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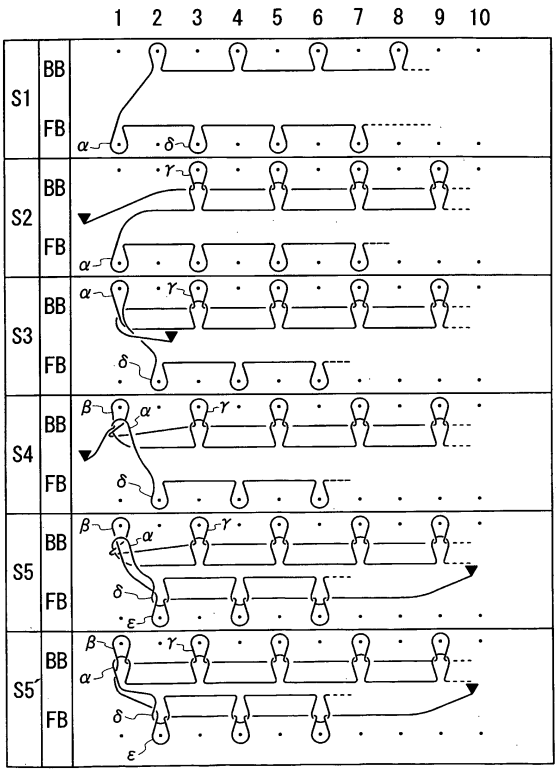
(54) METHOD OF KNITTING TUBULAR FABRIC, AND TUBULAR FABRIC

(57) Provided is a knitting method of a tubular knitted fabric in which a back stitch can be rotated without forming a twisted stitch in the tubular knitted fabric. A yarn feeder is moved toward an outer side (leftward in the plane of drawing), a stitch γ of BB is formed during such movement, and the yarn feeder is positioned on the outer side of a stitch α of FB. The stitch α is transferred to an empty needle on the outer side of a knitting width with respect to the stitch γ in the BB. The yarn feeder positioned on the outer side of the stitch α is moved toward an inner side (rightward in the plane of drawing), and positioned on the inner side of the stitch α. While moving the yarn feeder positioned on the inner side of the stitch α toward the outer side, a knitting yarn is fed to the knitting needle of the BB holding the stitch α to form a stitch β that becomes the back stitch when the tubular knitted fabric is seen from the outer side of the tube. The yarn feeder is then moved toward the inner side, and a new stitch ε is formed following the stitch δ proximate to the stitch α before transferring.

Fig. 1



EP 2 431 510 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a knitting method of a tubular knitted fabric of rotating a back stitch when knitting a tubular knitted fabric using a flat knitting machine, and a tubular knitted fabric including an area knitted by applying the knitting method of a tubular knitted fabric.

BACKGROUND ART

[0002] Tubular knitted fabrics such as a sweater and a glove are knitted using a flat knitting machine having at least a pair of front and back needle beds. A difference in the number of stitches held on the front and back needle beds may arise in the process of knitting such tubular knitted fabrics. In such a case, the number of stitches held on the front and back needle beds can be substantially equalized through the act of transferring a stitch at an end in a knitting width direction of a knitted fabric portion held on either one of the front and back needle beds to the outer side of a stitch at an end in a knitting width direction of a knitted fabric portion held on the other needle bed, or a so-called rotation. When carrying out such a rotation, there is proposed the knitting method of a tubular knitted fabric of twisting the stitch to be rotated in advance, for the front stitch, to resolve the twist of the stitch when the relevant stitch is rotated (refer to e.g., Patent Document 1). When moving the yarn feeder in one direction to form stitches, the twisted stitch is formed by hooking a knitting yarn with a knitting needle when the yarn feeder that has passed the position of the knitting needle scheduled to form the twisted stitch is inverted and again passed through the relevant knitting needle.

[0003] Fig. 6 shows one example of a method for twisting in advance a stitch to be rotated. FB in Fig. 6 indicates a front needle bed, BB indicates a back needle bed, ▼ indicates a yarn feeder, and "S + number" indicates the number of a knitting process. Such definitions are the same in Fig. 1, Fig. 2, Fig. 3, and Fig. 7, to be described later.

[0004] S1 of Fig. 6 shows a state before carrying out the rotation, that is, a state before moving a stitch held on a knitting needle 1 of the FB to the outer side in the knitting width direction of a stitch held on a knitting needle 2 of the BB. In order to form a stitch twisted in advance from the state of S1, the yarn feeder is once passed through the position of the knitting needle (knitting needle 1 of FB) scheduled to form the twisted stitch (S2), and the knitting is carried out when the yarn feeder is inverted and again passed through the position of the knitting needle (S3). New stitches are then formed following the stitches held on the knitting needles 2, 4, 6, 8 of the BB (S4). The twisted stitch is formed on the knitting needle 1 of the FB through a series of knitting processes, and such twisted stitch is rotated to the opposing BB (see S5). Here, S5 represents a knitting yarn so as to show the trajectory of movement of the yarn feeder, where the actual state of the knitting yarn is the state shown in S5' and the twist of the stitch twisted in advance is resolved.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0005]

[Patent document 1] Japanese Laid-Open Patent Publication No. 5-9851

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006] However, although the front stitch can be rotated by the knitting method of Patent Document 1, the back stitch cannot be rotated. The definition of front stitch and back stitch in the present specification refers to the state in which the tubular knitted fabric is seen from the outer side of the tube, where the stitch pulled out from an old stitch from the near side to the far side in the plane of drawing is the front stitch and the stitch pulled out the other way around is the back stitch in the drawing.

[0007] Fig. 7 is a knitting process diagram of a case in which the rotation of the back stitch is attempted in the tubular knitted fabric in which all the stitches are back stitches based on the technical concept of forming a stitch twisted in advance, similar to the rotation of the front stitch. In Fig. 7, a stitch to be rotated is the stitch held on the knitting needle 1 of the FB.

[0008] First, the stitches held on the BB are transferred to the opposing FB as a preparation for forming a new back stitch following the stitches held on the BB from the held state of the needle bed shown in S1 (S2). New stitches are formed following the transferred stitches from such a state (S3). The stitches formed in S3 are returned to the BB to become the back stitches.

[0009] Similar to the case of forming a twisted stitch of the front stitch, the yarn feeder is moved rightward in the plane of drawing and once passed through the position of the knitting needle 1 of the FB (S4), and after the stitch of the knitting needle 1 of the FB is transferred for rotation to the knitting needle 1 of the opposing BB, the yarn feeder is inverted leftward in the plane of drawing to form the stitch with the knitting needle 1 of the BB (S5). Lastly, the back stitches are formed following the stitches held on the FB in S5 (S6, S7).

[0010] Looking at the rotated stitch (stitch held on the knitting needle 2 of S7) formed as a result of carrying out the above knitting, the relevant stitch is a front stitch and not a back stitch. That is, only the front stitch is obtained even when attempting to rotate the back stitch. In addition, the old stitch on which the front stitch is formed is in a twisted state.

[0011] The present invention has been made in view of the above situation, and an object thereof is to provide a knitting method of a tubular knitted fabric capable of rotating a back stitch without forming a twisted stitch in the tubular knitted fabric, and a tubular knitted fabric having an area knitted by applying the method.

MEANS FOR SOLVING THE PROBLEMS

[0012] A knitting method of a tubular knitted fabric of the present invention is a knitting method of a tubular knitted fabric of, by using a flat knitting machine having at least a pair of front and back needle beds in which at least one of the front and back needle beds is capable of being racked in a traverse direction and stitches are transferable between the front and back needle beds, rotating a back stitch by positioning a stitch β, which is newly formed following a stitch α at the end in the knitting width direction of a one side knitted fabric portion held on one needle bed, on an outer side of a knitting width of an other side knitted fabric portion with respect to a stitch γ at the end in the knitting width direction of the other side knitted fabric portion held on the other needle bed facing the one needle bed. The knitting method of a tubular knitted fabric of the present invention includes the following steps on the assumption that the direction from the stitch α toward the knitted fabric portion is an inner side and the opposite direction is an outer side in a movement direction of a yarn feeder along an extending direction of the needle beds.

A step 1 of moving the yarn feeder toward the outer side, forming the stitch γ during the movement, and positioning the yarn feeder on the outer side of the stitch α.

A step 2 of transferring the stitch α to an empty needle on the outer side of the knitting width with respect to the stitch γ on the other needle bed.

A step 3 of moving the yarn feeder positioned on the outer side of the stitch α toward the inner side to be positioned on the inner side of the stitch α,

A step 4 of feeding a knitting yarn to the knitting needle of the other needle bed holding the stitch α while moving the yarn feeder positioned on the inner side of the stitch α toward the outer side, and forming the stitch β to become the back stitch when the tubular knitted fabric is seen from the outer side of the tube.

A step 5 of moving the yarn feeder toward the inner side and forming a new stitch ε following a stitch δ proximate to the stitch α in the step 1.

[0013] As one aspect of the knitting method of a tubular knitted fabric of the present invention, when knitting the tubular knitted fabric including an area where a front stitch and a back stitch adjoin each other, it is preferable that when rotating the back stitch from one needle bed to the other needle bed, the steps 1 to 5 are performed, and when rotating the front stitch from the one needle bed to the other needle bed, a stitch twisted in advance is formed on the one needle bed in the knitting direction opposite to the direction in the steps 1 to 5 to rotate the twisted stitch to the other needle bed. The knitting method for rotating the front stitch can use a known method as already described with reference to Fig. 6.

[0014] Furthermore, a tubular knitted fabric of the present invention is characterized in including an area knitted by applying the knitting method of a tubular knitted fabric of the present invention. The area for carrying out the rotation in the process of knitting the tubular knitted fabric includes the neckline of a sweater or the like, the joint portion of the thumb tubular portion in a glove along the shape of a human hand, and the like.

EFFECTS OF THE INVENTION

[0015] According to the knitting method of a tubular knitted fabric of the present invention, the back stitch can be rotated, and furthermore, the twisted stitch will not be formed when forming the back stitch. Therefore, the knitting method of a knitted fabric of the present invention is applicable to the knitting of the tubular knitted fabric including a rib structure in which the front stitch and the back stitch coexist.

[0016] According to the knitting method of a tubular knitted fabric of the present invention, the back stitch can be formed at the place desired to form the back stitch and the front stitch can be formed at the place desired to form the front stitch, and moreover, the twisted stitch will not be formed in the formation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a knitting process diagram according to a first embodiment when a knitting method of a tubular knitted fabric of the present invention is applied to a tubular knitted fabric in which stitches to be formed are all back stitches.

Fig. 2 is a knitting process diagram according to a second embodiment when a knitting method of a tubular knitted fabric of the present invention is applied to a tubular knitted fabric having a 1 x 1 rib structure.

Fig. 3 is a knitting process diagram according to the second embodiment following Fig. 2.

Fig. 4 is a photograph of a glove knitted by applying the knitting process shown in the second embodiment.

Fig. 5 is a photograph of a glove having a 1 x 1 rib structure knitted based on the technical concept described in Patent Document 1.

Fig. 6 is a knitting process diagram for rotating a front stitch without forming a twisted stitch.

Fig. 7 is a knitting process diagram when rotation of a back stitch is attempted based on the technical concept similar to the method of rotating the front stitch without forming the twisted stitch.

MODE FOR CARRYING OUT THE INVENTION

[0018] Hereinafter, a first embodiment of the present invention will be described with reference to Fig. 1, and a second embodiment will be described with reference to Figs. 2 and 3. The knitting described in both embodiments describes a knitting example that uses a two-bed flat knitting machine having a pair of front and back needle beds extending in a traverse direction and disposed opposite to each other in a cross direction. The flat knitting machine to use may, of course, be a four-bed flat knitting machine. In the embodiments, the description of the general operation irrelevant to the present invention such as the operation of transferring the stitches to the opposing needle bed to form a back stitch following the stitch held on the needle bed, and racking to move the held position of the stitches on the needle bed will be omitted.

<First Embodiment>

[0019] In the first embodiment, a description will be given of an example of forming a back stitch while rotating a stitch held on a knitting needle 1 of FB in a held state of S1 of Fig. 1 to the outer side in the knitting width direction of the stitch held on a knitting needle 2 of BB. The stitches formed after S2 are all back stitches.

[0020] In S2, the position of each of the stitches held on the BB in S1 is shifted one by one rightward in the plane of drawing by racking, and then new stitches are formed following the stitches held on the knitting needles 2, 4, 6, 8 of the BB in S1 while moving the yarn feeder leftward (outer side) in the plane of drawing and the yarn feeder is positioned on the outer side of the stitch α. A knitting yarn extending from the yarn feeder is continuous with the stitch γ newly formed following the stitch held on the knitting needle 2 of the BB in S1.

[0021] In S3, the stitch α is transferred to the opposing BB, and the position of each stitch held on the FB in S2 is shifted one by one leftward in the plane of drawing by racking, and thereafter, the yarn feeder is moved rightward (inner side) in the plane of drawing to be positioned on the inner side of the transferred stitch α.

[0022] Furthermore, in S4, the yarn feeder is moved to the outer side, and a stitch β is formed when the yarn feeder is again passed through the position of the knitting needle 1 of the BB.

[0023] In S5, the yarn feeder is moved toward the inner side, and a new back stitch is formed following the stitch held on the FB. Here, a stitch δ shown in Fig. 1 is a stitch next, in the knitting width direction, to the stitch α in S1, where a stitch ε is formed following the stitch δ in S5. Thereafter, the knitting of S2 to S5 is to be repeated when continuing the rotation of the back stitch.

[0024] In S5, the knitting yarn is represented to show the trajectory of movement of the yarn feeder, and hence it appears as if the knitting yarn is crossed and the stitch α and the stitch β are twisted. However, organizing the actual state of the knitting yarn, the knitting yarns are not crossed and the stitch α nor the stitch β are twisted as shown in S5'. Thus, the back stitch is rotated at the time point the back stitch is formed by carrying out knitting according to the knitting process of the present embodiment. Furthermore, other stitches also do not need to be twisted stitches when forming the back stitch. The finished tubular knitted fabric is thus not disfigured.

[0025] In addition, a plurality of stitches lined at the end in the knitting width direction can be successively rotated by applying the knitting method of the first embodiment. For instance, when successively rotating the stitches held on the knitting needles 1, 3 of the FB in S1, the knitting similar to the knitting shown in S2 to S4 are to be repeated twice, and then the knitting similar to the knitting shown in S5 is to be carried out.

<Second Embodiment>

[0026] In the second embodiment, a description will be given of an example of forming a 1 x 1 rib structure while rotating the stitches of the knitted fabric portion of the FB in the held state shown in S1 of Fig. 2 to the BB. Specifically, a new front stitch is formed following the stitches held on the knitting needle 3 of the FB and the knitting needles 2, 6 of the BB in S1, and a new back stitch is formed following the stitches held on the knitting needles 1, 5 of the FB and the knitting needle 4 of the BB.

[0027] In S2 to S5 of Fig. 2, the knitting similar to the knitting of S2 to S5 shown in Fig. 1 of the first embodiment is carried out to knit the rib structure and to rotate the back stitch. Specifically, the rib structure is knitted on the BB while moving the yarn feeder leftward (outer side) in the plane of drawing, and then the yarn feeder is positioned on the outer side of the stitch α held on the knitting needle 1 of the FB (S2). The stitch α is then transferred from the FB to the BB (S3). A new stitch β is formed following the stitch α transferred in S3 (S4). A new stitch, including a stitch ε, is then formed following the stitches of the FB not subjected to rotation (S5).

[0028] The rotation of the front stitch is then carried out by the knitting of S6 to S9 of Fig. 3. The knitting after S6 is returned at the stitch that acts as a turn-back point (not shown), where the knitting direction is set in the direction opposite to the knitting direction of S2 to S5, and the knitting is carried out similar to the conventional knitting method already described with reference to Fig. 6. Specifically, the yarn feeder is positioned on the outer side of the existing stitch (stitch of knitting needle 2 of FB), on which a new stitch to be rotated is formed, in S6. In S7, a twisted new stitch is formed by forming a stitch when turning back the yarn feeder that once passed the existing stitch and again passing the yarn feeder through the existing stitch. In S8, a new stitch is formed following the stitch of the BB not subjected to rotation, and in S9, the stitch twisted in advance formed in S8 is rotated to the opposing BB.

[0029] The stitch that acts as the turn-back point where

the knitting direction is reversed is fixed by being overlapped on the stitch proximate to the stitch of the turn-back point.

[0030] The tubular knitted fabric obtained through the above knitting process has the front stitch and the back stitch formed at the desired area although it is knitted with rotation carried out in the process of knitting. Furthermore, the tubular knitted fabric is not formed at all with twisted stitches in the process of knitting, and thus has an excellent appearance.

[0031] Fig. 4 shows a photograph of a glove knitted by applying the above knitting process. Fig. 5 shows a photograph of a glove in which the rotation of the back stitch is attempted through the procedure described with reference to Fig. 7 for comparison with the tubular knitted fabric knitted with the knitting method of the present embodiment.

[0032] As apparent from the comparison of Fig. 4 and Fig. 5, a rib structure that is not disarrayed is formed in the glove of Fig. 4 knitted by applying the knitting process of the present embodiment, whereas disarray is found at the portion of the back stitch of the rib structure circled in Fig. 5.

[0033] In the second embodiment, the twisted stitch of the back stitch is formed and then rotated by one stitch, and thereafter, the twisted stitch of the front stitch is formed and rotated by one stitch, but a plurality of stitches including the front stitch and the back stitch may be rotated successively. In that case, the twisted stitch of the back stitch is first formed according to the knitting method of a tubular knitted fabric of the present invention, and then the twisted stitch of the front stitch is formed in the knitting direction opposite to the knitting direction of the back stitch, and lastly, such twisted stitches are rotated successively.

DESCRIPTION OF REFERENCE NUMERALS

[0034]

1 to 10	knitting needle
FB	front needle bed
BB	back needle bed

Claims

1. A knitting method of a tubular knitted fabric of, when knitting the tubular knitted fabric using a flat knitting machine having at least a pair of front and back needle beds in which at least one of the front and back needle beds is capable of being racked in a traverse direction and stitches are transferable between the front and back needle beds, rotating a back stitch by positioning a stitch β, which is newly formed following a stitch α at an end in a knitting width direction of a one side knitted fabric portion held on one needle bed, on an outer side of a knitting width of an other side knitted fabric portion with respect to a stitch γ at an end in a knitting width direction of the other side knitted fabric portion held on the other needle bed facing the one needle bed, the knitting method of a tubular knitted fabric **characterized by**:

assuming the direction from the stitch α toward the knitted fabric portion is an inner side and the opposite direction is an outer side in a movement direction of a yarn feeder along an extending direction of the needle beds,

a step 1 of moving the yarn feeder toward the outer side, forming the stitch γ during the movement, and positioning the yarn feeder on the outer side of the stitch α;

a step 2 of transferring the stitch α to an empty needle on the outer side of the knitting width with respect to the stitch γ on the other needle bed;

a step 3 of moving the yarn feeder positioned on the outer side of the stitch α toward the inner side to be positioned on the inner side of the stitch α;

a step 4 of feeding a knitting yarn to the knitting needle of the other needle bed holding the stitch α while moving the yarn feeder positioned on the inner side of the stitch α toward the outer side, and forming the stitch β to become the back stitch when the tubular knitted fabric is seen from the outer side of the tube; and

a step 5 of moving the yarn feeder toward the inner side and forming a new stitch ε following a stitch δ proximate to the stitch α in the step 1.

2. The knitting method of a tubular knitted fabric according to claim 1, **characterized in that** when knitting the tubular knitted fabric including an area where a front stitch and a back stitch adjoin each other,

when rotating the back stitch from one needle bed to the other needle bed, the steps 1 to 5 are performed, and

when rotating the front stitch from the one needle bed to the other needle bed, a stitch twisted in advance is formed on the one needle bed in the knitting direction opposite to the direction in the steps 1 to 5 to rotate the twisted stitch to the other needle bed.

3. A tubular knitted fabric **characterized by** comprising an area knitted by applying the knitting method of a tubular knitted fabric according to claim 1.

Fig. 1

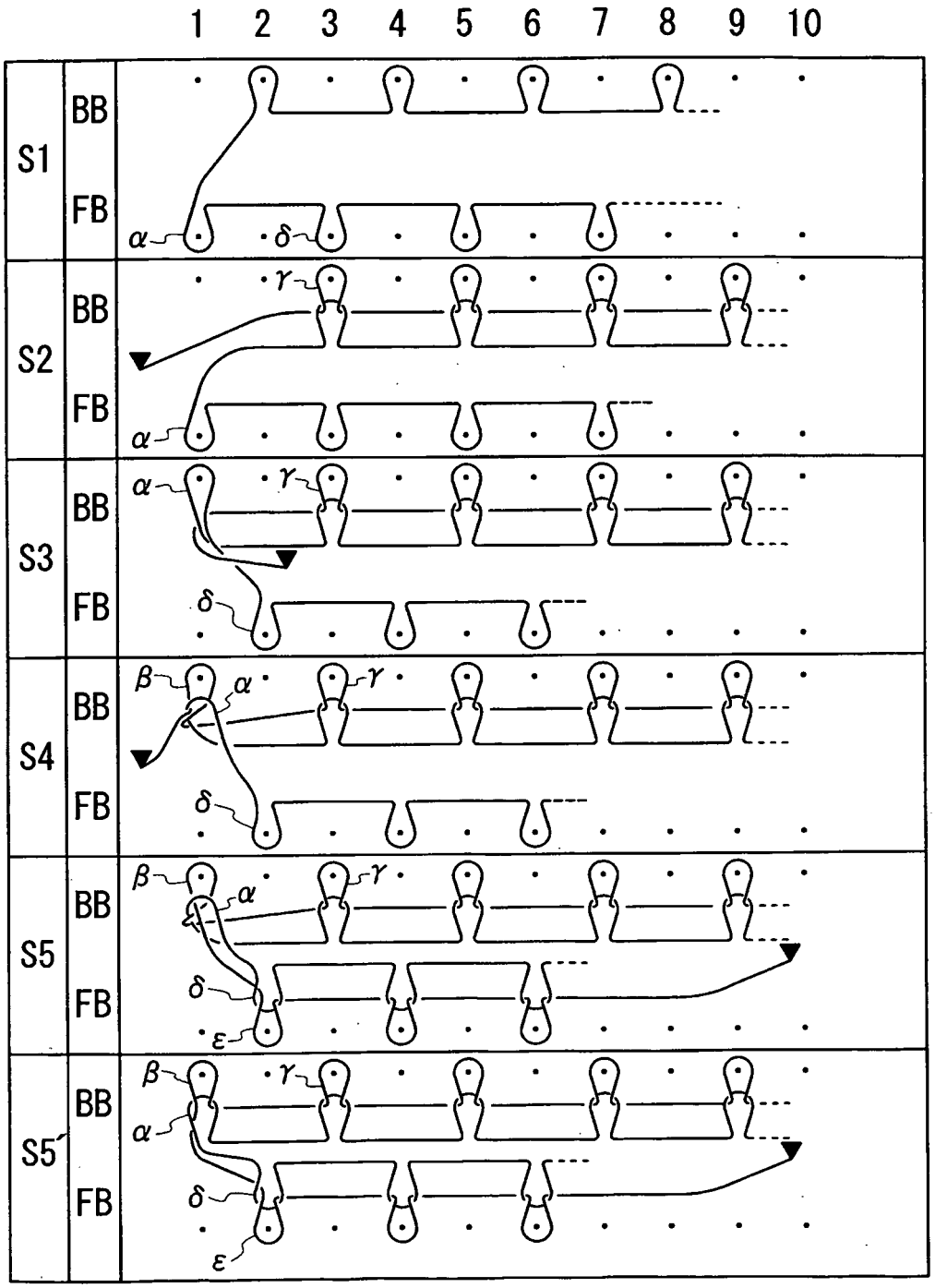

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Fig. 2

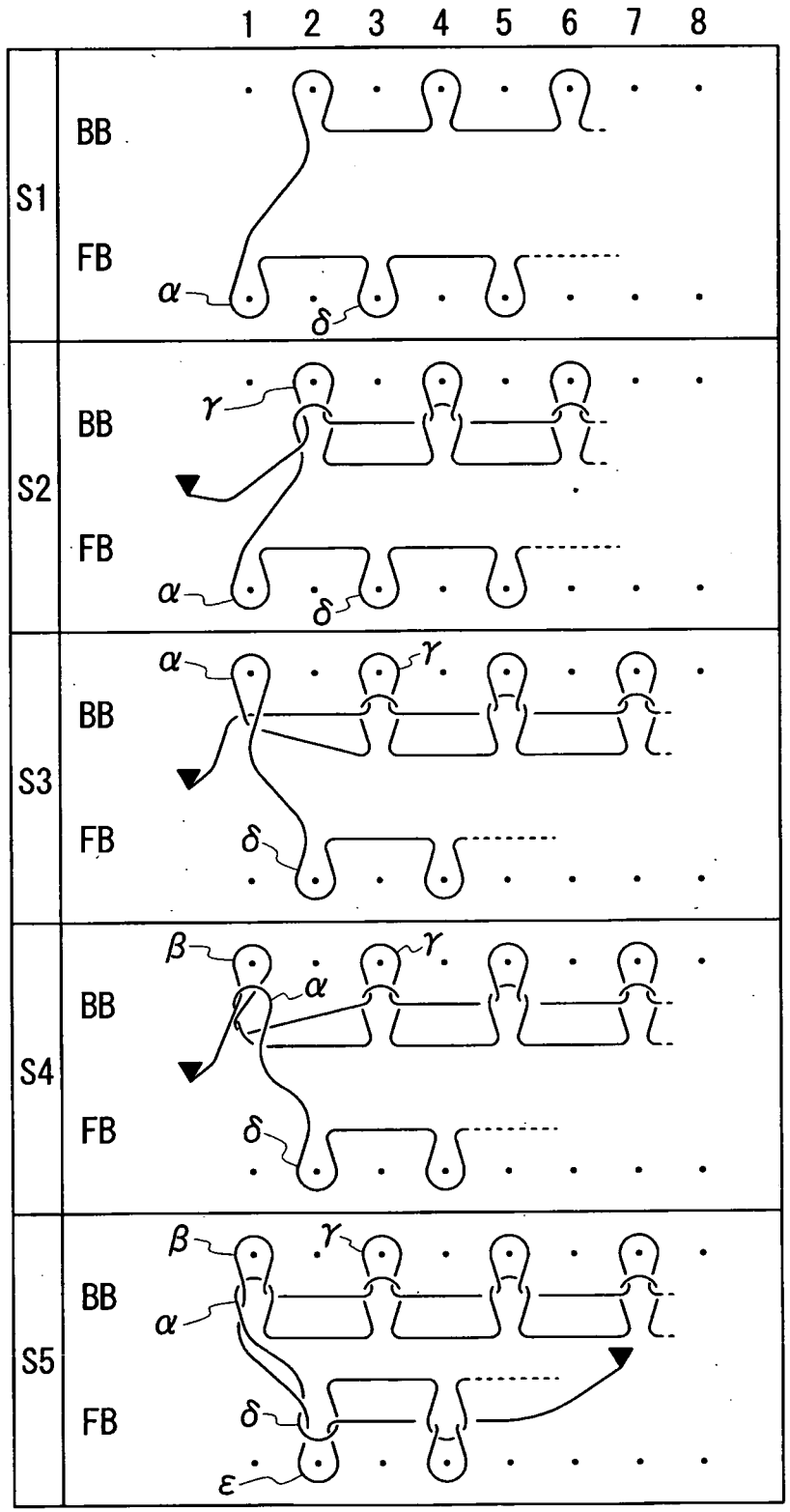
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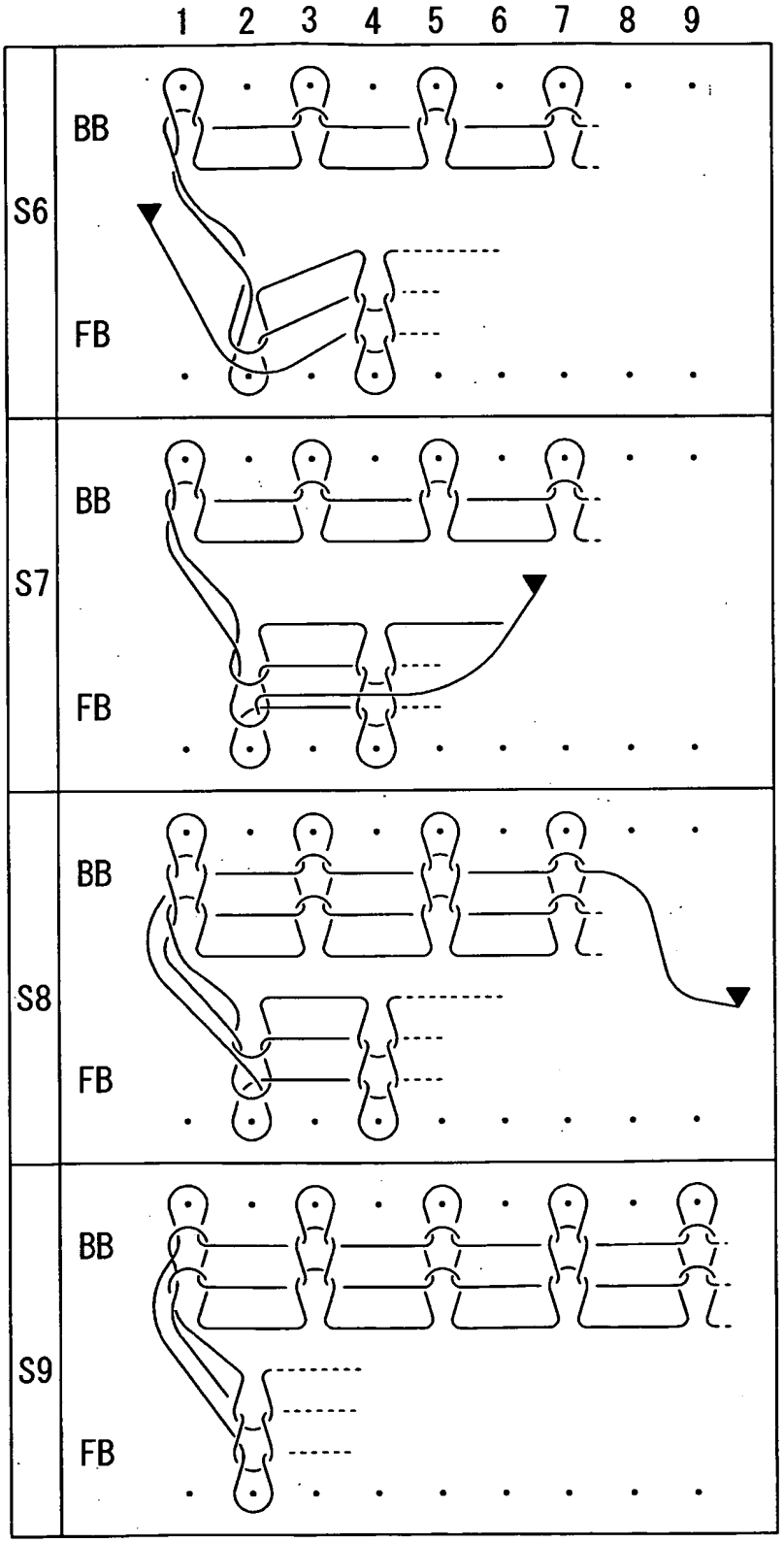
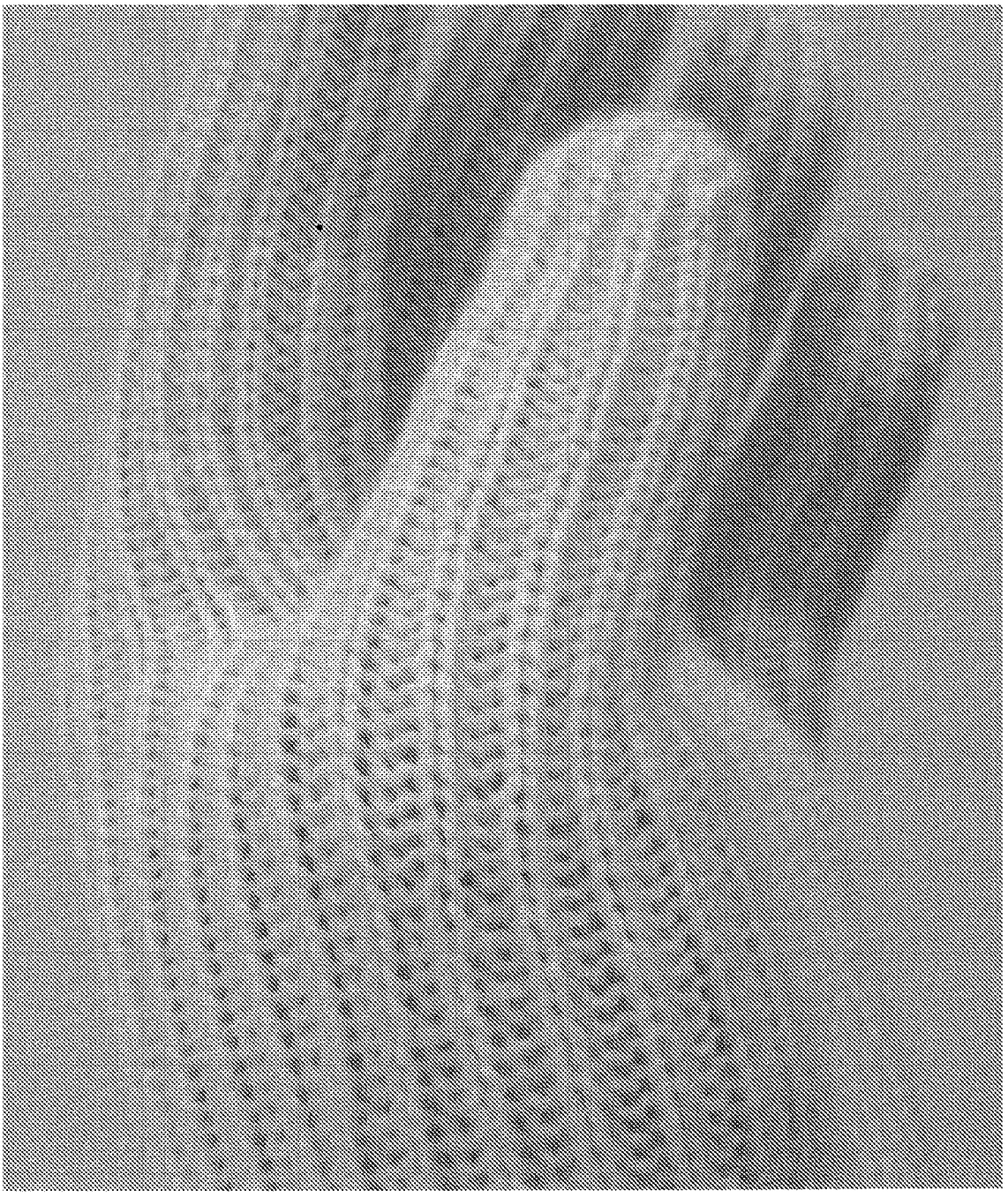
Fig. 3



[Fig. 4]



[Fig. 5]

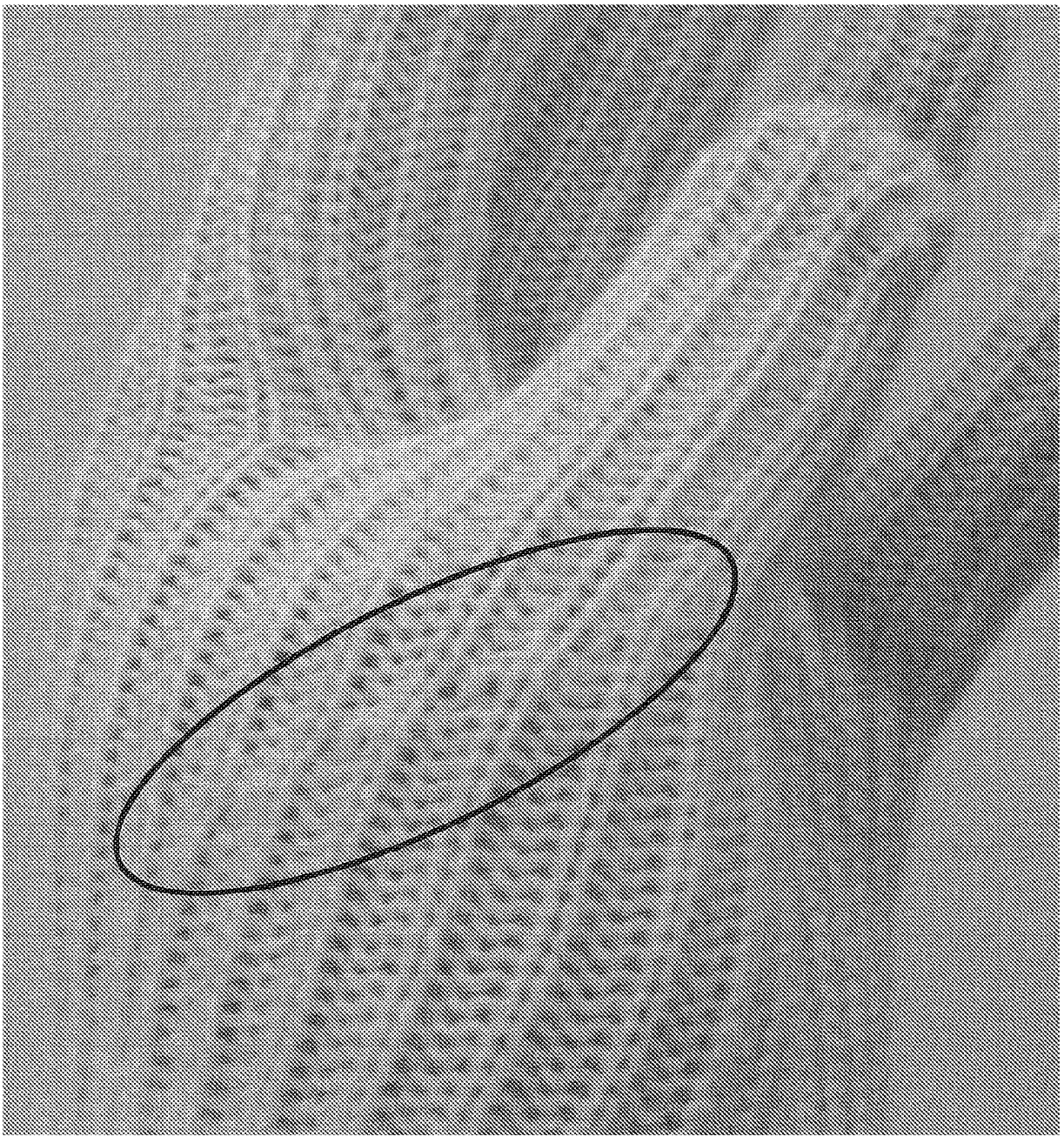


Fig. 6

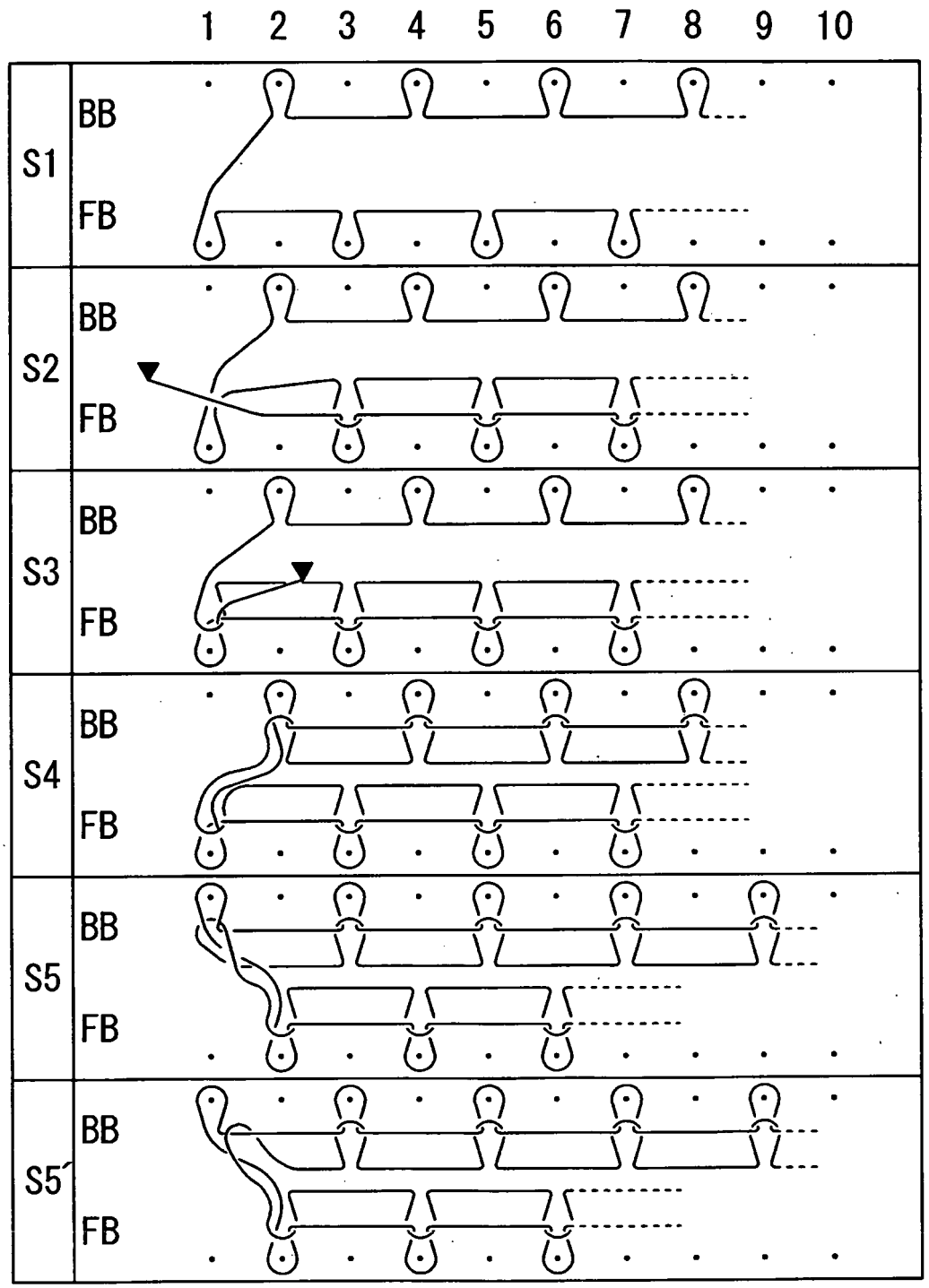
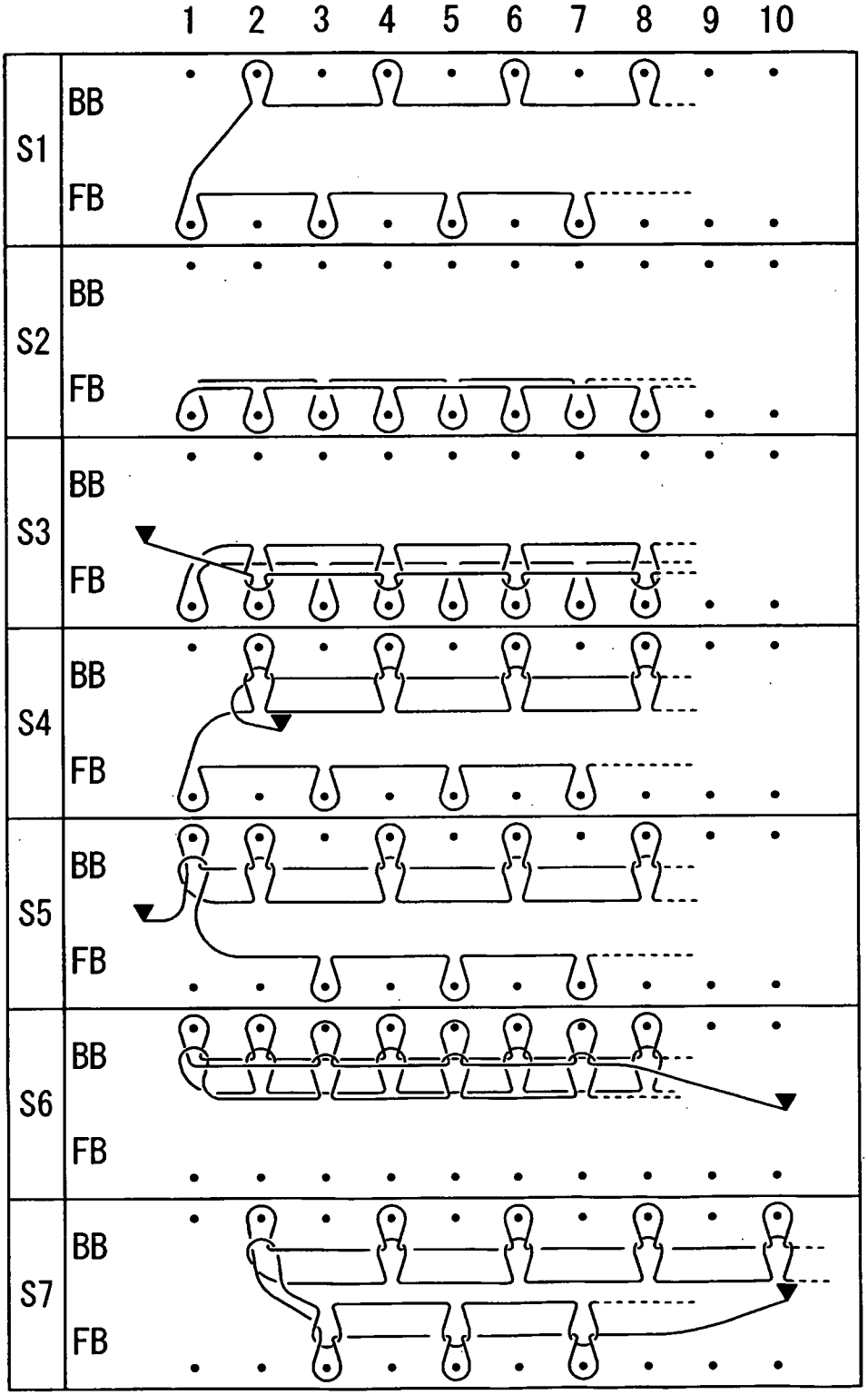


Fig. 7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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/056952

A. CLASSIFICATION OF SUBJECT MATTER
D04B1/28(2006.01)i, *D04B1/00*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D04B1/00-39/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010
Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 5-009851 A (Shima Seiki Mfg., Ltd.), 19 January 1993 (19.01.1993), entire text & US 5692399 A & EP 522778 A1 & KR 10-0205192 B & CN 1069785 A	1-3
A	JP 2006-188776 A (Shima Seiki Mfg., Ltd.), 20 July 2006 (20.07.2006), entire text & US 2008/0016918 A1 & EP 1835058 A1 & WO 2006/070764 A1 & KR 10-2007-0089732 A & CN 101094946 A	1-3

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 July, 2010 (13.07.10)	27 July, 2010 (27.07.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 5009851 A **[0005]**