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(54) **Method for preventing unraveling of knitting yarn**

(57) To provide a method for preventing unraveling of a knitting yarn capable of preventing unraveling of the knitting yarn with simple steps without using transfer.

The following steps α to δ are carried out using a flat knitting machine having a racking function to prevent the unraveling of the knitting yarn. In step α , a first stitch row 10 including a first stitch 1, a second stitch 2, and a third stitch 3 continuing in a knitting width direction is knitted. In step β , a needle bed is racked, positions in a knitting width direction of the first stitch 1 and the second stitch 2 are interchanged, and a second stitch row 20 including

a fourth stitch 4, a fifth stitch 5, and a sixth stitch 6 following in respective wale directions of the first stitch 1, the second stitch 2, and the third stitch 3 is knitted. In step γ , the needle bed is racked to a side opposite to that in step β to return the left and right position relationship of the first stitch 1 and the second stitch 2 to a state identical with the step α . In step δ , a third stitch row 30 following in the wale direction of the second stitch row 20 is knitted.

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a method for preventing unraveling of a knitting yarn for preventing unraveling of a knitting yarn at a yarn-in portion or a yarn-out portion where the knitting yarns are switched in the middle of knitting a knitted fabric when knitting the knitted fabric using a flat knitting machine.

Description of the Related Art

[0002] In a knitted fabric having horizontal stripe patterns, intarsia patterns, and the like, knitting yarns are switched in the middle of knitting the knitted fabric. The portion where the knitting yarns are switched includes a yarn-out portion, where the knitting yarn is pulled out from a knitted fabric portion knitted with the knitting yarn before the switching, and a yarn-in portion, where the knitting yarn after the switching is introduced to the knitted fabric portion knitted with the knitting yarn before the switching, and the knitting yarns need to be prevented from unraveling at the yarn-in portion and the yarn-out portion. The applicant of the present invention proposed a method for preventing unraveling of a knitting yarn for driving the flat knitting machine to perform prevention of unraveling (see e.g., Patent Document 1).

[0003] In Patent Document 1, when carrying out yarn-in or yarn-out, two holding points each consisting of a pickup stitch are formed, and one of the holding points is overlapped on a front side of an existing stitch and the other holding point is overlapped on a back side of another existing stitch to prevent unraveling of the knitting yarn. The existing stitches refer to the stitches already held on a needle bed before the holding points are formed, and the existing stitches to which each holding point is overlapped are at positions proximate to each other.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004] [Patent document 1] International Publication No. 2010/073491

SUMMARY OF THE INVENTION

[0005] In the method for preventing unraveling of the knitting yarn described in Patent Document 1, the number of knitting courses may increase if a flat knitting machine with only a few number of cam systems is used.

[0006] The present invention has been made in view of the above situation, and it is an object thereof to provide a method for preventing unraveling a knitting yarn capa-

ble of preventing unraveling of the knitting yarn with simple steps without using transfer.

[0007] The present invention achieves the above object by preventing unraveling of the knitting yarn using a racking function of a needle bed.

[0008] The present invention is a method for preventing unraveling of a knitting yarn for preventing unraveling of a knitting yarn at a yarn-in portion or a yarn-out portion when knitting a knitted fabric having at least one of the yarn-in portion and the yarn-out portion where knitting yarns are switched in the middle of knitting the knitted fabric using a flat knitting machine, which includes at least a pair of a front and a back needle bed and in which either one of the front and back needle beds is capable of being racked in a traverse direction. The method for preventing unraveling of the knitting yarn of the present invention includes the following steps α to δ .

[Step α] knitting a first stitch row including a first stitch, a second stitch, and a third stitch continuing in a knitting width direction. In the step α , the first stitch to the third stitch are arranged to satisfy either [A] or [B] below.

[A] arranging the first stitch and the third stitch on one needle bed, and the second stitch on the other needle bed.

[B] arranging the second stitch and the third stitch on one needle bed, and the first stitch on the other needle bed.

[Step β] racking the needle bed, interchanging positions in the knitting width direction of the first stitch and the second stitch, and knitting a second stitch row including a fourth stitch, a fifth stitch, and a sixth stitch following in respective wale directions of the first stitch, the second stitch, and the third stitch. For instance, if the knitting needle Y, on which the second stitch is held, is on the right with respect to the knitting needle X, on which the first stitch is held, in the step α , either one of the needle beds is racked so that the knitting needle Y is on the left of the knitting needle X in the step β . The racking pitch is preferably within a range of one to four pitches so as not to cause yarn breakage.

[Step γ] racking the needle bed in a direction opposite from the step β to return a left and right position relationship of the first stitch and the second stitch to a state identical with the step α . For example, in the relationship of the knitting needles X, Y, either one of the needle beds is racked so that the knitting needle Y is on the right of the knitting needle X in the step γ . In this case, the knitting needle Y merely needs to be on the right of the knitting needle X, and the racking pitch of the step γ may be different from the racking pitch of the step β .

[Step δ] knitting a third stitch row following in a wale direction of the second stitch row, fixing a position relationship of cross-over yarns formed between the first stitch and the second stitch and between the second stitch and the third stitch, and the cross-over yarns formed between the fourth stitch and the fifth stitch, and between the fifth stitch and the sixth stitch to prevent unraveling of the knitting yarn at the yarn-in portion or the yarn-out portion.

[0009] According to one aspect of the method for pre-

venting unraveling of the knitting yarn of the present invention, tuck is performed on the stitch held on the needle bed before the step α , at the yarn-in portion and after the step γ at the yarn-out portion.

[0010] According to the method for preventing unraveling of the knitting yarn of the present invention, the cross-over yarns cross in a complex manner near an area where the first stitch to the third stitch of the first stitch row, and the fourth stitch to the sixth stitch of the second stitch row continuing in the wale direction thereof are formed. Thus, the unraveling of the knitting yarn can be prevented at such area. Furthermore, method for preventing unraveling of the knitting yarn of the present invention prevents the unraveling of the knitting yarn by using the racking of the needle bed without transferring stitches, and hence, an increase in the number of knitting courses can be suppressed even if a flat knitting machine with only a few cam systems is used. In a knitted fabric including intarsia pattern knitted using a great number of knitting yarns, for example, the yarn-in and yarn-out are frequently carried out. Thus, suppressing the increase in the number of knitting courses by the method for preventing unraveling of the knitting yarn of the present invention can enhance the productivity of the knitted fabric.

[0011] The prevention of unraveling of the knitting yarn at the yarn-in portion/yarn-out portion can be more firmly carried out by performing tuck at the time of yarn-in/yarn-out with the method for preventing unraveling of the knitting yarn of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a knitting step diagram related to a method for preventing unraveling of a knitting yarn shown in an embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] With reference to Fig. 1, a method for preventing unraveling of a knitting yarn of the present invention will be hereinafter described using a portion where the knitting yarns in a horizontal stripe pattern are switched by way of example. For the knitting described in the embodiment, there is used a two-bed flat knitting machine including a pair of a front and a back needle bed extending in a traverse direction and disposed opposite to each other in a cross direction, and in which either one of the front and back needle beds is capable of racking in the traverse direction. The flat knitting machine to use may, of course, be a four-bed flat knitting machine.

<First Embodiment>

[0014] Fig. 1 is a knitting step diagram showing knitting procedure of an unraveling preventing method. From the left side of Fig. 1, "S + number" in the first column indicates a step number, "arrow + 1P" in the second column

indicates a racking direction and a racking pitch of the needle bed, "arrow (K means involving knitting)" in the third column indicates the moving direction of a yarn feeder, and a fourth column indicates a state of an actual knitting operation. In the fourth column, ● indicates a new stitch (including pickup stitch), ○ indicates a stitch held on the needle beds, V indicates a tuck stitch, and ▽ and ▼ indicate a yarn feeder. As shown in the fourth column, a flat knitting machine used in the present embodiment has a front needle bed (hereinafter referred to as FB) and a back needle bed (hereinafter referred to as BB) facing each other in a state shifted by 0.5 pitch. In each step, racking is performed first, and then knitting is performed.

[0015] S0 shows a state in which a yarn feeder 8 is moved in a left direction in a plane of drawing to knit one of the stripes in the horizontal stripe pattern. The yarn-out is carried out in S1 to S3 and S5 described below from the state of S0, and the yarn-in is carried out in S4 and S5 to S7.

[0016] In S1, the yarn feeder 8 is moved in a right direction in the plane of drawing to knit a first stitch row 10 (step α in the yarn-out). The first stitch row 10 includes a first stitch 1, a second stitch 2, and a third stitch 3 lined toward a knitting direction of the first stitch row 10 in order from a starting side. The second stitch 2 is a pickup stitch knitted on the BB, and the first stitch 1 and the third stitch 3 are stitches continuously knitted in a wale direction of the stitches held on the FB in S0. The second stitch 2 may be formed by split knitting.

[0017] In S2, the BB is racked by one pitch in the left direction in the plane of drawing, and then the yarn feeder 8 is moved in the left direction in the plane of drawing to knit a second stitch row 20 following in the wale direction of the first stitch row 10 (step β in the yarn-out). The second stitch row 20 includes a fifth stitch 5, a fourth stitch 4, and a sixth stitch 6 lined toward a direction opposite to the knitting direction of the second stitch row 20 in order from a terminating side.

[0018] In S3, the BB is racked by one pitch in the right direction in the plane of drawing, and the left and right position relationship of the first stitch 1 and the second stitch 2 is made the same as the time point S1 is finished (step γ in the yarn-out). Accordingly, cross-over yarns connecting the stitches 1 to 6 are crossed in a complex manner near an area where the first stitch 1, the second stitch 2, and third stitch 3 of the first stitch row 10, and the fourth stitch 4, the fifth stitch 5, and the sixth stitch 6 of the second stitch row 20 continuing in the wale direction of the first stitch row 10 are formed.

[0019] Furthermore, in S3, the yarn feeder 8 is moved in the right direction in the plane of drawing to perform tuck on the stitch on the right side in the plane of drawing (side opposite to the side of pulling out the knitting yarn) of the stitch held on the BB among the stitches of the second stitch row 20. The yarn feeder 8 is then moved in the left direction in the plane of drawing in S3, the knitting yarn from the yarn feeder 8 is taken out of the

knitting direction of the knitted fabric, and the knitting of the stripe by the yarn feeder 8 is finished. Although the knitting of the stripe by the yarn feeder 8 is finished, the prevention of unraveling of the knitting yarn at the yarn-out portion is not yet completed.

[0020] The tuck performed in S3 is the tuck performed after the step γ in the yarn-out, and although it is not an essential step, the prevention of unraveling of the knitting yarn of the yarn-out portion can be made more secure by performing the tuck. The stitch to perform the tuck may be positioned on the further right side in the plane of drawing of the position illustrated in S3, and is not particularly limited.

[0021] In S4 and thereafter, a new stripe following the stripe knitted with the knitting yarn from the yarn feeder 8 is knitted using a new yarn feeder 9. First, in S4, the new yarn feeder 9 is moved in the right direction in the plane of drawing to perform the tuck on an end stitch of the second stitch row 20 of the yarn-out portion, and then the yarn feeder 9 is moved in the left direction in the plane of drawing. The tuck of S4 is the tuck performed before the step α in the yarn-in, and although it is not an essential step, it has the effect of making the prevention of the unraveling of the knitting yarn of the yarn-in portion more secure. Therefore, S4 is preferably carried out. The stitch to perform the tuck is not particularly limited, but the stitch on which the tuck of the yarn-out is carried out in S3 is preferably avoided. This is because triple stitches will be obtained if the tuck is performed on the same stitch in S3 and S4.

[0022] In S5, the yarn feeder 9 is moved in the right direction in the plane of drawing to knit a third stitch row 30 following in the wale direction of the second stitch row 20 knitted in the yarn-out (step δ in the yarn-out). As a result, the position relationship of the cross-over yarns formed between the first stitch 1 and the second stitch 2 and between the second stitch 2 and the third stitch 3, and the cross-over yarns formed between the fourth stitch 4 and the fifth stitch 5 and between the fifth stitch 5 and the sixth stitch 6 is fixed, so that the knitting yarn of the yarn-out portion is prevented from unraveling.

[0023] The third stitch row 30 knitted in S5 is also the first stitch row 10 in the yarn-in (step α in the yarn-in), and the first stitch row 10 includes the first stitch 1, the second stitch 2, and third stitch 3 lined toward the knitting direction of the first stitch row 10 in order from a starting side. The second stitch 2 is knitted on the BB, and the first stitch 1 and the third stitch 3 are knitted on the FB.

[0024] In S6, the BB is racked by one pitch in the left direction in the plane of drawing, and then the yarn feeder 9 is moved in the left direction in the plane of drawing to knit the second stitch row 20 following in the wale direction of the first stitch row 10 (step β in the yarn-in). The fourth stitch 4, the fifth stitch 5, and the sixth stitch 6 of the second stitch row 20 are each formed continuously in the wale direction of the first stitch 1, the second stitch 2, and the third stitch 3.

[0025] In S7, the BB is racked by one pitch in the right

direction in the plane of drawing, and the left and right position relationship of the first stitch 1 and the second stitch 2 is made the same as the time point S5 is finished (step γ in the yarn-out). Accordingly, cross-over yarns connecting the stitches 1 to 6 are crossed in a complex manner near an area where the first stitch 1, the second stitch 2, and third stitch 3 of the first stitch row 10, and the fourth stitch 4, the fifth stitch 5, and the sixth stitch 6 of the second stitch row 20 continuing in the wale direction of the first stitch row 10 are formed.

[0026] Furthermore, in S7, the yarn feeder 9 is moved in the right direction in the plane of drawing to knit the third stitch row 30 continuing in the wale direction of the second stitch row 20 knitted in S6 (step δ in the yarn-in). As a result, the knitting yarn of the yarn-in portion is prevented from unraveling, similar to the yarn-out portion.

<Second Embodiment>

[0027] In the first embodiment, the second stitch 2 of the stitches 1 to 3 knitted to prevent the unraveling of the knitting yarn is knitted on the BB (see S1 and S5 of Fig. 1). On the other hand, in S1 and S5 of Fig. 1, the first stitch 1 may be knitted on the BB and the second stitch 2 and the third stitch 3 may be knitted on the FB (in this case, the first stitch 1 is a pickup stitch). In this case, in S2 and S6, the BB is racked by one pitch in the right direction in the plane of drawing to interchange the positions in the knitting width direction of the first stitch 1 and the second stitch 2. Furthermore, in S5 and S7, the left and right position relationship of the first stitch 1 and the second stitch 2 is returned to be the same as S1 and S5 in a state the BB is racked by one pitch in the left direction in the plane of drawing. The prevention of the unraveling of the knitting yarn in the yarn-in portion/yarn-out portion can be carried out even with the above knitting steps.

[0028] The present invention is not limited to the embodiments described above, and can be appropriately changed and implemented within a scope not deviating from the gist of the invention. In the embodiments, the yarn-in/yarn-out is carried out at the end in the knitting width direction of the knitted fabric, but the yarn-in/yarn-out may be carried out at portions other than the end. For example, in the knitted fabric including the intarsia pattern, the knitting yarn is often changed at an intermediate portion (portion other than the end) in the knitting width direction of the knitted fabric, and hence the yarn-in/yarn-out shown in Fig. 1 is preferably carried out at the intermediate portion in such a case.

Claims

1. A method for preventing unraveling of a knitting yarn for preventing unraveling of a knitting yarn at a yarn-in portion or a yarn-out portion when knitting a knitted fabric having at least one of the yarn-in portion and

the yarn-out portion where knitting yarns are switched in the middle of knitting the knitted fabric using a flat knitting machine, which includes at least a pair of a front and a back needle bed (FB, BB) and in which either one of the front and back needle beds is capable of being racked in a traverse direction; the method being **characterized by:**

step α of knitting a first stitch row (10) including a first stitch (1), a second stitch (2), and a third stitch (3) continuing in a knitting width direction so as to satisfying requirement [A] or [B],

[A] arranging the first stitch (1) and the third stitch (3) of the first stitch (1), the second stitch (2), and the third stitch (3) on one needle bed (FB) and the second stitch (2) on the other needle bed (BB),

[B] arranging the second stitch (2) and the third stitch (3) of the first stitch (1), the second stitch (2), and the third stitch (3) on one needle bed (FB), and the first stitch (1) on the other needle bed (BB);

step β of racking the needle bed (BB), interchanging positions in the knitting width direction of the first stitch (1) and the second stitch (2), and knitting a second stitch row (20) including a fourth stitch (4), a fifth stitch (5), and a sixth stitch (6) following in respective wale directions of the first stitch (1), the second stitch (2), and the third stitch (3);

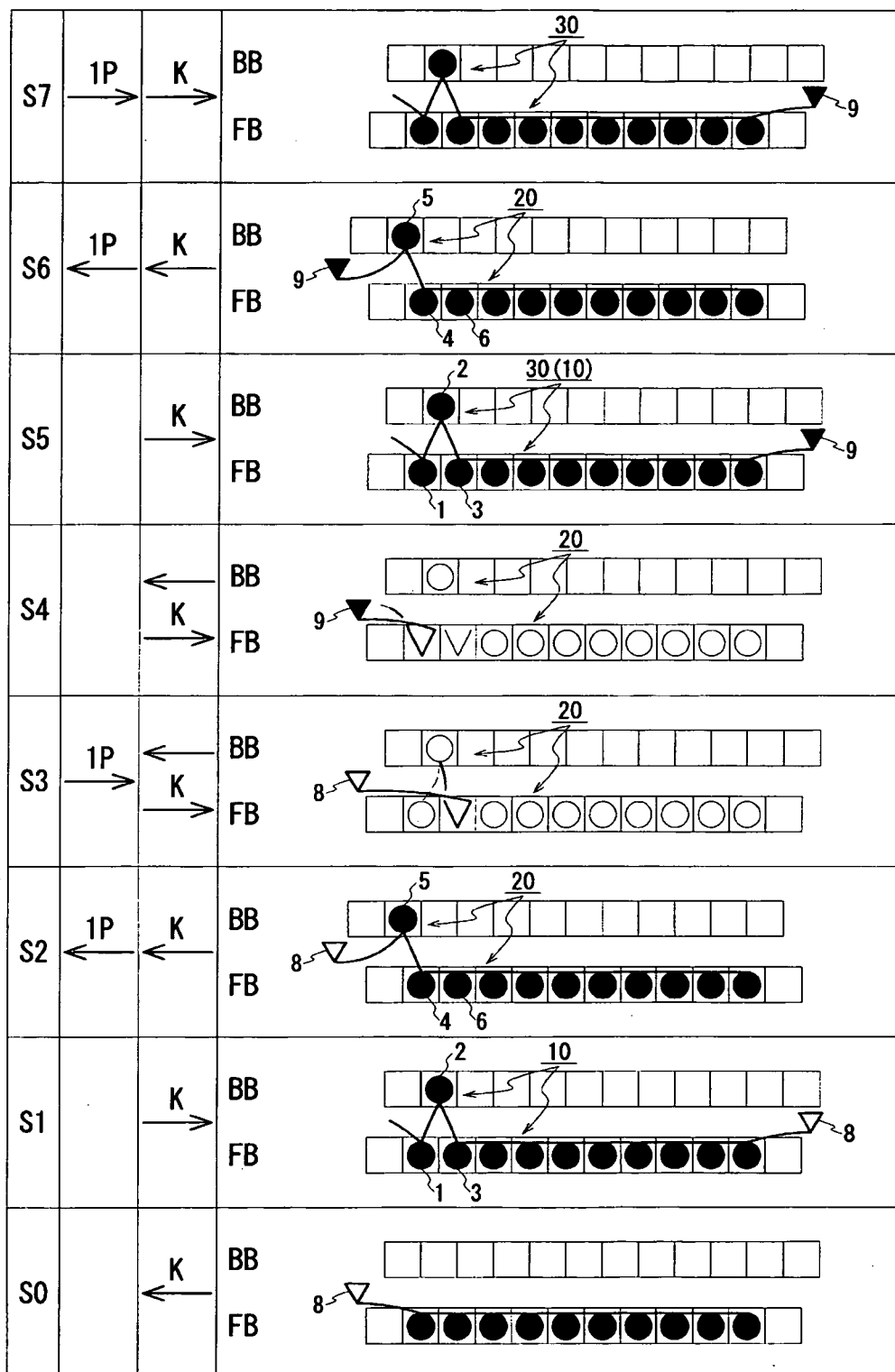
step γ of racking the needle bed (BB) in a direction opposite from the step β to return a left and right position relationship of the first stitch (1) and the second stitch (2) to a state identical with the step α ; and

step δ of knitting a third stitch row (30) following in a wale direction of the second stitch row (20), fixing a position relationship of cross-over yarns formed between the first stitch (1) and the second stitch (2), between the second stitch (2) and the third stitch (3), between the fourth stitch (4) and the fifth stitch (5), and between the fifth stitch (5) and the sixth stitch (6) to prevent unraveling of the knitting yarn at the yarn-in portion or the yarn-out portion.

2. The method for preventing unraveling of the knitting yarn according to claim 1, **characterized in that** tuck is performed on the stitch held on the needle bed before the step α at the yarn-in portion and after the step γ at the yarn-out portion.

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Fig. 1





EUROPEAN SEARCH REPORT

Application Number
EP 13 00 1104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 758 518 A (SHU NOBUHISA [JP] ET AL) 2 June 1998 (1998-06-02) * column 4, line 45 - column 10, line 55; claim 1; figures 2-4, 6, 14-16 * -----	1	INV. D04B1/12
A	EP 0 641 879 A1 (SCHIEBER UNIVERSAL MASCHF [DE]) 8 March 1995 (1995-03-08) * column 1, line 25 - column 2, line 21; figures 1, 2 * -----	1,2	
			TECHNICAL FIELDS SEARCHED (IPC)
			D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 August 2013	Examiner Sterle, Dieter
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 00 1104

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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06-08-2013

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REFERENCES CITED IN THE DESCRIPTION

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