BB) to become the terminating end of the knitting course of the knitted fabric γ , and thereafter, entrains the yarn feeder X. The entrained yarn feeder X is used in the knitting of the knitted fabric portion α by the cam system C1. When the knitting of the knitted fabric portion β is finished, the carriage stops the yarn feeder Y on the left side, in the plane of drawing, of the stitch 8 (knitting needle E of the BB) at the terminating end of the knitted fabric portion β .

[0031] In S2, the stitch at the terminating end of the next knitting course of the knitted fabric portion γ is formed following in a wale direction of the pickup stitch at the starting end in the knitting course of the knitted fabric portion γ formed in S1. Similarly for the knitted fabric portions β and α , the stitch 8 at the terminating end and the stitch 5 at the starting end in the next knitting course are formed on the pickup stitch 3 at the starting end and the pickup stitch 2 at the terminating end of the knitting course formed in S1, respectively. The vertical relationship of the cross-over yarns arranged in the two adjacent knitted fabric portions is similar to S1.

[0032] In S3, the knitted fabric portions α , β , γ are knitted for one course according to the knitting direction and the knitting order similar to S1. A stitch 10 at the terminating end of the knitted fabric portion α is newly formed in the wale direction following the stitch 5 at the starting end of the knitted fabric portion α knitted in S2. A stitch 11 at the starting end of the knitted fabric portion β is

newly formed in a wale direction following the stitch 8 at the terminating end of the knitted fabric portion β knitted in S2. Furthermore, the stitch (knitting needle K of the BB) at the terminating end of the knitted fabric portion β is newly formed on the stitch at the starting end of the knitted fabric portion β knitted in S2, and the stitch (knitting needle J of the BB) at the starting end of the knitted fabric portion γ is newly formed in the wale direction following the stitch at the terminating end of the knitted fabric portion γ knitted in S2.

[0033] The knitting of S2 and S3 are thereafter repeated to complete the knitted fabric including the knitted fabric portions adjacent to each other. Fig. 2 shows a state of the knitting yarn of each portion α , β at the boundary portion of the adjacent knitted fabric portions α , β in the knitted fabric. As shown in Fig. 2, the knitting yarn (shown with thick line in the figure) connecting the front stitch 1 of the knitted fabric portion α and a front stitch 6 following in the wale direction of the front stitch 1 entangles with a knitting yarn (shown with a thick line in the figure) connecting a back stitch 3 at the end of the knitted fabric portion β and a front stitch 4 next to the back stitch 3 so as to be hooked and turned back, thus coupling the knitted fabric portions α , β .

[0034] When the actual knitted fabric knitted according to the knitting steps of Fig. 1 is seen from the front side, that is, when the knitted fabric is seen from the FB side towards the BB side of Fig. 1, it can be seen that the stitches are not disturbed at the boundary portion of the knitted fabric portion α and the knitted fabric portion β , as shown in the photograph of Fig. 3. This is because the knitted fabric portions α , β are coupled by having the knitting yarns of the knitted fabric portions α , β entangled, instead of tucking the knitting yarn of one knitted fabric portion α (β) to the other knitted fabric portion β (α).

[0035] When the knitted fabric is seen from the back side, it can be seen that the back stitch knitted on the BB in the knitting steps of Fig. 1, that is, the stitch at the end of the knitted fabric portion α (β) at the boundary portion of the knitted fabric portions α , β is arranged on the back side of the knitted fabric portion β (α), as shown in the photograph of Fig. 4.

<Second Embodiment>

[0036] In a second embodiment, an example in which the knitting is carried out such that the knitting directions of the adjacent knitted fabric portions are opposite to each other and the knitting on the BB for joining the knitted fabric portions is carried out in only one of the adjacent knitted fabric portions, as opposed to the first embodiment, will be described based on Figs. 5 and 6.

[0037] First, the knitting of the knitted fabric portions α , β , γ following in the wale direction of the stitches held on the knitting needles A to O of the FB shown in S10 of Fig. 5 is started (S11). One cam system is used in this embodiment. First, in S11, the carriage is moved in the right direction in the plane of drawing to knit the knitted

fabric portions α , γ . In this case, a stitch 11 at the terminating end is formed on the knitting needle E of the FB when knitting the knitted fabric portion α , and a pickup stitch to become the starting end of the knitted fabric portion γ is formed on the knitting needle J of the BB within the knitting region of the knitted fabric portion β when knitting the knitted fabric portion γ . After the knitting of the knitted fabric portion α is finished, the cam system stops entraining the yarn feeder X, and entrains the new yarn feeder Z to knit the knitted fabric portion γ . In S11, the carriage is moved to the left side in the plane of drawing to knit the knitted fabric portion β . In this case, the yarn feeder Y is entrained from within the knitting region of the knitted fabric portion γ , and a pickup stitch 13 to become the terminating end of the knitted fabric portion β is formed on the knitting needle E of the BB within the knitting region of the knitted fabric portion α .

[0038] Next, in S12, the carriage is once moved in the right direction in the plane of drawing without performing knitting, and thereafter, the knitted fabric portions γ , α are knitted while moving the carriage in the left direction in the plane of drawing, and lastly, the knitted fabric portion β is knitted while again moving the carriage in the right direction in the plane of drawing. In this case, a stitch at the terminating end of the knitted fabric portion γ and a stitch at the starting end of the knitted fabric portion β are formed as new stitches following the respective pickup stitches formed in S11.

[0039] Moreover, in S13, the knitting similar to S11 is carried out to form a stitch following in the wale direction of the back stitches formed in S12. Subsequently, the knitting of S12 and S13 is repeated to complete the knitted fabric portions α , β , γ .

[0040] As a result of carrying out the knitting described above, the knitting yarn connecting the front stitch 11 at the end of the knitted fabric portion α formed from S11 to S12 of Fig. 5 of the adjacent knitted fabric portions α , β and a front stitch 14 following in the wale direction of the front stitch 11 entangles with a cross-over yarn (shown with a thick line) connecting a back stitch 13 at the terminating end of the knitted fabric portion β formed in S11 of Fig. 5 and a front stitch 12 connected to the back stitch 13 so as to be hooked and turned back, as shown in the loop diagram of Fig. 6. The knitted fabric portion α and the knitted fabric portion β are coupled by such entanglement of the cross-over yarn and the knitting yarn.

<Third Embodiment>

[0041] In a third embodiment, an example in which the knitting is carried out such that the knitting directions of the knitted fabric portions adjacent to each other are the same, similarly to the first embodiment, and the knitting on the BB for joining the knitted fabric portions is carried out in only one of the adjacent knitted fabric portions, will be described based on Figs. 7 and 8.

[0042] First, the knitting of the knitted fabric portions

α , β , γ following in the wale direction of the stitches held on the knitting needles A to O of the FB shown in S20 of Fig. 7 is started (S21). In S21, the knitted fabric portions α , γ are knitted with the cam system C1 and the knitted fabric portion β is knitted with the cam system C2. In this case, a pickup stitch 22 at the terminating end is formed on the knitting needle F of the BB in the knitting region of the knitted fabric portion β when knitting the knitted fabric portion α , and a stitch 23 to become the starting end of the knitted fabric portion β is formed on the knitting needle F of the FB when knitting the knitted fabric portion β . Similarly for the boundary of the knitted fabric portions β , γ on the right side in the plane of drawing, a pickup stitch at the terminating end is formed on the knitting needle K of the BB for the knitted fabric portion β on the near side in the knitting direction, and a stitch at the starting end is formed on the knitting needle K of the FB for the knitted fabric portion γ on the far side in the knitting direction.

[0043] Next, in S22, the knitting direction is inverted from S21 so that the knitted fabric portions γ , α are knitted with the cam system C1 and the knitted fabric portion β is knitted with the cam system C2. In this case, the stitches at the starting end of the knitted fabric portions β , α are formed as new stitches following the pickup stitches formed in S21.

[0044] Further, in S23, knitting similar to S21 is carried out to form a stitch following in the wale direction of the back stitches formed in S22. Thereafter, the knitting of S22, S23 is repeated to complete the knitted fabric portions α , β , γ .

[0045] As a result of carrying out the knitting described above, the knitting yarn connecting a front stitch 26 of the knitted fabric portion β formed from S22 to S23 of the adjacent knitted fabric portions α , β and a front stitch 29 following in the wale direction of the front stitch 26 entangles with a cross-over yarn (shown with a thick line) connecting a back stitch 28 at the terminating end of the knitted fabric portion α formed in S23 of Fig. 7 and a front stitch 27 connected to the back stitch 28 so as to be hooked and turned back, as shown in the loop diagram of Fig. 8. The knitted fabric portion α and the knitted fabric portion β are coupled by such entanglement of the cross-over yarn of the knitted fabric portion α and the knitting yarn of the knitted fabric portion β .

<Others, modifications>

[0046] When carrying out return knitting using the flat knitting machine, the stitch at the terminating end in the knitting direction is formed, and thereafter, the stitch at the starting end of the next knitting course is formed following the stitch at the terminating end. In this case, the knitting needle proximate to the knitting needle on which the stitch at the terminating end is held is also raised, and thus the stitch at the end may not be cleared from the hook of the knitting needle. The method of solving such a problem includes dividing the knitting operation

of the proximate knitting needles to separate knitting courses. Such a problem may occur in the joining method of the adjacent knitted fabric portions of the present invention when knitting the next knitting course with respect to the terminating end holding stitch formed in the BB to connect the adjacent knitted fabric portions. The miss knitting is thus preferably carried out in the next knitting course with respect to the terminating end holding stitch. For example, when knitting the knitted fabric portion α in S2 of the first embodiment, the stitch 5 is not formed with respect to the pickup stitch 2 formed on the knitting needle F of the BB in S1 and the stitch 6 of the knitting needle E of the FB is assumed as the stitch at the starting end of the knitted fabric portion α in S2. The stitch 1 proximate to the pickup stitch 2 in S1 is thus knitted down one step by S2 in which the miss knitting is also performed, so that the clearing mistake of the pickup stitch 2 can be avoided when forming the stitch 10 on the pickup stitch 2 in the next S3. Furthermore, the miss knitting may be carried out without carrying out the knitting of a stitch 15 with the knitting needle E of the BB in S12 in Fig. 5 of the second embodiment, and the miss knitting may be carried out without carrying out the knitting of the stitch 24 with the knitting needle F of the BB in S22 in Fig. 7 of the third embodiment.

[0047] The embodiments of the present invention are not limited to the embodiments described above.

For example, the joining method of the adjacent knitted fabric portions of the present invention can be used to join the body and the sleeves of the sweater.

DESCRIPTION OF REFERENCE NUMERALS

[0048]

A to O knitting needle
 FB front needle bed BB back needle bed
 X, Y, Z yarn feeder
 α , β , γ knitted fabric portion
 1, 4 to 11, 12, 14 to 19, 21, 23 to 29 stitch
 2, 3, 13, 22 pickup stitch
 1, 4, 6, 7, 11, 12, 14, 16, 21, 23, 25, 26, 27, 29 front stitch
 2, 3, 5, 8, 13, 15, 19, 22, 24, 28 back stitch

Claims

1. A joining method of adjacent knitted fabric portions (α , β , γ) for joining a plurality of knitted fabric portions (α , β , γ), which are lined in a knitting width direction of a knitted fabric and knitted independently, using a flat knitting machine including at least a front and a back needle bed (FB, BB) disposed opposite to each other and a plurality of yarn feeders (X, Y, Z) for feeding a knitting yarn to a knitting needle (A to O), the method **characterized by**:

when increasing the number of courses of the knitted fabric portions (α , β , γ) by alternately repeating a step of knitting two adjacent knitted fabric portions (α , β , γ) one course at a time while reversing the knitting direction for every course, carrying out in at least some knitting courses, at least one of

(1) forming a terminating end holding stitch in form of a pickup stitch (2, 3, 13, 22) or a stitch to become a terminating end of at least one of the adjacent knitted fabric portions (α , β , γ) on a knitting needle (A to O), which is located at a position overlapping a knitting region of the other knitted fabric portion different from the knitted fabric portion including the terminating end holding stitch, of the needle bed (FB, BB) opposing the needle bed (BB, FB) on which the stitch before the terminating end holding stitch is formed,

so that a knitting yarn, which connects the terminating end holding stitch and the stitch before the terminating end holding stitch, crosses between the front and back needle beds (FB, BB) so as to intersect a knitting yarn of the other knitted fabric portion and (2) forming a starting end holding stitch in form of a pickup stitch (2, 3, 13, 22) or a stitch to become a starting end of at least one of the adjacent knitted fabric portions (α , β , γ) on a knitting needle (A to O), which is located at a position overlapping a knitting region of the other knitted fabric portion different from the knitted fabric portion including the starting end holding stitch, of the needle bed (FB, BB) opposing the needle bed (BB, FB) on which the stitch after the starting end holding stitch is formed, so that a knitting yarn, which connects the starting end holding stitch and the stitch after the starting end holding stitch, crosses between the front and back needle beds (FB, BB) so as to intersect a knitting yarn of the other knitted fabric portion;

wherein the yarns that cross between the front and back needle beds (FB, BB) after carrying out (1) and (2) are cross-over yarns, and some cross-over yarns and the knitting yarn of the knitted fabric portion different from the knitted fabric portion including the cross-over yarns are entangled to couple the adjacent knitted fabric portions (α , β , γ).

2. The joining method of the adjacent knitted fabric portions (α , β , γ) according to claim 1, **characterized in that**

the two adjacent knitted fabric portions (α , β , γ) are knitted in the same knitting direction; and both (1) and (2) are carried out for every course or every some course.

3. The joining method of the adjacent knitted fabric portions (α , β , γ) according to claim 1 or 2, **characterized in that**

in the knitting course after the knitting course in which (1) is carried out, miss knitting is performed on the terminating end holding stitch formed in (1) and a new terminating end holding stitch is formed after the next knitting course.

4. The joining method of the adjacent knitted fabric portions (α , β , γ) according to claim 1 or 2, **characterized in that** an intarsia pattern is knitted by differing colors of the knitting yarns for knitting the adjacent knitted fabric portions (α , β , γ).

5. A knitted fabric including a plurality of knitted fabric portions which are lined in a knitting width direction and knitted by different knitting yarns, **characterized in that**

a stitch on a boundary side end of some knitting courses in at least one knitted fabric portion of the adjacent knitted fabric portions including front stitches is a back stitch, and

a knitting yarn connecting the back stitch and the front stitch next to the back stitch in the knitting course including the back stitch is a cross-over yarn, and said cross-over yarn is entangled with a knitting yarn connecting a front stitch, which is closest to the boundary portion in the other knitted fabric portion, and a front stitch following in a wale direction of the front stitch, to couple the knitted fabric portions.

Patentansprüche

1. Verbindungsverfahren für benachbarte Gestrickteile (α , β , γ) zum Verbinden einer Vielzahl von Gestrickteilen (α , β , γ), die in einer Strickbreitenrichtung eines Gestricks aufgereiht sind und unabhängig voneinander gestrickt werden, unter Verwendung einer Flachstrickmaschine, die wenigstens ein vorderes und ein gegenüberliegendes hinteres Nadelbett (FB, BB) und eine Vielzahl von Fadenführern (X, Y, Z) zum Zuführen eines Strickfadens zu einer Stricknadel (A bis O) enthält, wobei das Verfahren **gekennzeichnet ist durch:**

wenn die Anzahl von Reihen der Gestrickteile (α , β , γ) **durch** das alternierende Wiederholen eines Schritts zum Stricken von zwei benachbarten Gestrickteilen (α , β , γ) jeweils für eine Reihe, wobei die Strickrichtung für jede Reihe umgekehrt wird, erhöht wird, Durchführen in we-

nigstens einigen Strickreihen wenigstens eines der Folgenden:

- (1) Bilden einer Abschlussende-Haltemasche in Form einer Aufgreifmasche (2, 3, 13, 22) oder einer Masche, die ein Abschlussende wenigstens eines der benachbarten Gestrickteile (α , β , γ) wird, auf einer Stricknadel (A bis O), die sich an einer Position befindet, die einen Strickbereich des anderen Gestrickteils als des die Abschlussende-Haltemasche enthaltenden Gestrickteils überlappt, des Nadelbetts (FB, BB) gegenüber dem Nadelbett (BB, FB), an dem die Masche vor der Abschlussende-Haltemasche gebildet wird, sodass ein Strickfaden, der die Abschlussende-Haltemasche und die Masche vor der Abschlussende-Haltemasche verbindet, zwischen den vorderen und hinteren Nadelbetten (FB, BB) kreuzt, um einen Strickfaden des anderen Gestrickteils zu kreuzen, und
- (2) Bilden einer Anfangsende-Haltemasche in der Form einer Aufgreifmasche (2, 3, 13, 22) oder einer Masche, die ein Anfangsende wenigstens eines der benachbarten Gestrickteile (α , β , γ) wird, auf einer Stricknadel (A bis O), die sich an einer Position befindet, die einen Strickbereich des anderen Gestrickteils als des die Anfangsende-Haltemasche enthaltenden Gestrickteils überlappt, des Nadelbetts (FB, BB) gegenüber dem Nadelbett (BB, FB), auf dem die Masche nach der Anfangsende-Haltemasche gebildet wird, sodass ein Strickfaden, der die Anfangsende-Haltemasche und die Masche nach der Anfangsende-Haltemasche verbindet, zwischen den vorderen und hinteren Nadelbetten (FB, BB) kreuzt, um einen Strickfaden des anderen Gestrickteils zu kreuzen,

wobei die Fäden, die zwischen den vorderen und hinteren Nadelbetten (FB, BB) kreuzen, nach dem Ausführen von (1) und (2) Überkreuzungsfäden sind, und einige Überkreuzungsfäden und der Strickfaden des anderen Gestrickteils als dem die Überkreuzungsfäden enthaltenden Gestrickteil miteinander verschlungen werden, um die benachbarten Gestrickteile (α , β , γ) miteinander zu koppeln.

2. Verbindungsverfahren für benachbarte Gestrickteile (α , β , γ) nach Anspruch 1, **dadurch gekennzeichnet, dass**

die zwei benachbarten Gestrickteile (α , β , γ) in der gleichen Strickrichtung gestrickt werden, und sowohl (1) als auch (2) für jede Reihe oder jede so

und so vierte Reihe durchgeführt wird.

3. Verbindungsverfahren für benachbarte Gestrickteile (α , β , γ) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass:**

in der Strickreihe nach der Strickreihe, in der (1) durchgeführt wird, ein Fehlstricken an der in (1) gebildeten Abschlussende-Haltemasche durchgeführt wird und eine neue Abschlussende-Haltemasche nach der nächsten Strickreihe gebildet wird.

4. Verbindungsverfahren für benachbarte Gestrickteile (α , β , γ) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** ein Intarsia-Muster durch verschiedene Farben der Strickfäden für das Stricken der benachbarten Gestrickteile (α , β , γ) gestrickt wird.

5. Gestrick, das eine Vielzahl von Gestrickteilen enthält, die in einer Strickbreitenrichtung aufgereiht sind und mit verschiedenen Strickfäden gestrickt werden, **dadurch gekennzeichnet, dass:**

eine Masche an einem grenzseitigen Ende einiger Strickreihen in wenigstens einem vordere Maschen enthaltenden Gestrickteil der benachbarten Gestrickteile eine hintere Masche ist, und ein Strickfaden, der die hintere Masche und die vordere Masche neben der hinteren Masche in der die hintere Masche enthaltenden Strickreihe verbindet, ein Überkreuzungsfaden ist, wobei der Überkreuzungsfaden mit einem Strickfaden, der eine vordere Masche, die dem Grenzteil in dem anderen Gestrickteil am nächsten ist, und eine in der Maschenstäbchenrichtung auf die vordere Masche folgende vordere Masche verbindet, verschlungen ist, um die Gestrickteile miteinander zu koppeln.

Revendications

1. Procédé de jonction de portions de tissu tricoté adjacentes (α , β , γ) pour joindre une pluralité de portions de tissu tricoté (α , β , γ), qui sont alignées dans une direction de largeur de tricotage d'un tissu tricoté et qui sont tricotées de manière indépendante, en utilisant une machine à tricoter à plat comprenant au moins une fonture avant et une fonture arrière (FB, BB) disposées face-à-face et une pluralité de distributeurs de fil (X, Y, Z) pour fournir un fil à tricoter à une aiguille à tricoter (A à O), le procédé étant **caractérisé par :**

lors d'une augmentation du nombre de courses des portions de tissu tricoté (α , β , γ) en répétant alternativement une étape consistant à tricoter

deux portions de tissu tricoté adjacentes (α , β , γ) une course à la fois pendant qu'on inverse la direction de tricotage pour chaque course, réaliser dans au moins certaines courses de tricotage, au moins l'une des étapes suivantes

(1) former une maille de maintien d'extrémité de terminaison sous forme d'une maille prélevée (2, 3, 13, 22) ou d'une maille destinée à devenir une extrémité de terminaison d'au moins l'une des portions de tissu tricoté adjacentes (α , β , γ) sur une aiguille à tricoter (A à O), qui est située à une position chevauchant une région de tricotage de l'autre portion de tissu tricoté différente de la portion de tissu tricoté comprenant la maille de maintien d'extrémité de terminaison, de la fonture (FB, BB) opposée à la fonture (BB, FB) sur laquelle la maille se trouvant avant la maille de maintien d'extrémité de terminaison est formée,

de sorte qu'un fil à tricoter, qui connecte la maille de maintien d'extrémité de terminaison et la maille se trouvant avant la maille de maintien d'extrémité de terminaison, traverse entre les fontures avant et arrière (FB, BB) de manière à intersecter un fil à tricoter de l'autre portion de tissu tricoté, et

(2) former une maille de maintien d'extrémité de démarrage sous forme d'une maille prélevée (2, 3, 13, 22) ou d'une maille destinée à devenir une extrémité de démarrage d'au moins l'une des portions de tissu tricoté adjacentes (α , β , γ) sur une aiguille à tricoter (A à O), qui est située au niveau d'une position chevauchant une région de tricotage de l'autre portion de tissu tricoté différente de la portion de tissu tricoté comprenant la maille de maintien d'extrémité de démarrage, de la fonture (FB, BB) opposée à la fonture (BB, FB) sur laquelle la maille se trouvant après la maille de maintien d'extrémité de démarrage est formée, de sorte qu'un fil à tricoter, qui connecte la maille de maintien d'extrémité de démarrage et la maille se trouvant après la maille de maintien d'extrémité de démarrage, traverse entre les fontures avant et arrière (FB, BB) de manière à intersecter un fil à tricoter de l'autre portion de tissu tricoté ;

dans lequel les fils qui traversent entre les fontures avant et arrière (FB, BB) après la réalisation de (1) et (2) sont des fils de traversée, et certains fils de traversée et le fil à tricoter de la portion de tissu tricoté différente de la portion de tissu tricoté comprenant les fils de traversée sont enchevêtrés pour coupler les portions de

tissu tricoté adjacentes (α , β , γ).

2. Procédé de jonction des portions de tissu tricoté adjacentes (α , β , γ) selon la revendication 1, **caractérisé en ce que** les deux portions de tissu tricoté adjacentes (α , β , γ) sont tricotées dans la même direction de tricotage ; et les deux étapes (1) et (2) sont réalisées pour chaque course ou pour chaque course avec un certain intervalle de courses.
3. Procédé de jonction des portions de tissu tricoté adjacentes (α , β , γ) selon la revendication 1 ou 2, **caractérisé en ce que** dans la course de tricotage après la course de tricotage dans laquelle l'étape (1) est réalisée, un tricotage manqué est réalisé sur la maille de maintien d'extrémité de terminaison formée dans (1) et une nouvelle maille de maintien d'extrémité de terminaison est formée après la course de tricotage suivante.
4. Procédé de jonction des portions de tissu tricoté adjacentes (α , β , γ) selon la revendication 1 ou 2, **caractérisé en ce qu'un** motif intarsia est tricoté par différentes couleurs des fils à tricoter pour tricoter les portions de tissu tricoté adjacentes (α , β , γ).
5. Tissu tricoté comprenant une pluralité de portions de tissu tricoté qui sont alignées dans une direction de largeur de tricotage et qui sont tricotées par des fils à tricoter différents, **caractérisé en ce que** une maille située sur une extrémité de côté de frontière de certaines courses de tricotage, dans au moins une portion de tissu tricoté des portions de tissu tricoté adjacentes comprenant des mailles de devant, est une maille de derrière, et un fil à tricoter connectant la maille de derrière et la maille de devant à la suite de la maille de derrière dans la course de tricotage comprenant la maille de derrière est un fil de traversée, et le fil de traversée est enchevêtré avec un fil à tricoter connectant une maille de devant, qui est la plus proche de la portion de frontière dans l'autre portion de tissu tricoté, et une maille de devant à la suite dans une direction de colonne de mailles de la maille de devant, pour coupler les portions de tissu tricoté.

Fig. 1

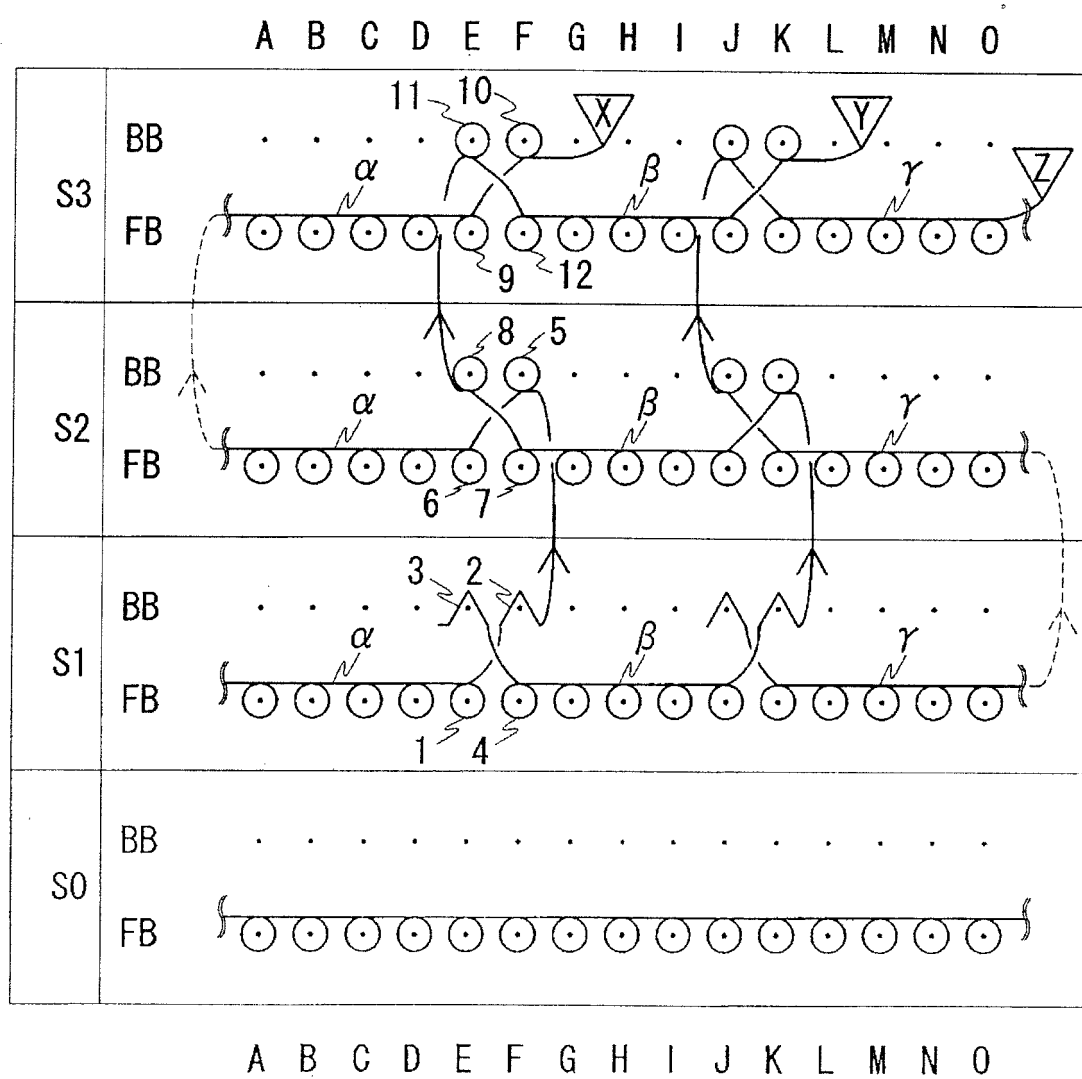


Fig. 2

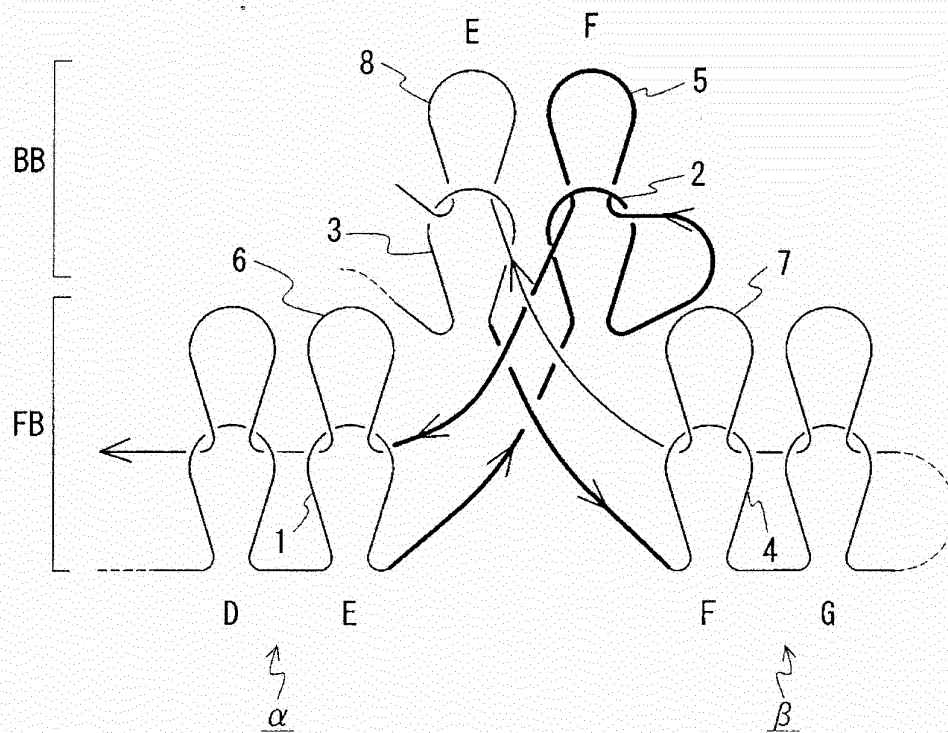


Fig. 3

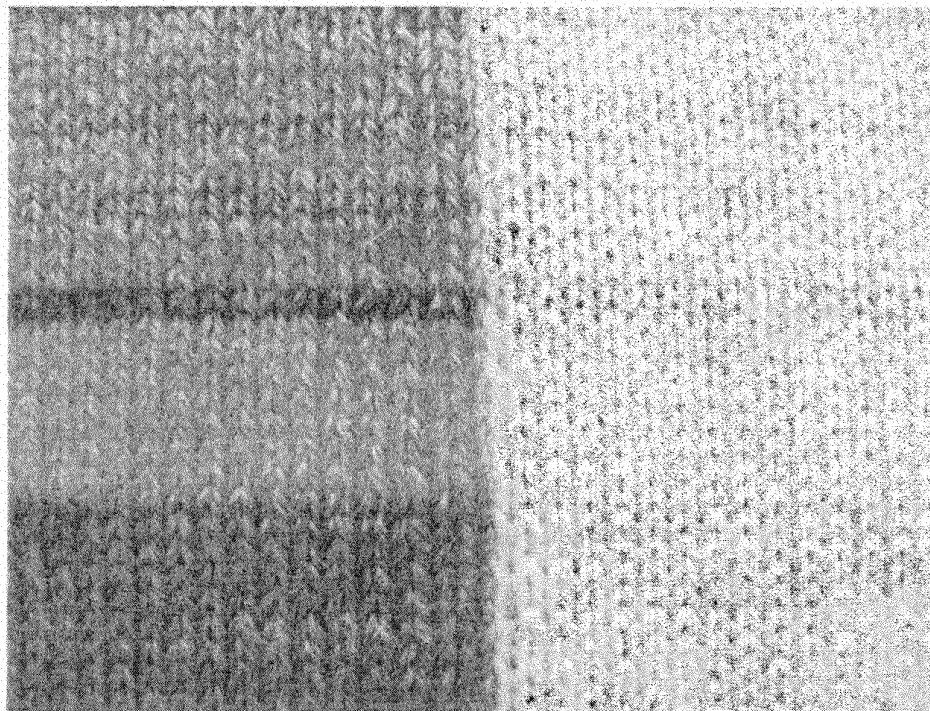


Fig. 4

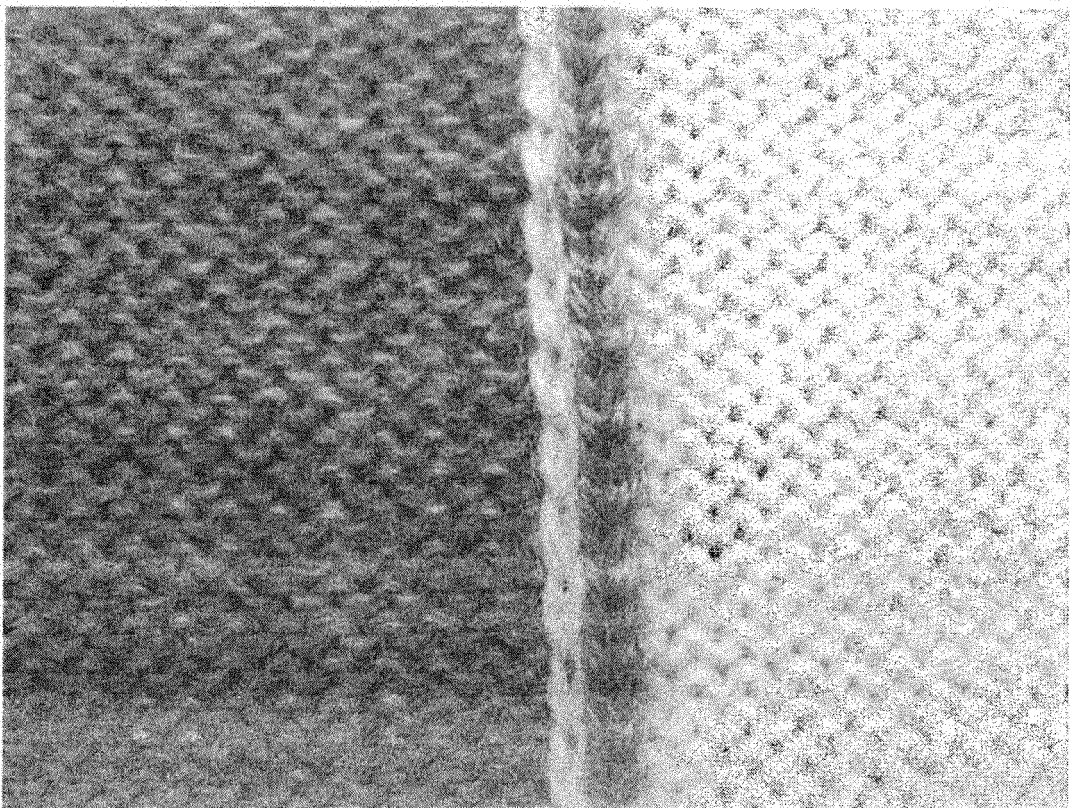


Fig. 5

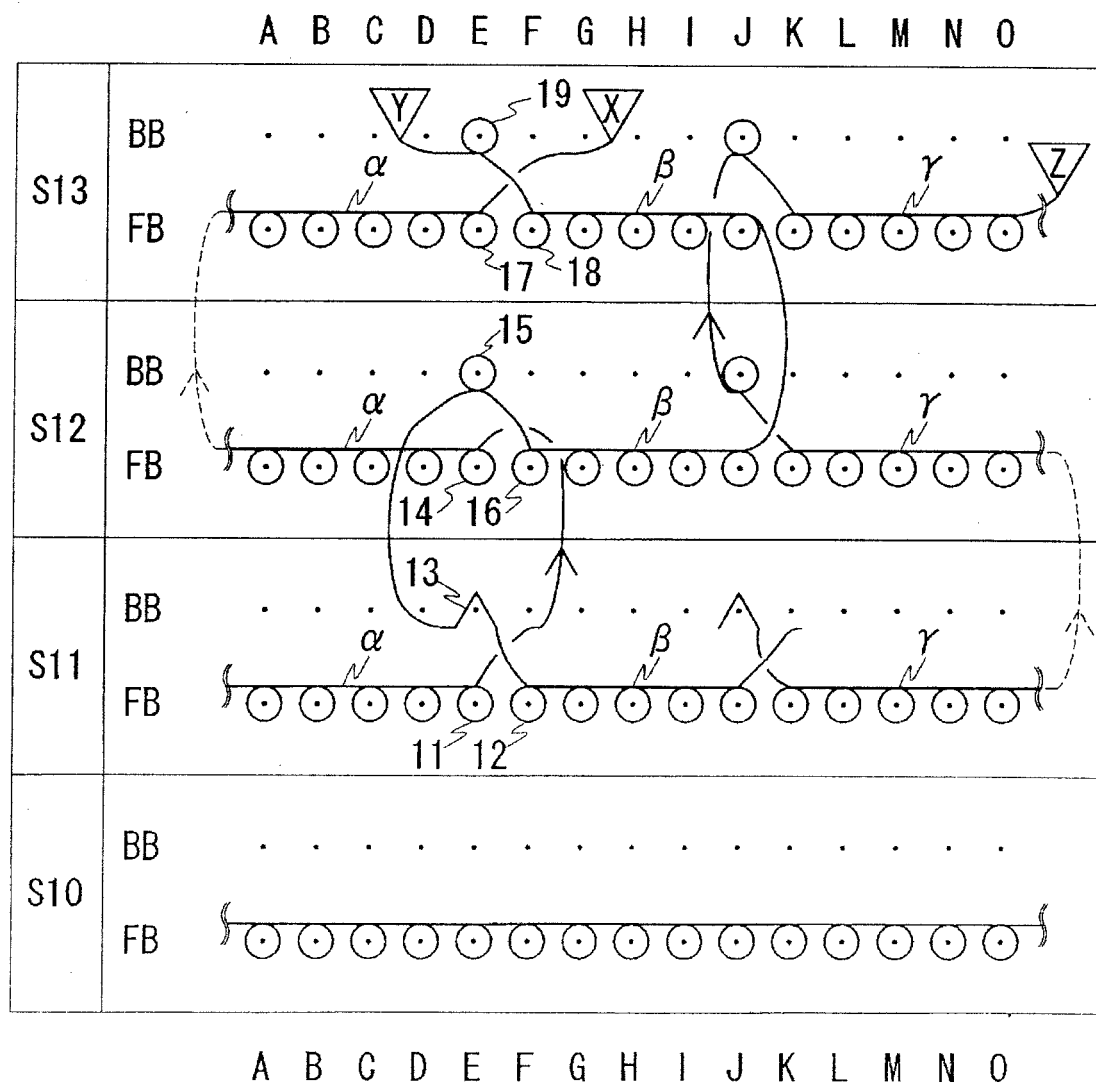


Fig. 6

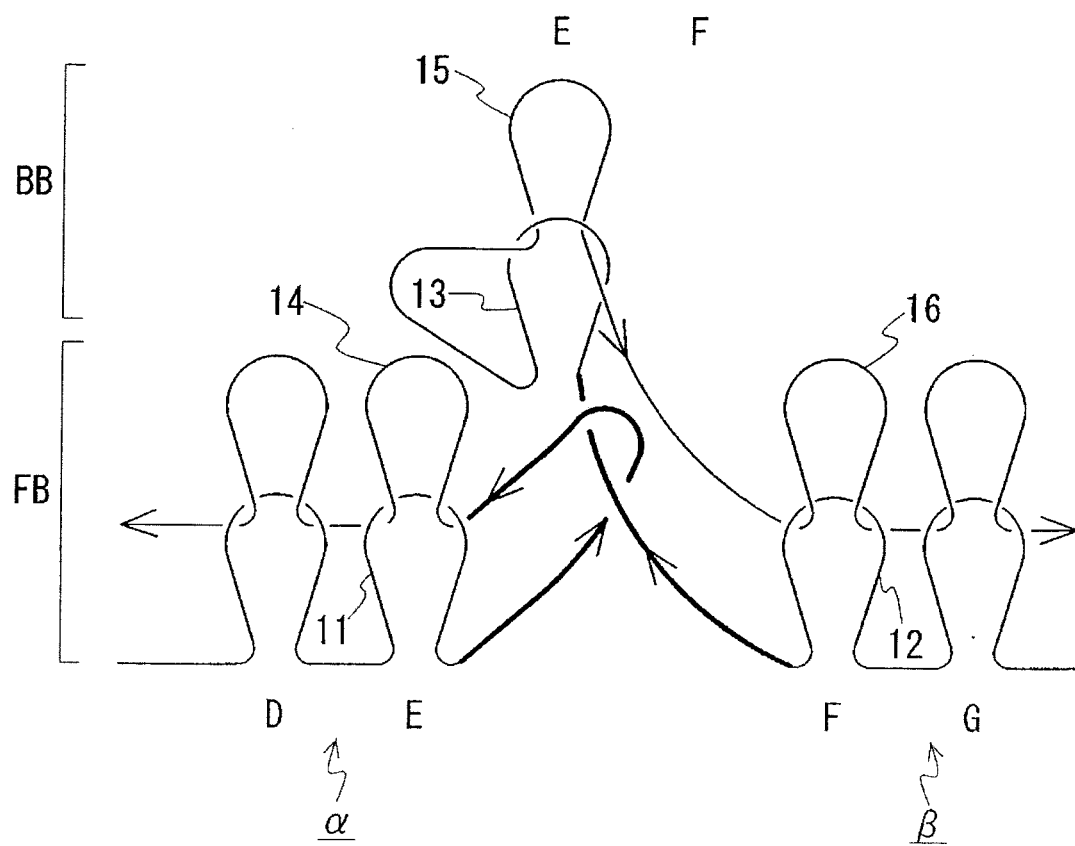


Fig. 7

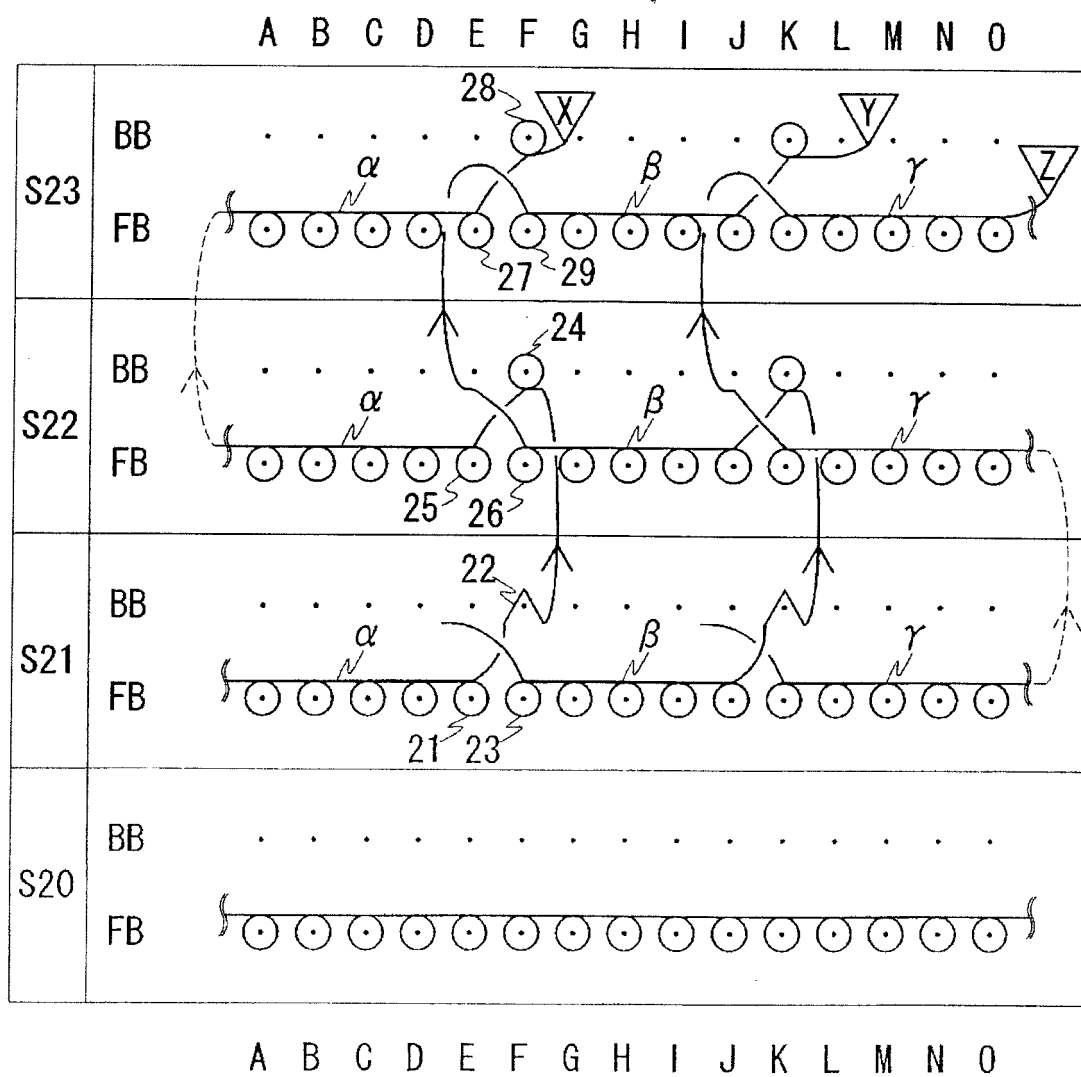


Fig. 8

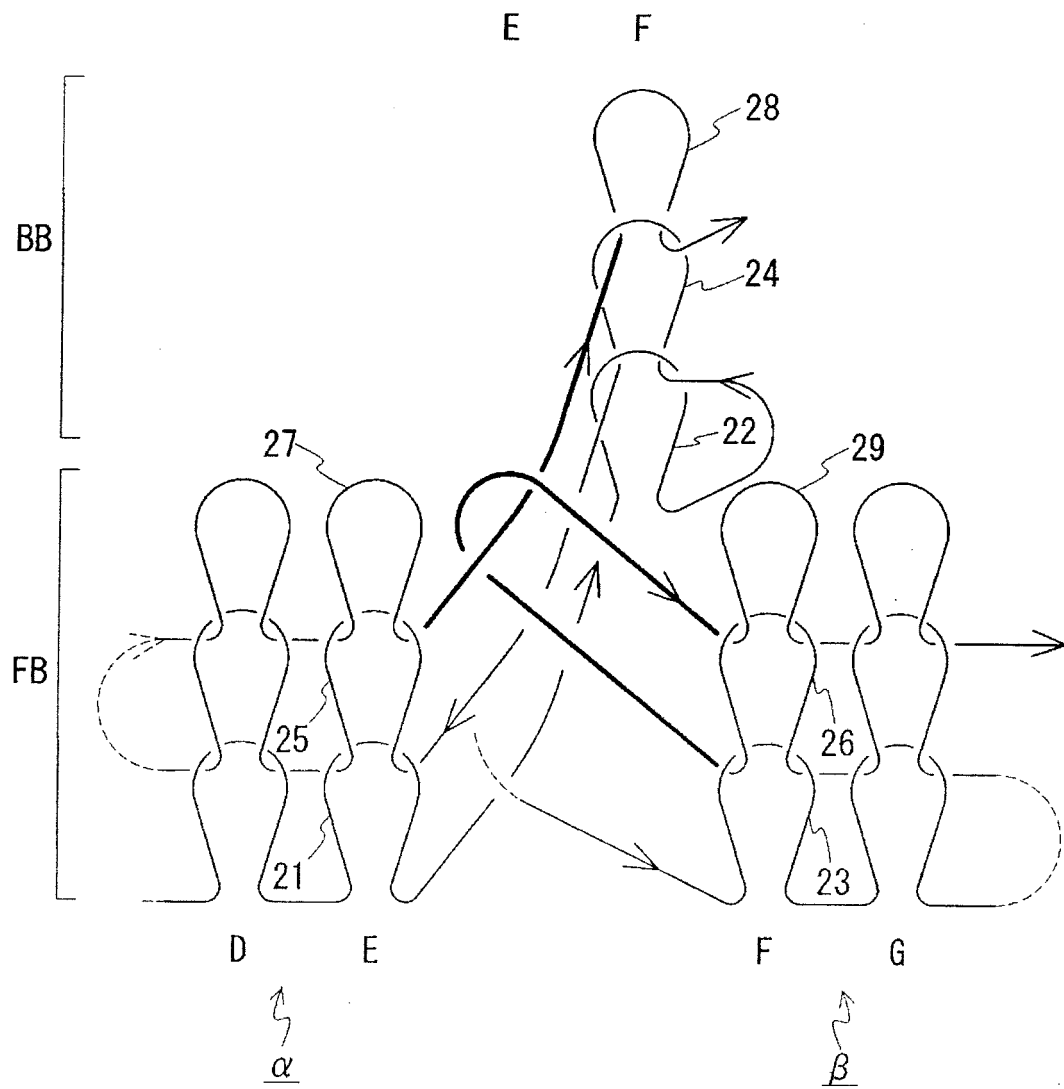


Fig. 9

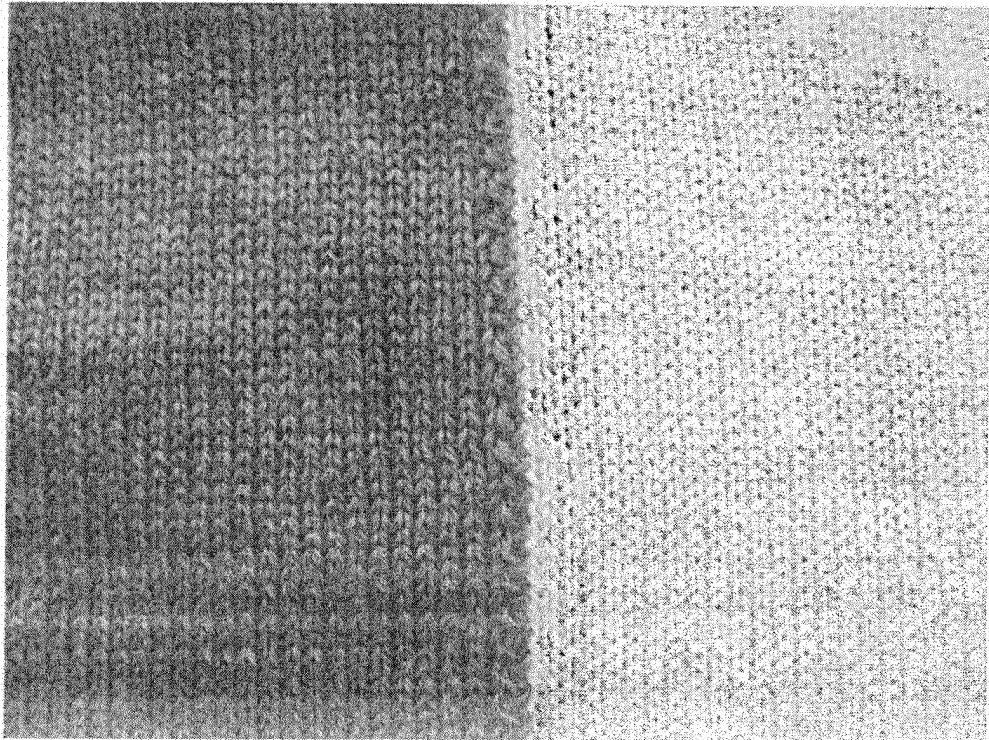
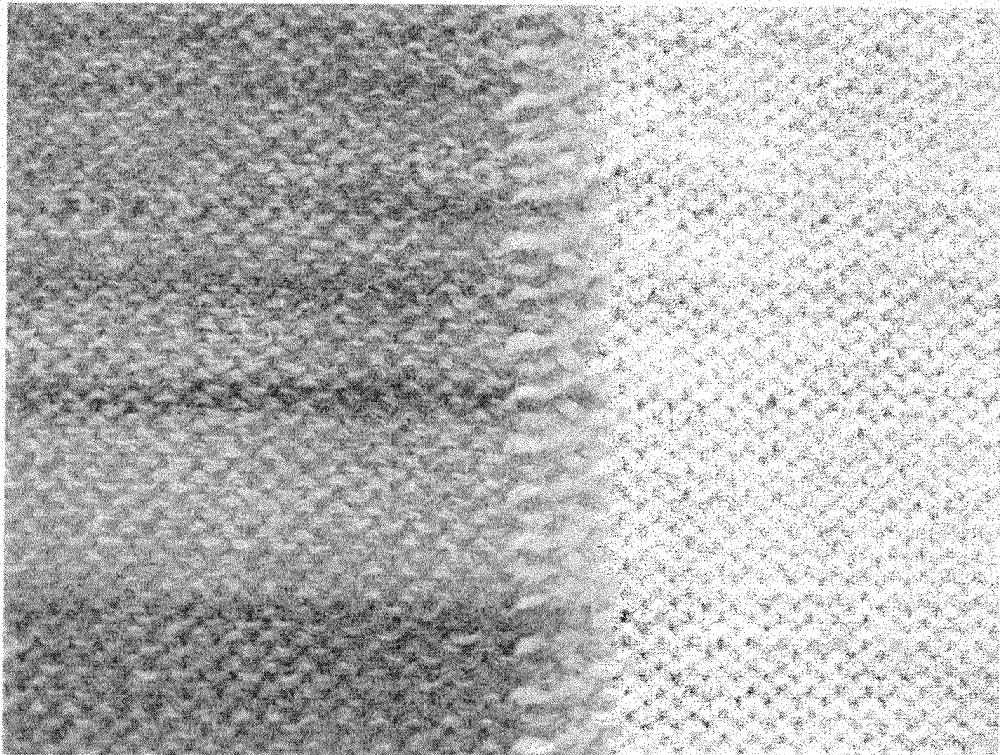


Fig. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 56053247 A [0003]
- EP 2390393 A1 [0004]
- US 5467616 A [0005]
- JP 2000199156 A [0006]