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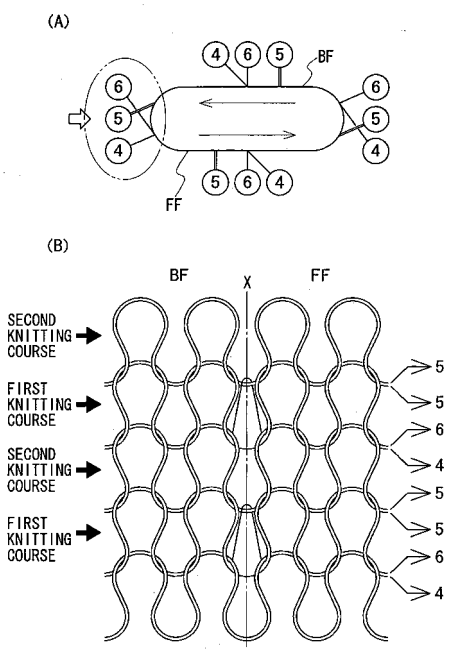
(54) METHOD OF KNITTING A TUBULAR FABRIC AND TUBULAR FABRIC

(57) A knitting method of a tubular knitted fabric in which a large hole does not form at a boundary portion of a front knitted fabric portion and a back knitted fabric portion even when knitting a knitted fabric to a tubular shape through double system knitting, and a tubular knitted fabric knitted with the knitting method are provided. Assuming a yarn feeder 4 on a front side of a flat knitting machine of a plurality of yarn feeders 4, 5, 6 that reciprocate in a direction parallel to needle beds is a near side yarn feeder, the yarn feeder 6 positioned on a far side than the yarn feeder 4 is a far side yarn feeder, and the yarn feeder 5 positioned between the yarn feeder 4 and the yarn feeder 6 is a middle side yarn feeder, the yarns are fed from the yarn feeder 4 and the yarn feeder 6 with respect to the knitting needle driven by a preceding cam system and the yarns are fed from the yarn feeder 5 with respect to the knitting needle driven by a following cam systems to carry out knitting. The tubular knitted fabric knitted in such a manner does not have a large hole at a boundary portion X of a front knitted fabric portion FF and a back knitted fabric portion BF.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a method of knitting tubular knitted fabric through a double system knitting with a flat knitting machine, and a tubular knitted fabric knitted with the method.

BACKGROUND ART

[0002] A flat knitting machine generally includes at least a pair of front and back needle beds, a carriage that reciprocates on the needle bed, and a plurality of rails lined in parallel in a direction orthogonal to the longitudinal direction of the needle beds at above the needle beds. The carriage includes a plurality of cam systems for driving the knitting needles lined on the needle beds to perform the knitting operation. Each rail has a yarn feeder attached so as to be slidable in a direction parallel to the longitudinal direction of the needle beds.

[0003] One of knitting techniques using the flat knitting machine includes double system knitting (e.g., Patent Document 1). In the double system knitting, the plurality of yarn feeders are entrained by the carriage, and the yarn is fed from each yarn feeder with respect to each knitting needle driven by each preceding and following cam system of the carriage. The knitting two courses thus can be carried out with the movement of the carriage in one direction.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0004] Patent Document 1: Japanese Laid-Open Patent Publication No. 10-266047

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] However, when knitting the knitted fabric to a tubular shape with the conventional double system knitting, problematically, the knitting yarn fed from the preceding yarn feeder and the knitting yarn fed from the following yarn feeder cross at one end in a knitting width direction, which is a reverse position of the yarn feeder, whereby a hole forms in the knitted fabric due to such crossing.

[0006] For example, a case of knitting a tubular knitted fabric in a counterclockwise direction (direction of thin arrow in the drawing) is illustrated in Fig. 5 (A), with a yarn feeder 5 on the near side when seen from the front side of the flat knitting machine as the following yarn feeder and a yarn feeder 6 on the far side than the yarn feeder 5 as the preceding yarn feeder. In Fig. 5 (A), the lower side of a paper face is the front needle bed, the front knitted fabric portion FF of the tubular knitted fabric being knitted at the front needle bed, and the upper side of the paper face is the back needle bed, the back knitted fabric portion BF of the tubular knitted fabric being knitted at the back needle bed. Fig. 5(B) is a loop diagram of the portion indicated with a chain double dashed line in Fig. 5 (A) when seen from a direction of an outlined arrow.

[0007] When carrying out the knitting shown in Fig. 5 (A), the knitting yarn from the yarn feeder 5, which is knitted afterwards, crosses the knitting yarn fed from the yarn feeder 6, which is of the knitting course formed before, at the left end (portion surrounded with the chain double dashed line) in the knitting width direction when transitioning from the knitting at the back needle bed to the knitting at the front needle bed. If the knitting at the front needle bed is further started from such a state, the crossing state of the knitting yarn from the yarn feeder 5 and the knitting yarn from the yarn feeder 6 reflects on the knitted fabric. As shown in Fig. 5(B), a sinker loop (portion connecting two adjacent stitches of the same course) of the knitting course knitted with the knitting yarn from the yarn feeder 6 is pulled up by a sinker loop of the knitting course knitted with the knitting yarn from the yarn feeder 5 thereby forming a large hole g in the knitted fabric at a boundary portion X of the front knitted fabric portion FF and the back knitted fabric portion BF due to such crossing. As apparent from Fig. 6, which shows a photograph of the actual knitted fabric, the hole g has a size that can be visually recognized, and hence may affect the outer appearance of the knitted fabric. The photograph of Fig. 6 and the photographs of Fig. 2 and Fig. 4, to be described later, are taken with the knitted fabric pulled in the knitting width direction.

[0008] The problem of crossing described above occurs at the right end in the knitting width direction if the yarn feeder 5 is the preceding yarn feeder and the yarn feeder 6 is the following yarn feeder. In Fig. 5, an example in which two knitting yarns are fed from one yarn feeder has been shown, but similar problem may obviously occur even if one knitting yarn is fed from one yarn feeder.

[0009] The present invention has been made in view of the above, and it is an object of the present invention to provide a knitting method of tubular knitted fabric in which a large hole does not form at the boundary portion of the front knitted fabric portion and the back knitted fabric portion even when knitting the knitted fabric to a tubular shape through the double system knitting, and a tubular knitted fabric knitted with the knitting method.

MEANS FOR SOLVING THE PROBLEMS

[0010] The knitting method of tubular knitted fabric of the present invention is a knitting method of a tubular knitted fabric using a flat knitting machine, which has at least a pair of front and back needle beds and is configured to drive knitting needles of the needle beds to perform a knitting operation by a plurality of cam systems arranged in a carriage that reciprocates on the needle

beds and also has a plurality of yarn feeders attached to reciprocate in a direction parallel to the longitudinal direction of the needle beds with respect to each of a plurality of rails laid in parallel in a direction orthogonal to a longitudinal direction of the needle beds at above the needle bed, in which two courses are knitted with the preceding cam system and the following cam system by the movement of the carriage in one direction. Assuming the yarn feeder on the front side of the yarn feeders arranged in the flat knitting machine is a near side yarn feeder, the yarn feeder positioned on a far side than the near side yarn feeder is a far side yarn feeder, and the yarn feeder positioned between the near side yarn feeder and the far side yarn feeder is a middle side yarn feeder, the knitting method of tubular knitted fabric of the present invention feeds yarns from the near side yarn feeder and the far side yarn feeder with respect to the knitting needle driven by either one of the cam systems, the preceding cam system or the following cam system, and feeds yarns from the middle side yarn feeder with respect to the knitting needle driven by the other one of the cam systems to carry out knitting to a tubular shape.

[0011] The knitting method of tubular knitted fabric of the present invention preferably feeds the yarns from the near side yarn feeder and the far side yarn feeder with respect to the knitting needles driven by the preceding cam system. In other words, the yarn is preferably fed from the middle side yarn feeder with respect to the knitting needle driven by the following cam system.

[0012] The tubular knitted fabric of the present invention is a tubular knitted fabric including front and back knitted fabric portions knitted by using a flat knitting machine, which has at least a pair of front and back needle beds and is configured to drive knitting needles of the needle beds to perform a knitting operation by a plurality of cam systems arranged in a carriage that reciprocates on the needle beds and also has a plurality of yarn feeders attached to reciprocate in a direction parallel to the longitudinal direction of the needle beds with respect to each of a plurality of rails laid in parallel in a direction orthogonal to a longitudinal direction of the needle beds at above the needle beds, in which the front and back knitted fabric portions are knitted by carrying out knitting two courses with the preceding cam system and the following cam system by the movement of the carriage in one direction. The tubular knitted fabric is formed by alternately repeating a first knitting course made up of a plurality of knitting yarns and a second knitting course made up of one or more knitting yarns. In the tubular knitted fabric of the present invention, some of the knitting yarns of the plurality of knitting yarns configuring a sinker loop of the knitting yarns of the first knitting course cross a sinker loop of the second knitting course adjacent to the first knitting course, and the remaining knitting yarns do not cross the sinker loop of the second knitting course at a boundary portion of the front knitted fabric portion and the back knitted fabric portion.

EFFECTS OF THE INVENTION

[0013] According to the knitting method of tubular knitted fabric of the present invention, the knitting yarn from the middle side yarn feeder and the knitting yarn from the far side yarn feeder do not cross if the knitting yarn from the near side yarn feeder and the knitting yarn from the middle side yarn feeder cross when the knitting of the front knitted fabric portion of the tubular knitted fabric and the knitting of the back knitted fabric portion of the tubular knitted fabric are switched. The knitting yarn from the middle side yarn feeder and the knitting yarn from the near side yarn feeder do not cross if the knitting yarn from the far side yarn feeder and the knitting yarn from the middle side yarn feeder cross when the knitting of the front and back knitted fabric portions is switched. That is, even if the tubular knitted fabric is knitted through the double system knitting, a knitting yarn to which the sinker loop does not cross always exists at both boundary portions (boundary portions on the left and the right in the knitting width direction of the knitted fabric) of the front knitted fabric portion and the back knitted fabric portion. As a result, the non-crossing knitting yarn bridges across the front and back knitted fabric portions as a sinker loop of a normal shape at the position of the hole formed by crossing, and hence the formed hole does not outstand and the appearance of the boundary portion becomes satisfactory. Furthermore, the knitting yarn to which the sinker loop crosses and the knitting yarn to which the sinker loop does not cross exist at both boundary portions of the knitted fabric, and hence both boundary portions can have almost the same appearance, and a knitted fabric with balanced appearance and a beautiful finish can be obtained. Furthermore, the productivity of the knitted fabric can be enhanced since knitting is carried out through the double system knitting.

[0014] The first knitting course to which knitting yarns are fed from the near side yarn feeder and the far side yarn feeder is formed before the second knitting course to which knitting yarns are fed from the middle side yarn feeder by feeding the yarns from the near side yarn feeder and the far side yarn feeder with respect to the knitting needles driven by the preceding cam system. In this case, the knitting yarns from the middle side yarn feeder cross one of the knitting yarns, the knitting yarn from the near side yarn feeder or the knitting yarn from the far side yarn feeder, that are already formed, and pull up the one of the knitting yarns towards the second knitting course at the boundary portion of the front and back knitted fabric portions. The shape of the sinker loop at the boundary portion X formed of the knitting yarns from the middle side yarn feeder does not greatly deform with respect to the shape of the sinker loop at other than the boundary portion X in the same knitting course (see sinker loop originating from the yarn feeder 5 of Fig. 1 (B), to be hereinafter described). The knitting yarns from the middle side yarn feeder do not cross the other one of the knitting yarns, and such other knitting yarn maintains the state

when it has been formed. That is, the sinker loops are the same in height in the knitted fabric and the shapes of such sinker loops are uniform in all knitting courses of the knitted fabric, and hence the appearance of the knitted fabric is satisfactory (see Fig. 1 (B)). In this case as well, the left and right boundary portions in the knitted fabric have almost the same appearance, and a knitted fabric with balanced appearance and a beautiful finish can be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 (A) is an explanatory view showing a state of yarn feeders when knitting through a knitting method of a tubular knitted fabric described in a first embodiment. (B) is a loop diagram showing a boundary portion of the front and back knitted fabric portions at the side surrounded with a dotted line in (A) when seen from the direction of an outlined arrow.

Fig. 2 is a photograph of the vicinity of the boundary portion in the tubular knitted fabric described in the first embodiment.

Fig. 3 (A) is an explanatory view showing a state of the yarn feeders when knitting through a knitting method of a tubular knitted fabric described in a second embodiment. (B) is a loop diagram showing a boundary portion of the front and back knitted fabric portions at the side surrounded with a dotted line in (A) when seen from the direction of an outlined arrow.

Fig. 4 is a photograph of the vicinity of the boundary portion in the tubular knitted fabric described in the second embodiment.

Fig. 5(A) is an explanatory view showing a state of the yarn feeders when knitting through a knitting method of a tubular knitted fabric of the background art. (B) is a loop diagram showing a boundary portion of the front and back knitted fabric portions at the side surrounded with a dotted line in (A) when seen from the direction of an outlined arrow.

Fig. 6 is a photograph of the vicinity of the boundary portion in the tubular knitted fabric of the background art.

MODE FOR CARRYING OUT THE INVENTION

[0016] Preferred embodiments (first and second embodiments) of the present invention will be described below in detail with reference to the drawings. In both the first and second embodiments, a tubular knitted fabric including a front knitted fabric portion knitted at a front needle bed and a back knitted fabric portion knitted at a back needle bed is knitted through the double system knitting of carrying out the knitting two courses at once by one forward movement or backward movement of a carriage arranged in the flat knitting machine. The tubular knitted fabric of the present invention includes, of course, a tubular article (e.g., sweater) in which the front and back knitted fabric portions are completely continued, but also an article (e.g., cardigan) in which one part of the tube is not continued.

[0017] First, the flat knitting machine used in the embodiment will be described. The flat knitting machine is a flat knitting machine having a pair of front and back needle beds extending in a transverse direction and disposed opposite to each other in a cross direction. Such a flat knitting machine includes a two-bed flat knitting machine including a front needle bed and a back needle bed, and a four-bed flat knitting machine including another pair of needle beds disposed opposite to each other at above the front and back needle beds.

[0018] The flat knitting machine includes a plurality of rails laid in parallel in a direction orthogonal to the longitudinal direction of the needle beds at above the needle beds regardless of how many needle beds are arranged. Each rail has a yarn feeder attached so as to be slidable on the rail, which yarn feeder can reciprocate in a direction parallel to the longitudinal direction of the needle bed. In Fig. 1 and Fig. 3 used in the description of the first and second embodiments described afterward, only three yarn feeders, a yarn feeder 4, a yarn feeder 5, and a yarn feeder 6 are illustrated. The positional relationship of such yarn feeders 4 to 6 is a positional relationship in which the yarn feeder 4 (near side yarn feeder) is arranged on the nearest side when seen from the front side of the flat knitting machine, the yarn feeder 6 (far side yarn feeder) is arranged on the farthest side, and the yarn feeder 5 (middle side yarn feeder) is arranged between the yarn feeder 4 and the yarn feeder 6.

[0019] Furthermore, the flat knittingmachine includes a carriage mounted with a plurality of cam systems for driving the knitting needles of the needle beds. In the knitting method of tubular knitted fabric of the present invention, the double system knitting is carried out by using two of the plurality of cam systems to form stitches. If three or more cam systems are arranged, two may be used for forming the stitches, and the remaining one may be used for transfer, and the like.

<First Embodiment>

[0020] The tubular knitted fabric including a back knitted fabric portion BF and a front knitted fabric portion FF as shown in Fig. 1 is knitted using the flat knitting machine described above. Fig. 1 (A) is a view showing a positional relationship of the yarn feeders 4, 5, 6 at the time of knitting. A thin arrow in the figure shows the movement direction of the yarn feeders 4, 5, 6 (same as the movement direction of the carriage), where the front knitted fabric portion FF is knitted at the front needle bed on the lower side of the paper face and the back knitted fabric portion BF is knitted at the back needle bed on the upper side of the paper face with the movement of the yarn feeders 4, 5, 6. Fig. 1 (B) is a loop diagram of the portion shown with a chain double dashed line in Fig. 1 (A) when seen

from the direction of an outlined arrow, where a boundary portion X of the front knitted fabric portion FF and the back knitted fabric portion BF is shown with a chain line. Fig. 3 used in the description of the second embodiment, described afterwards, is viewed in the same manner.

[0021] When continuously knitting the front knitted fabric portion FF and the back knitted fabric portion BF, one knitting yarn is fed from each of the yarn feeders 4 and 6 with respect to the knitting needles driven by the preceding cam system, and two knitting yarns are fed from the yarn feeder 5 with respect to the knitting needles driven by the following cam system. In this case, the yarn feeders 4 and 6 are traveled so as to be ahead of the yarn feeder 5. The order of the yarn feeder 4 and the yarn feeder 6 in the carriage is not particularly limited, and may be exactly simultaneous as long as the distal ends of the yarn feeders 4, 6 do not interfere with each other.

[0022] The thickness of the knitted fabric becomes uniform if the number of knitting yarns is the same for the knitting with the preceding cam system and for the knitting with the following cam system, and a satisfactory appearance of the knitted fabric is realized if the knitting yarns to be knitted with both cam systems are the same color. Therefore, in the present embodiment, one knitting yarn of the same color is fed from each of the yarn feeders 4 and 6, and two knitting yarns of the same color are fed from the yarn feeder 5. Instead of feeding two knitting yarns from the yarn feeder 5, one knitting yarn may be fed from the yarn feeder 5 and a yarn feeder 5' (not illustrated) separate from the yarn feeder 5, respectively, as following yarn feeders. In this case, the yarn feeder 5' that is on the far side than the yarn feeder 4 and on the near side than the yarn feeder 6 is used.

[0023] When the double system knitting is carried out with the yarn feeders 4 to 6 having the above positional relationship, a first knitting course made up of two knitting yarns fed from the yarn feeders 4 and 6 forms before a second knitting course made up of two knitting yarns fed from the yarn feeder 5. In this case, the knitting yarns of the yarn feeder 5 cross the knitting yarn of the yarn feeder 6 when the knitting of the back knitted fabric portion BF is finished at the left end in the knitting width direction (portion surrounded with a chain double dashed line in Fig. 1 (A)) at where the knitting of the back knitted fabric portion BF transitions to the knitting of the front knitted fabric portion FF. When the knitting of the front knitted fabric portion FF then starts, the knitting yarns of the yarn feeder 5 pull up the knitting yarn of the yarn feeder 6. The knitting yarn of the yarn feeder 4 does not cross the knitting yarns of the yarn feeder 5, and hence is not pulled up by the knitting yarns of the yarn feeder 5 when transitioning from the knitting of the back knitted fabric portion BF to the knitting of the front knitted fabric portion FF.

[0024] The state of the stitches at the boundary portion X of the front knitted fabric portion FF and the back knitted fabric portion BF at the left end in the knitting width direction of the tubular knitted fabric knitted in the above manner is as shown in Fig. 1(B). As shown in the figure, a sinker loop originating from the yarn feeder 6 of the sinker loops of the first knitting course is hooked to a sinker loop (originating from the yarn feeder 5) of the second knitting course formed after the first knitting course, and is pulled up towards the second knitting course at the boundary portion X of the knitted fabric. In this case, the shape of the sinker loop originating from the yarn feeder 5 has a shape substantially the same as the shape of a normal sinker loop (sinker loop at other than the boundary portion X). That is, in the second knitting course, the sinker loop at the boundary portion X has substantially the same shape and has substantially the same height as the sinker loop at other than the boundary portion X. At the boundary portion X, the sinker loop originating from the yarn feeder 4 does not cross the sinker loop of the second knitting course and thus is not pulled up towards the second knitting course at all, and maintains the state when it has been formed (state hooked to a pair of stitches sandwiching the boundary portion X of the second knitting course formed one before the first knitting course).

[0025] As described above, the sinker loops are the same in height in the knitted fabric and the shapes of such sinker loops are uniform in all knitting courses of the knitted fabric, and hence the appearance of the knitted fabric is satisfactory. It is apparent that a hole is not formed from the photograph (Fig. 2) showing a state at the boundary portion X of the actual knitted fabric.

[0026] At the right end in the knitting width direction, the knitting yarn of the yarn feeder 4 crosses the knitting yarns of the yarn feeder 5 and is pulled up by such knitting yarns, but the knitting yarn of the yarn feeder 6 does not cross the knitting yarns of the yarn feeder 5 and is not pulled up by such knitting yarns. Thus, a hole does not form even at the boundary portion of the front and back knitted fabric portions at the right end in the knitting width direction.

[0027] The boundary portion X at the left end in the knitting width direction and the boundary portion at the right end in the knitting width direction are different in that the knitting yarn forming the first knitting course that crosses the knitting yarns (originating from the yarn feeder 5) forming the second knitting course is either from the yarn feeder 6 or the yarn feeder 4, but are the same in that one of the two knitting yarns forming the first knitting course is pulled up but the remaining knitting yarn is not pulled up. Thus, both boundary portions in the knitted fabric have almost the same appearance, and a knitted fabric with balanced appearance and a beautiful finish is obtained.

<Second Embodiment>

[0028] In the first embodiment, the knitting yarns from the middle side yarn feeder are fed for the knitting with the following cam system, but may be fed for the knitting with the preceding cam system. A case of feeding the

yarns from the middle side yarn feeder for the knitting with the preceding cam system will be described below with reference to Fig. 3 and Fig. 4.

[0029] As shown in Fig. 3 (A), the yarn feeders 4 to 6 are arranged in the order from the front surface to the rear of the flat knitting machine in the double system knitting of the present embodiment. The carriage is moved towards the left of a paper face to knit the back knitted fabric portion BF, and then the carriage is moved towards the right of the paper face to knit the front knitted fabric portion FF.

[0030] When the above knitting is carried out, the second knitting course made up of two knitting yarns fed from the yarn feeder 5 forms before the first knitting course made up of two knitting yarns fed from the yarn feeders 4 and 6. In this case, the knitting yarn of the yarn feeder 4 crosses the knitting yarns of the yarn feeder 5 when the knitting of the back knitted fabric portion BF is finished at the left end in the knitting width direction (portion surrounded with a chain double dashed line in Fig. 3 (A)) at where the knitting of the back knitted fabric portion BF transitions to the knitting of the front knitted fabric portion FF. When the knitting of the front knitted fabric portion FF then starts, the knitting yarn of the yarn feeder 4 pulls up the two knitting yarns of the yarn feeder 5. In other words, the knitting yarn of the yarn feeder 4 is pulled down by the two knitting yarns of the yarn feeder 5. The knitting yarn of the yarn feeder 6 does not cross the knitting yarns of the yarn feeder 5, and hence is not be pulled down by the knitting yarns of the yarn feeder 5.

[0031] Fig. 3(B) shows a state of the stitches at the boundary portion X at the left end of the knitted tubular knitted fabric. As shown in the figure, a sinker loop originating from the yarn feeder 4 of the sinker loops of the first knitting course is hooked to a sinker loop of the second knitting course formed before the first knitting course, and is pulled down towards the second knitting course at the boundary portion X. At the boundary portion X, the sinker loop originating from the yarn feeder 6 does not cross the sinker loop of the second knitting course, and thus is not pulled down towards the second knitting course at all, and becomes the sinker loop of the same shape as the sinker loop in the case where the normal knitting is carried out, that is, the same shape as the sinker loop at a position other than the boundary portion X in the same knitting course. More specifically describing, the sinker loop originating from the yarn feeder 6 is in a state hooked to a pair of stitches sandwiching the boundary portion X of the second knitting course formed one before the first knitting course.

[0032] The knitting method of the tubular knitted fabric of the present embodiment is similar to the conventional double system knitting in that the sinker loop of the knitting course (second knitting course) formed before is pulled up and deformed by the sinker loop of the knitting course (first knitting course) formed after, thereby forming a hole in the knitted fabric at the boundary portion X of the front knitted fabric portion FF and the back knitted fabric portion BF. However, the hole that forms at the boundary portion X is very small due to the non-crossing sinker loop originating from the knitting yarn of the yarn feeder 6. In fact, it can be seen from the photograph (Fig. 4), which shows a state at the boundary portion of the knitted fabric knitted through the knitting method of the tubular knitted fabric of the present embodiment, that a hole big enough to be considered a hole is not formed compared to the knitted fabric (Fig. 6) knitted through the conventional knitting method.

[0033] At the right end in the knitting width direction, the knitting yarn from the yarn feeder 6 crosses the two knitting yarns from the yarn feeder 5 and pulls up such knitting yarns, but the knitting yarn of the yarn feeder 4 does not cross the two knitting yarns from the yarn feeder 5 and does not pull up such knitting yarns. That is, the right end in the knitting width direction also has an appearance similar to the left end in the knitting width direction described above, and thus the appearance significantly improves compared to the knitted fabric knitted through the conventional knitting method.

INDUSTRIAL APPLICABILITY

[0034] The knitting method of tubular knitted fabric of the present invention can be suitably used in the double system knitting capable of carrying out knitting two courses with the movement of the carriage in one direction.

DESCRIPTION OF SYMBOLS

[0035]

4, 5, 6	yarn feeder
FF	front knitted fabric portion
BF	back knitted fabric portion
X	boundary portion of front and back knitted fabric portions
g	hole

Claims

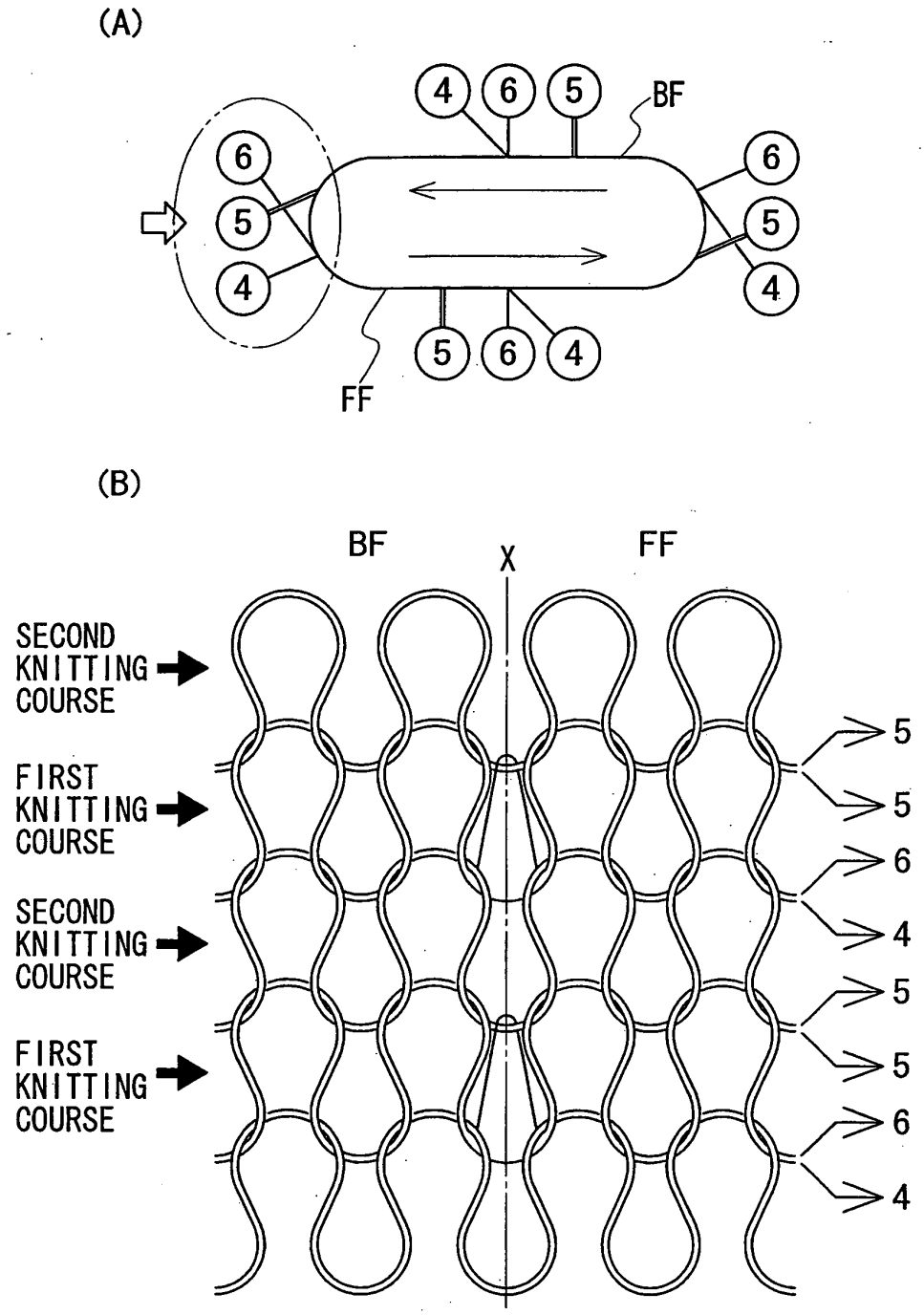
1. A knitting method of tubular knitted fabric using a flat knitting machine, which has at least a pair of front and back needle beds and is configured to drive knitting needles of the needle beds to perform a knitting operation by a plurality of cam systems arranged in a carriage that reciprocates on the needle beds and also has a plurality of yarn feeders attached to reciprocate in a direction parallel to a longitudinal direction of the needle beds with respect to each of a plurality of rails laid in parallel in a direction orthogonal to the longitudinal direction of the needle beds at above the needle beds, in which two courses are knitted with the preceding cam system and the following cam system by movement of the carriage in one direction, the knitting method **characterized in**

that
when the yarn feeder on a front side of the yarn feeders arranged in the flat knitting machine is a near side yarn feeder,
the yarn feeder positioned on a far side than the near side yarn feeder is a far side yarn feeder, and
the yarn feeder positioned between the near side yarn feeder and the far side yarn feeder is a middle side yarn feeder,
yarns are fed from the near side yarn feeder and the far side yarn feeder with respect to the knitting needle driven by either one of the cam systems, the preceding cam system or the following cam system, and
yarns are fed from the middle side yarn feeder with respect to the knitting needle driven by the other one of the cam systems to carry out knitting to a tubular shape.

2. The knitting method of tubular knitted fabric according to claim 1, wherein the yarns are fed from the near side yarn feeder and the far side yarn feeder with respect to the knitting needles driven by the preceding cam system.

3. A tubular knitted fabric including front and back knitted fabric portions knitted by using a flat knitting machine, which has at least a pair of front and back needle beds and is configured to drive knitting needles of the needle beds to perform a knitting operation by a plurality of cam systems arranged in a carriage that reciprocates on the needle beds and also has a plurality of yarn feeders attached to reciprocate in a direction parallel to a longitudinal direction of the needle beds with respect to each of a plurality of rails laid in parallel in a direction orthogonal to the longitudinal direction of the needle beds at above the needle beds, the front and back knitted fabric portions knitted by carrying out knitting two courses with the preceding cam system and the following cam system by movement of the carriage in one direction,
wherein
the tubular knitted fabric is formed by alternately repeating a first knitting course made up of a plurality of knitting yarns, and
a second knitting course made up of one or more knitting yarns; and
some of the knitting yarns of the plurality of knitting yarns configuring a sinker loop of the first knitting course cross a sinker loop of the second knitting course adjacent to the first knitting course, and the remaining knitting yarns do not cross the sinker loop of the second knitting course at a boundary portion of the front knitted fabric portion and the back knitted fabric portion.

Fig. 1


(A)
4
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6
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(B)
BF
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SECOND KNITTING COURSE
FIRST KNITTING COURSE
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Fig. 2

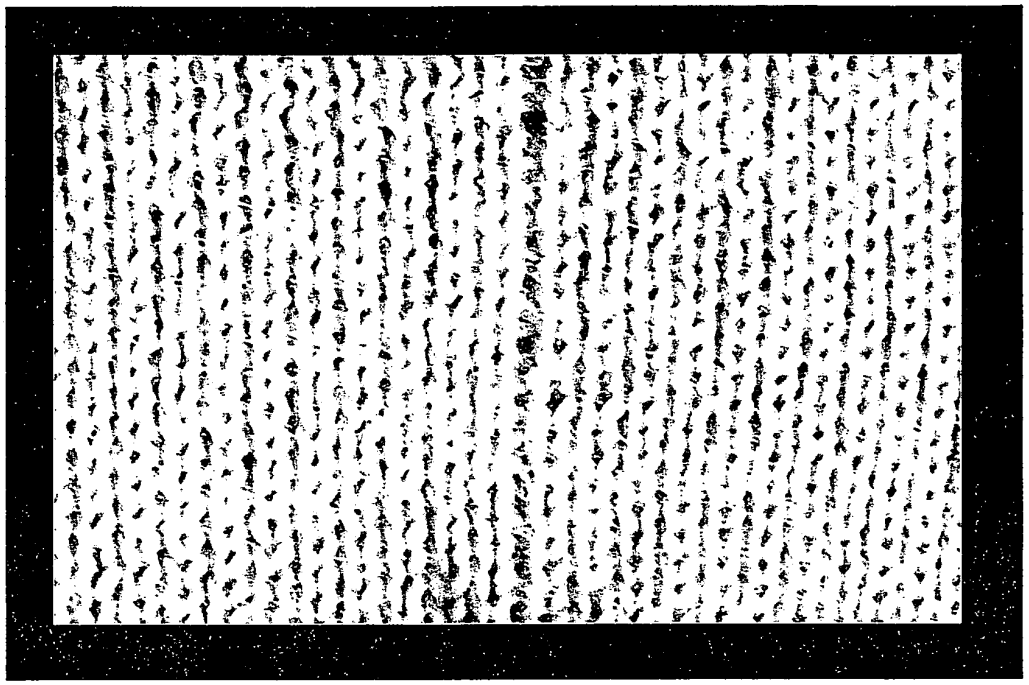
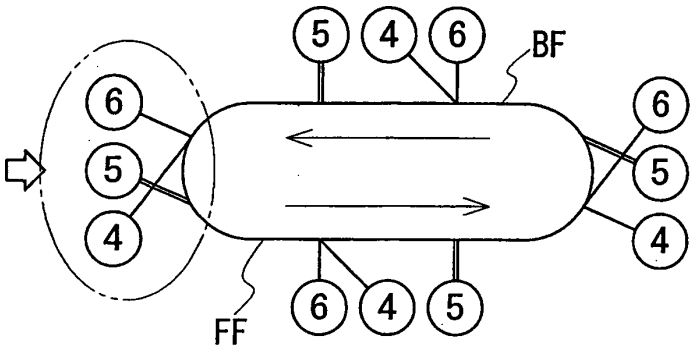


Fig. 3

(A)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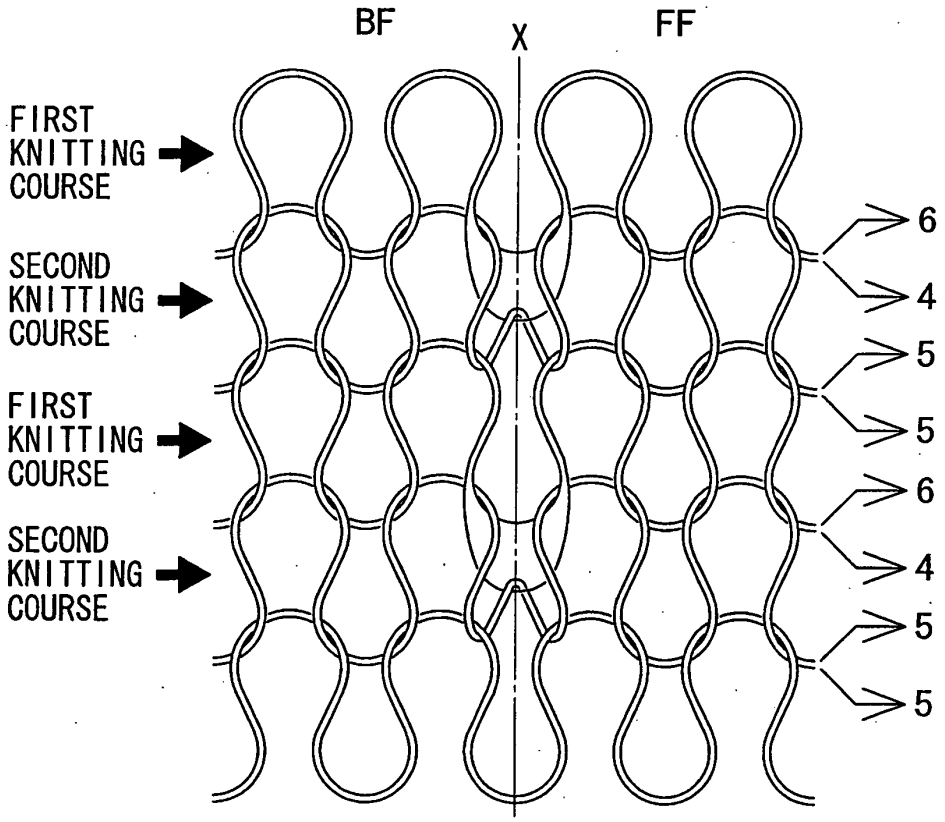
5

(B)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FF
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SECOND KNITTING COURSE
FIRST KNITTING COURSE
SECOND KNITTING COURSE
6
4
5
5
6
4
5
5

Fig. 4

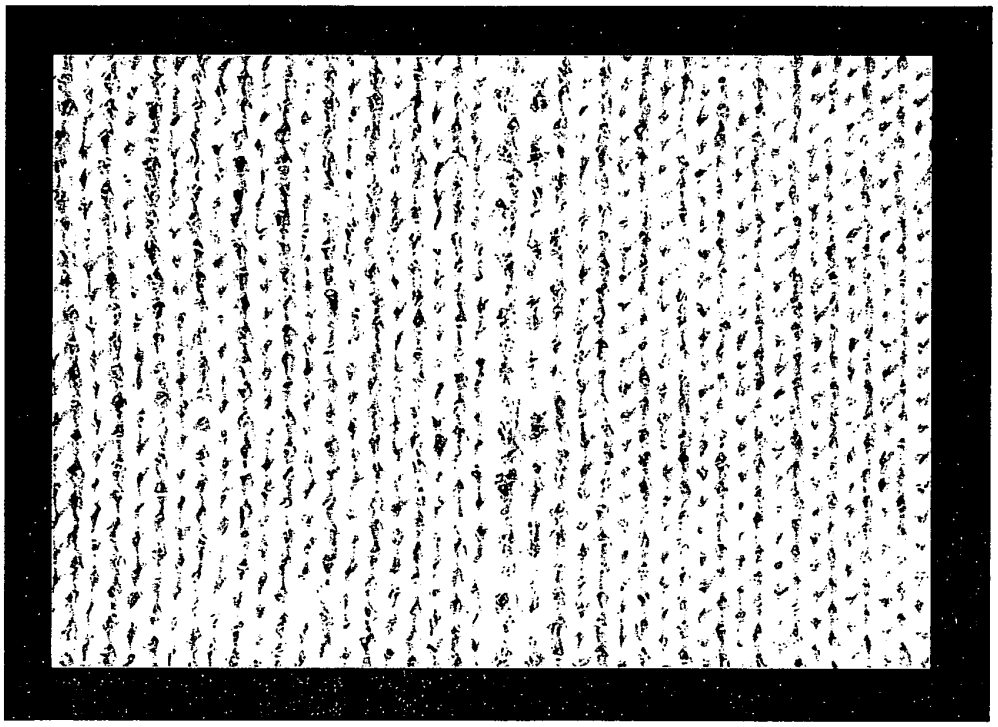
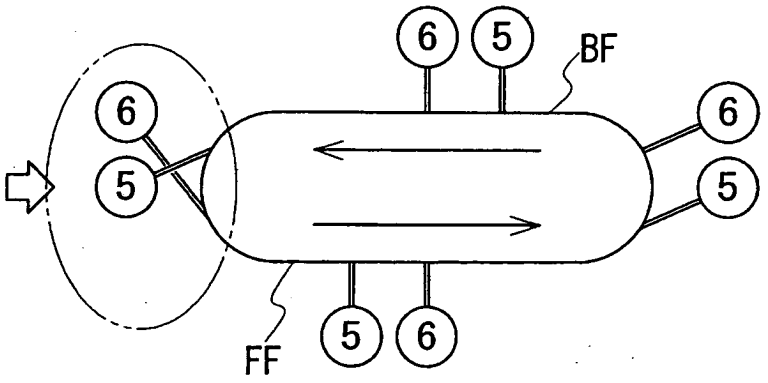


Fig. 5

(A)



(B)

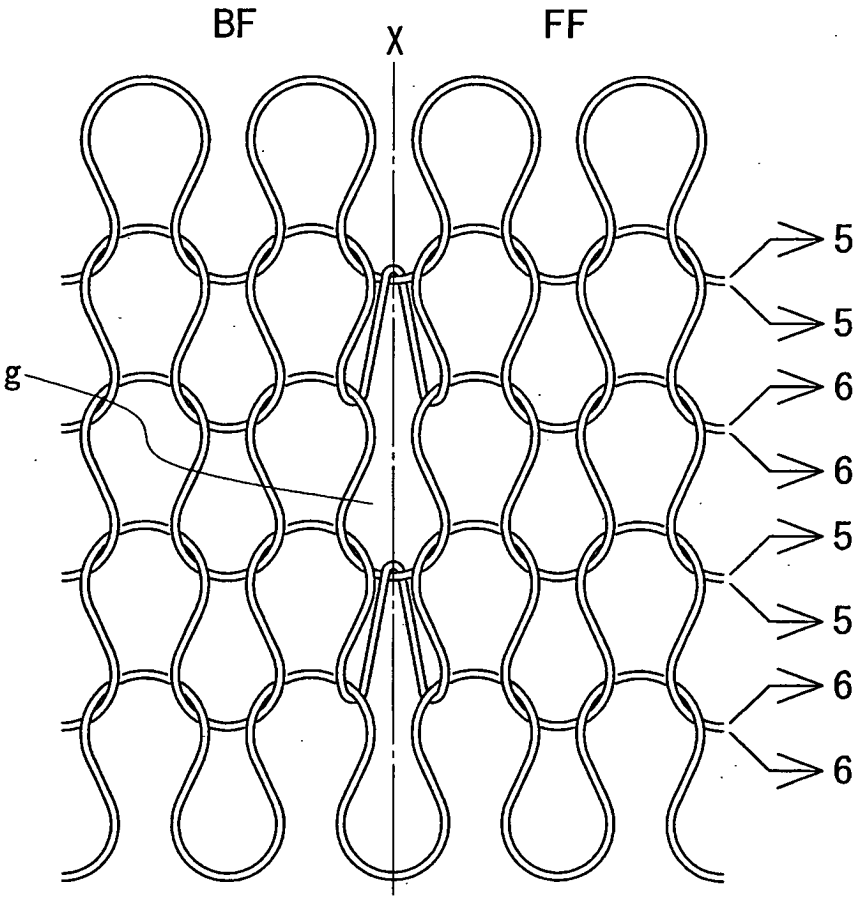
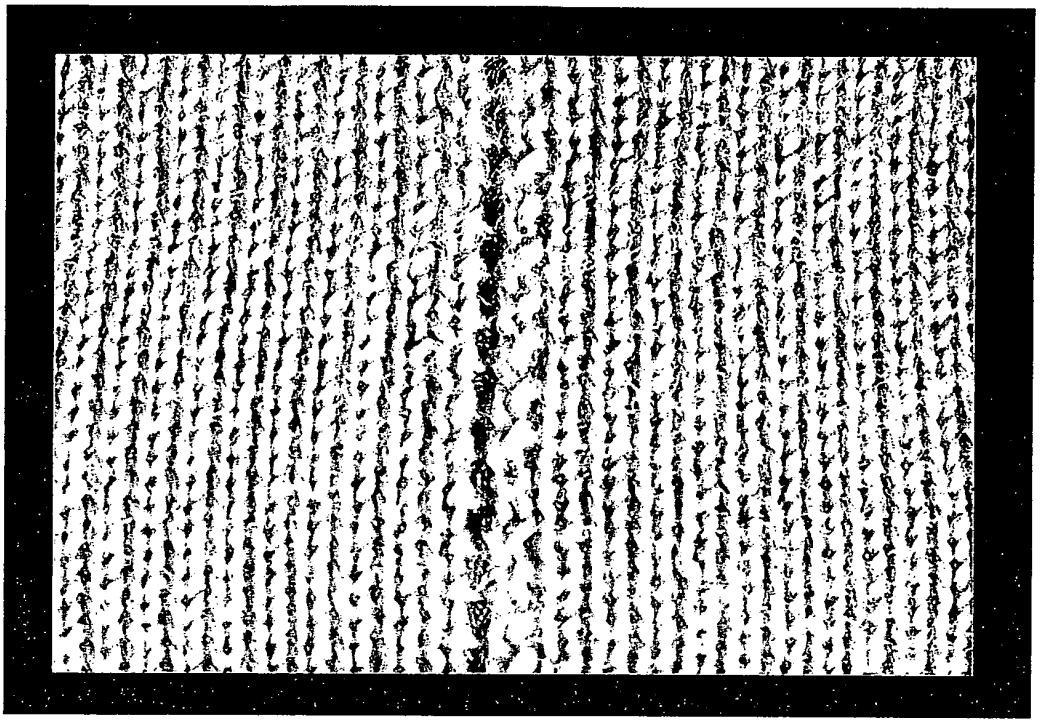


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/001893

A. CLASSIFICATION OF SUBJECT MATTER
D04B1/00(2006.01)i, *D04B1/24*(2006.01)i, *D04B7/32*(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, D04B1/24, D04B7/32

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 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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	WO 2007/099709 A1 (Shima Seiki Mfg., Ltd.), 07 September, 2007 (07.09.07), Full text & EP 1990452 A1 & CN 101395313 A	1-3
A	JP 10-266047 A (Shima Seiki Mfg., Ltd.), 06 October, 1998 (06.10.98), Full text & EP 867547 B1 & US 6021650 A	1-3
A	JP 2000-34654 A (Shima Seiki Mfg., Ltd.), 02 February, 2000 (02.02.00), Full text (Family: none)	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
14 July, 2009 (14.07.09)	28 July, 2009 (28.07.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 10266047 A **[0004]**