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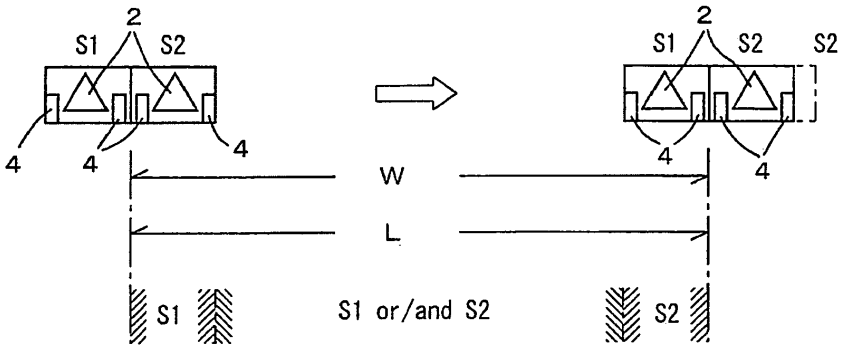
(54) Knitting method by flat knitting machine and editing apparatus for knitting data

(57) Configuration: A knitting machine includes a needle bed (32, 34), a carriage (36), a carrier, and a controller (40). The carriage (36) is provided with at least two cam systems (S1, S2, S3) in a longitudinal direction of the needle bed (32, 34), and the cam systems (S1, S2, S3) perform knitting using a yarn from the carrier. For a course of the carriage (36) in which a yarn is not fed from the carrier to a needle on the needle bed (32, 34) and a knitting width is longer than a width of one cam system (S1, S2, S3), the knitting width is divided into at least two portions that are to be knitted by different cam systems (S1, S2, S3), and a knitting width of a first portion and a knitting width of a last portion are set such that a sum of the knitting width of the first portion and the knitting width of the last portion in a travelling direction of the carriage (36) is at least the width of one cam system (S1, S2, S3). The first portion is knitted by a following cam system in the travelling direction of the carriage (36), and the last portion is knitted by a preceding cam system in the travelling direction of the carriage (36).

Effects: The stroke of the carriage (36) is shortened.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to knitting by a flat knitting machine, and particularly relates to improvement in the knitting efficiency.

Background Art

[0002] In a flat knitting machine, for example, a carriage is caused to travel back and forth on a pair of front and rear needle beds, and cam systems included in the carnage are used to operate needles on the needle beds. As the cam systems, for example, a plurality of (e.g., two or three) cam systems are often provided for each of the front needle bed and the rear needle bed. Note that, since the front and the rear needle beds are provided with the same number of cam systems, the number of cam systems is often indicated as the number thereof for one needle bed. For example, a carriage provided with two cam systems for each of the front and the rear needle beds is referred to as a 2-cam (system) carriage. The needles are arranged on the needle beds, a yarn is fed from a carrier to the needles, needles are selected by needle selection portions of the cam systems, and operations such as knit, tuck, and transfer are performed by operating the needles with knitting cams of the cam systems. One travel of the carriage is referred to as one course, and one row of stitches in the travelling direction of the carriage is also referred to as one course. Whether "one course" refers to carriage course or stitch course is determined from context. A carriage is provided with a plurality of cam systems, for example, in order to make it possible to knit stitches for a plurality of courses in one carriage course, or to knit a stitch using one cam system while performing transfer using another cam system.

[0003] In a flat knitting machine, knitting for one course is performed by a single cam system. For example, in a course for performing transfer, even a carriage provided with a plurality of cam systems uses a single cam system to perform all transfer operations throughout that course. Such an approach is common knowledge in knitting using a flat knitting machine.

[0004] The time required to knit a knitted fabric becomes longer as the carriage stroke becomes longer. For example, Patent Literature 1 (WO2008/078415) discloses a technique for shortening the stroke necessary for preliminary needle selection. FIG. 10 shows the example disclosed in Patent Literature 1. It is assumed that knitting is performed from left to right in the drawing, S2 refers to a preceding cam system that performs an operation such as knitting, and S1 refers to a following cam system that is in a resting state in this example. Whether a cam system is a preceding one or a following one is determined according to the travelling direction of the carriage in the course, and the resting state refers to a state in which the knitting cam is not in operation. W refers to a knitting width, which is a width of a zone from a knitting needle that is operated first to a knitting needle that is operated last in the travelling direction of the carriage. L refers to a carriage stroke. The cam systems S1 and S2 each include a knitting cam 2 and needle selection portions 4. One pair of needle selection portions 4 are arranged on the front and rear sides of the knitting cam 2. When selecting needles, preliminary needle selection is performed to divide needles into needles for miss and needles for performing operations such as knit, tuck, and transfer, and main needle selection is then performed to divide needles into needles for performing knit or transfer and needles for performing tuck. Since the needle selection performed by the needle selection portion 4 is only for one step, the preliminary needle selection is performed by a needle selection portion 4b of the preceding cam system S2 at the end of a course, and, after the carriage returns, the main needle selection is performed by the needle selection portion 4b again, and knitting is performed by the knitting cam of the cam system S2. If the preliminary needle selection at the end of the course is performed by a needle selection portion 4a of the cam system S1, the stroke becomes longer as defined by the broken line at the upper right in FIG. 10. On the other hand, if the preliminary needle selection and the main needle selection for starting the next course are both performed by the needle selection portion 4b of the cam system S2, the stroke is shortened.

[0005] As shown in FIG. 10, knitting in one course is performed throughout by the cam system S2, and Patent Literature 1 at no time states that the cam system S2 is put in a resting state during one course and the cam system S 1 is operated instead. Note that the cam system S1 may be used to perform knitting for one course, but, in this case, the cam system S2 is put in a resting state.

Citation List

Patent Literature

[0006] Patent Literature 1: WO2008/078415

Summary of the Invention

Problem to be Solved by the Invention

[0007] It is an object of the present invention to improve the knitting efficiency of a flat knitting machine by shortening the carriage stroke.

Means for Solving Problem

[0008] The present invention is directed to a knitting method using a flat knitting machine including a needle bed, a carriage, a carrier, and a controller, in which the carriage is provided with at least two cam systems in a longitudinal direction of the needle bed, and the cam systems perform knitting using a yarn from the carrier, char-

acterized by the steps of:

for a course of the carnage in which a yarn is not fed from the carrier to a needle on the needle bed and a knitting width is longer than a width of one cam system,
dividing the knitting width into at least two portions that are to be knitted by different cam systems, and setting a knitting width of a first portion and a knitting width of a last portion such that a sum of the knitting width of the first portion and the knitting width of the last portion in a travelling direction of the carriage is at least the width of one cam system; and
knitting the first portion by a following cam system in the travelling direction of the carriage, and knitting the last portion by a preceding cam system in the travelling direction of the carriage.
Here, the knitting width of a course of the carriage refers to the width of a zone from a knitting needle that is operated first to a knitting needle that is operated last in the travelling direction of the carriage. The knitting width of the first portion refers to the width of any zone extending to the downstream side in the travelling direction of the carriage from a knitting needle that is operated first by the following cam system before a knitting needle that is operated by a cam system other than the following cam system. The knitting width of the last portion refers to the width of any zone extending to the upstream side in the travelling direction of the carriage from a knitting needle that is operated last by the preceding cam system before a knitting needle that is operated by a cam system other than the preceding cam system.

[0009] Moreover, the present invention is directed to a knitting data editing apparatus for a flat knitting machine including a needle bed, a carriage, a carrier, and a controller, in which the carriage is provided with at least two cam systems in a longitudinal direction of the needle bed, and the cam systems perform knitting using a yarn from the carrier, characterized by including:

course identifying means for identifying a course of the carriage in which a yarn is not fed from the carrier to a needle on the needle bed and a knitting width is longer than a width of one cam system, by analyzing knitting data; and
allocating means for automatically allocating the cam systems such that, in a case where a sum of a knitting width of a first portion and a knitting width of a last portion in a travelling direction of the carriage is at least the width of one cam system when the knitting width of the course that has been identified by the course identifying means is divided into at least two portions that are to be knitted by different cam systems, the first portion is knitted by a following cam system in the travelling direction of the carnage and the last portion is knitted by a preceding cam system in the travelling direction of the carriage.

[0010] Note that the knitting width of the first portion may include a zone in which the following cam system operates a needle on the needle bed and a zone in which no cam system operates a needle on the needle bed. Furthermore, the knitting width of the last portion may include a zone in which the preceding cam system operates a needle on the needle bed and a zone in which no cam system operates a needle on the needle bed. That is to say, the knitting width of the first portion refers to the sum of the width of a zone in which the following cam system operates a needle and the width of a zone that is continued from that zone and in which no cam system operates a needle. In a similar manner, the knitting width of the last portion refers to the sum of the width of a zone in which the preceding cam system operates a needle and the width of a zone that is continued from that zone and in which no cam system operates a needle. Furthermore, when operating a needle on the needle bed for a knitting width of a portion between the first portion and the last portion, the preceding cam system and/or the following cam system operates the needle.

[0011] It is preferable that the course is a course for performing stitch transfer. Knitting is performed without causing a yarn to be fed from the carrier, that is, without forming a stitch, in the case where transfer is performed by knitting a cable pattern, narrowing stitches, increasing stitches, sliding stitches, or the like. For example, FIG. 5 shows knitting courses for a cable pattern, wherein the carriage performs stitch formation for three courses, and performs transfer for three courses. If the stroke of a course for performing transfer is shortened by the width of one cam system, the knitting time is shortened by, for example, several percent. Furthermore, the carriage travels without using the carrier also in an operation that shakes off stitches from needles as well as the transfer operation.

[0012] In the present invention, as shown in FIGS. 1 to 4, the carriage stroke is shortened. For example, the comparison between FIGS. 1 and 10 shows that the stroke of a carnage provided with two cam systems is shortened by the width of one cam system. Furthermore, as shown in FIG. 3, the stroke of a carriage provided with three cam systems is shortened by the width of two cam systems. The reason for this is that the first portion of the course is knitted by the following cam system S 1 or the like and the last portion of the course is knitted by the preceding cam system S2 or the like.
If the carriage is provided with three or more cam systems, the knitting is preferably started by a cam system that travels last and ended by a cam system that travels first, but, for example, the knitting may be started by the cam system that travels last and ended by a cam system that travels therebetween. Note that the cam system that travels therebetween may not be used.

[0013] The knitting data editing apparatus is included, for example, in the flat knitting machine or the knit design

apparatus. If the editing apparatus is included in the flat knitting machine, the flat knitting machine is caused to edit existing knitting data so as to implement the present invention. Furthermore, if the editing apparatus is included in the knit design apparatus, when designing a knitted fabric and creating knitting data, the knitting data is edited so as to implement the present invention.

[0014] In this specification, the description regarding the knitting method is applicable as it is to the knitting data editing apparatus, and the description regarding the knitting data editing apparatus is applicable as it is to the knitting method. When the first portion of the course is knitted by a following cam system in the travelling direction of the carriage and the last portion of the course is knitted by a preceding cam system in the travelling direction of the carriage, a portion between the first portion and the last portion may be knitted by either one of the preceding cam system and the following cam system, and may be knitted by both of the preceding cam system and the following cam system. The width of one cam system refers to a length from a point where one cam system starts a knitting operation including needle selection on one needle to a point where the cam system ends the knitting operation. Note that, in the case where the knitting width of a course is the width of one cam system or shorter, it is efficient to knit the entire knitting width by the following cam system. However, the case where the knitting width is the width of one cam system or shorter does not occur so often, and, therefore, for example, the knitting may be started by the following cam system and ended by the preceding cam system.

[0015] FIG. 6 shows an example in which the present invention and a conventional example have an equal stroke, wherein the knitting width W is equal to the width of one cam system. In the case where the knitting width is shorter than the width of one cam system, it is meaningless to implement the present invention, and, in the case where the knitting width is equal to the width of one cam system, the stroke does not change regardless of the implementation of the present invention. However, the case where the knitting width is shorter than the width of one cam system does not occur so often, and, therefore, the knitting may be performed as in the present invention regardless of the knitting width.

[0016] Note that, in the case where the first portion in the knitting width may be knitted by either one of the preceding cam system and the following cam system as shown in the course C4 in FIG. 5, the stroke of the carriage does not change regardless of the application of the embodiment. Thus, a condition that the first portion in the knitting width may be knitted only by the following cam system may be added as a condition for applying the embodiment.

Brief Description of the Drawings

[0017]

FIG. 1 is a diagram showing the allocation of cam systems and the carriage stroke according to an embodiment.

FIG. 2 shows ON/OFF states of the cam systems in FIG. 1, wherein 1) shows ON/OFF states of a cam system S1, and 2) shows ON/OFF states of a cam system S2.

FIG. 3 is a diagram showing the allocation of cam systems and the carriage stroke in a carriage provided with three cam systems.

FIG. 4 shows ON/OFF states of the cam systems in FIG. 2, wherein 1) shows ON/OFF states of a cam system S1, 2) shows ON/OFF states of a cam system S2, and 3) shows ON/OFF states of a cam system S3.

FIG. 5 is a diagram showing the carriage strokes in knitting of a cable pattern according to the embodiment and a conventional example.

FIG. 6 is a diagram showing a condition in which a conventional example and the embodiment have an equal stroke, wherein 1) shows the stroke according to the embodiment, and 2) shows the stroke according to the conventional example.

FIG. 7 shows a flowchart illustrating an algorithm for the allocation of cam systems according to the embodiment.

FIG. 8 is a block diagram of a knit design apparatus according to the embodiment.

FIG. 9 is diagram showing a flat knitting machine according to the embodiment.

FIG. 10 is a diagram showing the allocation of cam systems and the carriage stroke according to a conventional example.

Description of Embodiments

[0018] Hereinafter, an optimal embodiment for carrying out the present invention will be described.

Embodiment

[0019] FIGS. 1 to 9 show an embodiment, wherein an arrow indicates a travelling direction of the carriage, ON indicates that a cam system performs knitting, and OFF indicates that a cam system is in a resting state. FIG. 1 shows the allocation of cam systems S1 and S2 in knitting only with transfer, and FIG. 2 shows ON/OFF states of the cam systems S1 and S2 at that time. A first portion in the knitting width W is knitted by the following cam system S1, and a last portion is knitted by the preceding cam system S2. A portion therebetween may be knitted by either one or both of the cam systems S1 and S2. In the example in FIGS. 1 and 2, the knitting width of the first portion and the knitting width of the last portion are each set so as to be equal to the width of one cam system.

[0020] The solid lines in FIG. 2 indicate an example in which the cam system S2 is preferentially used, and the broken lines indicate an example in which the cam sys-

tem S1 is preferentially used. In either case, there is a period in which both the cam systems S1 and S2 are used. Furthermore, if the knitting width W is long as in FIGS. 1 and 2, the carriage stroke L and the knitting width W are substantially equal to each other. This stroke is shorter than that in FIG. 10 by the width of one cam system in the longitudinal direction of the needle beds. This aspect is particularly advantageous in knitting where transfer is performed many times, but this embodiment can be applied not only to transfer but also to stitch shake-off.

[0021] FIG. 3 shows the allocation of three cam systems, namely cam systems S1, S2, and S3 for a course only with transfer, in a carriage provided with the cam systems S1, S2, and S3. FIG. 4 shows examples of the allocation of the cam systems S1, S2, and S3 for the course in FIG. 3, wherein the solid lines indicate an example in which the cam system S2 is preferentially used, and the broken lines indicate an example in which the cam system S1 is preferentially used. In the case of FIGS. 3 and 4, the stroke L is shorter than the knitting width W, a first portion in the knitting width is knitted using the cam system S1, and a last portion in the knitting width is knitted using the cam system S3. A middle portion in the knitting width is knitted using at least one of the cam systems S1, S2, and S3, and may be knitted using two or three cam systems among the cam systems S1, S2, and S3. A portion between the middle portion and the first portion in the knitting width is knitted using at least one of the cam systems S1 and S2, and a portion between the middle portion and the last portion in the knitting width is knitted using at least one of the cam systems S2 and S3. In this example, there are periods in which both the cam systems S1 and S2 are used and in which both the cam systems S2 and S3 are used.

[0022] FIG. 5 shows an example of knitting courses for a cable pattern, wherein the cable pattern is knitted by repeating courses C1 to C6. The carriage is provided with two cam systems. In the courses C1 to C3, two rows of stitches are knitted in each course, that is, six rows are knitted in total. In the course C4, stitches are transferred, and the rear needle bed is racked to the left before the course C5. Then, half the stitches that have been transferred are transferred back to the front needle bed. Then, the rear needle bed is racked to the right before the course C6, and the remaining half of the stitches that have been transferred are transferred back to the front needle bed.

[0023] In the course C4, unless the last portion in the knitting width is knitted using the preceding cam system for at least the width of one cam system, the stroke becomes longer. The reason for this is that, if the last portion in the knitting width is allocated to the preceding cam system only for a width shorter than the width of one cam system, the following cam system knits an allocated portion and makes the stroke longer to the left than in a conventional example. Note that the first portion in the knitting width may be knitted by either the preceding or following cam system. In this case, the stroke does not change regardless of the application of the embodiment, and the stroke is shortened when only the following cam system is allowed to knit the first portion in the knitting width.

[0024] In the courses C5 and C6, according to the embodiment, the knitting is started by the following cam system, and the knitting is ended by the preceding cam system. On the other hand, according to the conventional example, for example, the entire course C5 is knitted by the following cam system, and the entire course C6 is knitted by the preceding cam system. Accordingly, in this embodiment, the stroke is shortened by the width of one cam system in the courses C5 and C6. If the total strokes for six courses of the carriage are shortened by a width twice the width of the cam system, the knitting time is shortened by several percent.

[0025] FIG. 6 shows the lower limit of the knitting width by which the stroke is shortened according to the embodiment, wherein 1) shows the stroke according to the embodiment, and 2) shows the stroke according to the conventional example. In 1) of FIG. 6, the sum of the knitting width of the first portion knitted by the following cam system S1 and the knitting width of the last portion knitted by the preceding cam system S2 is equal to the width of one cam system. At that time, the embodiment and the conventional example have an equal stroke. Furthermore, in 1) of FIG. 6, the sum of the knitting width of the first portion and the knitting width of the last portion is equal to the knitting width W. If the sum of the knitting width of the first portion and the knitting width of the last portion is equal to the width of one cam system, in the embodiment, the allocation of the cam systems changes depending on the initial position of the carriage with respect to the knitting width. However, in either case, the carriage stroke L 1 is 2W, which is a width twice the width of the cam system. In the conventional example, when performing knitting for the knitting width W, the carriage has to travel for the stroke corresponding to knitting width W + width of one cam system, and the stroke in this case is 2W. Accordingly, if the knitting width W is equal to the width of one cam system, the embodiment and the conventional example have an equal carriage stroke.

[0026] FIG 7 shows a process relating to shortening of the stroke, which is performed by a knit design apparatus 10 in FIG. 8 or a flat knitting machine 30 in FIG. 9. In Step 1 of FIG. 7, knitting data is read for one course. In Step 2, it is determined whether or not to use a carrier in that course. If that course is a course that does not use a carrier, such as a course for performing transfer or shake-off, it is checked whether or not there is a cam system not allocated to the knitting (Step 3). Then, it is determined whether or not division of the knitting width is possible such that the sum of the knitting width of the first portion and the knitting width of the last portion in the travelling direction of the carriage is at least the width of one cam system, and such that the first portion and the last portion are knitted using different cam systems

(Step 4). If the division is not possible, all transfer operations in one course are performed by a single cam system as in a conventional example. If the division is possible, in Step 5, the cam systems are allocated such that the knitting is started by the following cam system and the knitting is ended by the preceding cam system according to the embodiment. A portion between the first portion and the last portion in the knitting is knitted by either one or both of the preceding cam system and the following cam system, and, if there is no next course (Step 6), the process is ended. Accordingly, the stroke is shortened. Note that, if the course is started from a position where the knitting may be started also by the preceding cam system, this embodiment may be or may not be applied.

[0027] FIG. 8 shows a knit design apparatus according to the embodiment, wherein 12 denotes a mouse but may denote another pointing device, 14 denotes a keyboard, 16 denotes, for example, a color printer, and 18 denotes, for example, a color monitor. 20 denotes a design assist unit that edits a knitted fabric design input by a user from the mouse 12, the keyboard 14, an input/output device 26, or the like and that provides an environment for facilitating the design operation. 22 denotes a data converter that converts the knitted fabric design into knitting data, and 24 denotes a stroke shortening unit that changes the knitting data for a course in which shortening of the stroke is possible, by performing the process in FIG. 7. The stroke shortening unit 24 includes course identifying means for identifying a course in which a yarn is not fed from the carrier to a needle on the needle beds and the knitting width is longer than the width of one cam system, by analyzing the knitting data, and allocating means for automatically allocating the cam systems such that, if the sum of the knitting width of the first portion and the knitting width of the last portion in the travelling direction of the carriage is at least the width of one cam system when the knitting width of the identified course is divided into at least two portions that are to be knitted using different cam systems, the first portion is knitted by a following cam system in the travelling direction of the carriage and the last portion is knitted by a preceding cam system in the travelling direction of the carriage. 26 denotes an input/output device that is used to input the knitted fabric design and output the knitting data. The printer 16 may be omitted. Note that the course in which a yarn is not fed from the carrier to a needle on the needle beds may be divided in advance by the user using a design apparatus or the like into at least two portions that are to be knitted using different cam systems. Alternatively, the stroke shortening unit 24 may be provided with setting means for dividing that course into at least two portions that are to be knitted using different cam systems, and setting the knitting width of the first portion and the knitting width of the last portion such that the sum of the knitting width of the first portion and the knitting width of the last portion in the travelling direction of the carriage is at least the width of one cam system.

[0028] In FIG. 9, 30 denotes a flat knitting machine according to the embodiment that includes, for example, a front needle bed 32 and a rear needle bed 34, but may include four needle beds configured by upper and lower needle beds on the front and rear sides. 36 denotes a carriage that includes, for example, two cam systems S1 and S2 on the front needle bed 32 and two cam systems S1' and S2' on the rear needle bed 34, and that is caused to travel in the longitudinal direction of the needle beds 32 and 34 by a motor 38. 40 denotes a controller that controls the flat knitting machine 30, receives the knitting data from the input/output device 42, and performs the process in FIG. 7 using an interpreter 44, thereby changing the knitting data for a course in which shortening of the stroke is possible. 46 denotes a carriage drive unit that drives the carriage 36 and the motor 38. The controller 40 controls conveyance of a carrier (not shown) and cancellation of the conveyance, the length of a yarn that is to be used, a mechanism for lowering the knitted fabric, the racking operation of the needle beds 32 and 34, and the like.

Reference Signs List

[0029]

2	Knitting cam
4	Needle selection portion
10	Knit design apparatus
12	Mouse
14	Keyboard
16	Printer
18	Monitor
20	Design assist unit
22	Data converter
24	Stroke shortening unit
26	Input/output device
30	Flat knitting machine
32	Front needle bed
34	Rear needle bed
36	Carriage
38	Motor
40	Controller
42	Input/output device
44	Interpreter
46	Carriage drive unit
S1, S2, S3	Cam system
W	Knitting width
L	Stroke
C1 to C5	Carriage course

Claims

1. A knitting method by a flat knitting machine (30) including a needle bed (32, 34), a carriage (36), a carrier, and a controller (40), in which the carriage (36) is provided with at least two cam systems (S1, S2,

S3) in a longitudinal direction of the needle bed (32, 34), and the cam systems (S1, S2, S3) perform knitting using a yarn from the carrier, **characterized by** the steps of:

for a course of the carriage (36) in which a yarn is not fed from the carrier to a needle on the needle bed (32, 34) and a knitting width is longer than a width of one cam system (S1, S2, S3),
dividing the knitting width into at least two portions that are to be knitted by different cam systems (S1, S2, S3), and setting a knitting width of a first portion and a knitting width of a last portion such that a sum of the knitting width of the first portion and the knitting width of the last portion in a travelling direction of the carriage (36) is at least the width of one cam system (S1, S2, S3); and
knitting the first portion by a following cam system in the travelling direction of the carriage (36), and knitting the last portion by a preceding cam system in the travelling direction of the carriage (36).

2. The knitting method by a flat knitting machine (30) according to claim 1, **characterized in that** the knitting width of the first portion includes a zone in which the following cam system operates a needle on the needle bed (32, 34) and a zone in which no cam system operates a needle on the needle bed (32, 34), and/or the knitting width of the last portion includes a zone in which the preceding cam system operates a needle on the needle bed (32, 34) and a zone in which no cam system operates a needle on the needle bed (32, 34).

3. The knitting method by a flat knitting machine (30) according to claim 1 or 2, **characterized in that**, when operating a needle on the needle bed (32, 34) for a knitting width of a portion between the first portion and the last portion, the preceding cam system and/or the following cam system operates the needle.

4. The knitting method by a flat knitting machine (30) according to any one of claims 1 to 3, **characterized in that** the course is a course for performing stitch transfer.

5. A knitting data editing apparatus for a flat knitting machine (30) including a needle bed (32, 34), a carriage (36), a carrier, and a controller (40), in which the carriage (36) is provided with at least two cam systems (S1, S2, S3) in a longitudinal direction of the needle bed (32, 34), and the cam systems (S1, S2, S3) perform knitting using a yarn from the carrier, **characterized by**:

course identifying means for identifying a course of the carriage (36) in which a yarn is not fed from the carrier to a needle on the needle bed (32, 34) and a knitting width is longer than a width of one cam system (S1, S2, S3), by analyzing knitting data; and
allocating means for automatically allocating the cam systems (S1, S2, S3) such that, in a case where a sum of a knitting width of a first portion and a knitting width of a last portion in a travelling direction of the carriage (36) is at least the width of one cam system (S1, S2, S3) when the knitting width of the course that has been identified by the course identifying means is divided into at least two portions that are to be knitted by different cam systems (S1, S2, S3), the first portion is knitted by a following cam system in the travelling direction of the carriage (36) and the last portion is knitted by a preceding cam system in the travelling direction of the carriage (36).

6. The knitting data editing apparatus according to claim 5, **characterized in that** the knitting data editing apparatus is included in the flat knitting machine (30) or a knit design apparatus (10).

FIG. 1

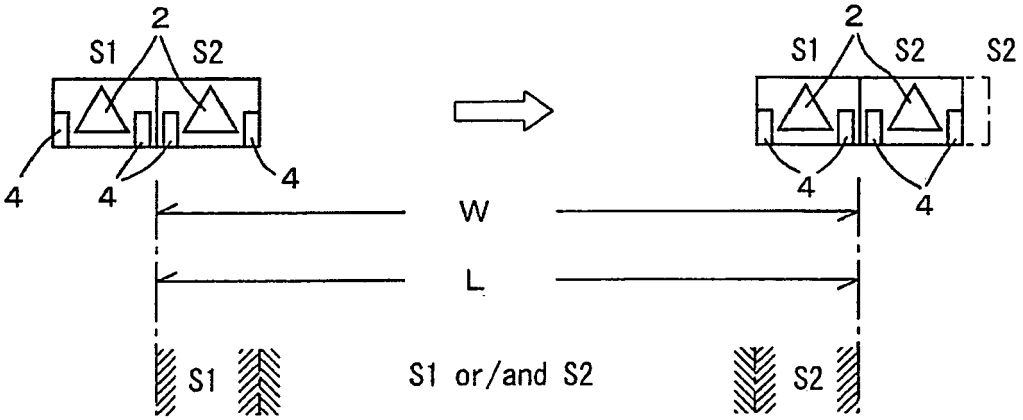


FIG. 2

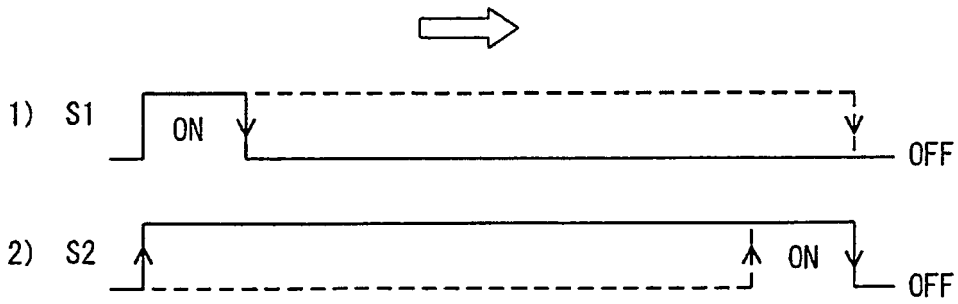


FIG. 3

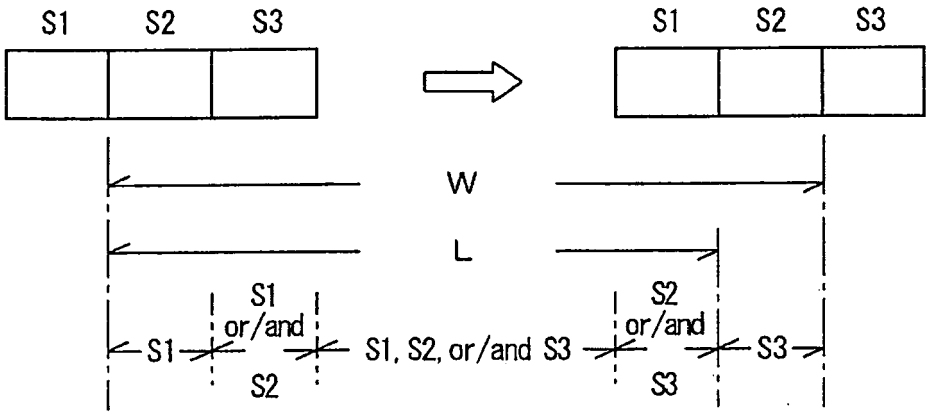

S1
S2
S3
S1
S2
S3
W
L
S1
or/and
S2
S1
S1, S2, or/and S3
S2
or/and
S3
S3

FIG. 4

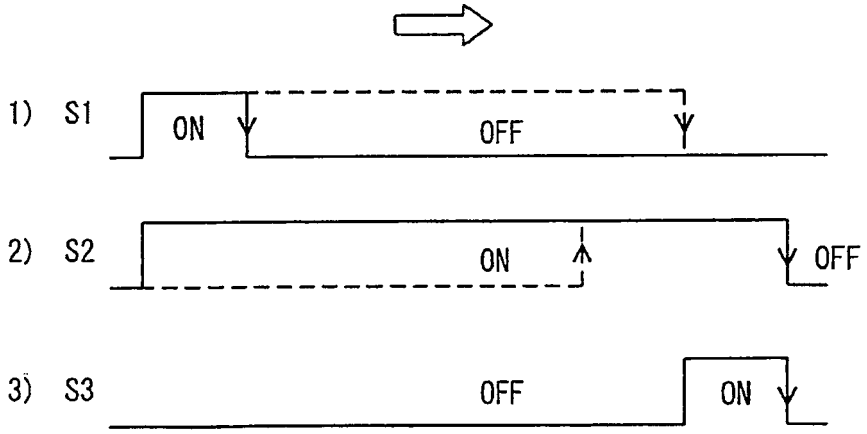

1) S1
ON
OFF
2) S2
ON
OFF
3) S3
OFF
ON

FIG. 5

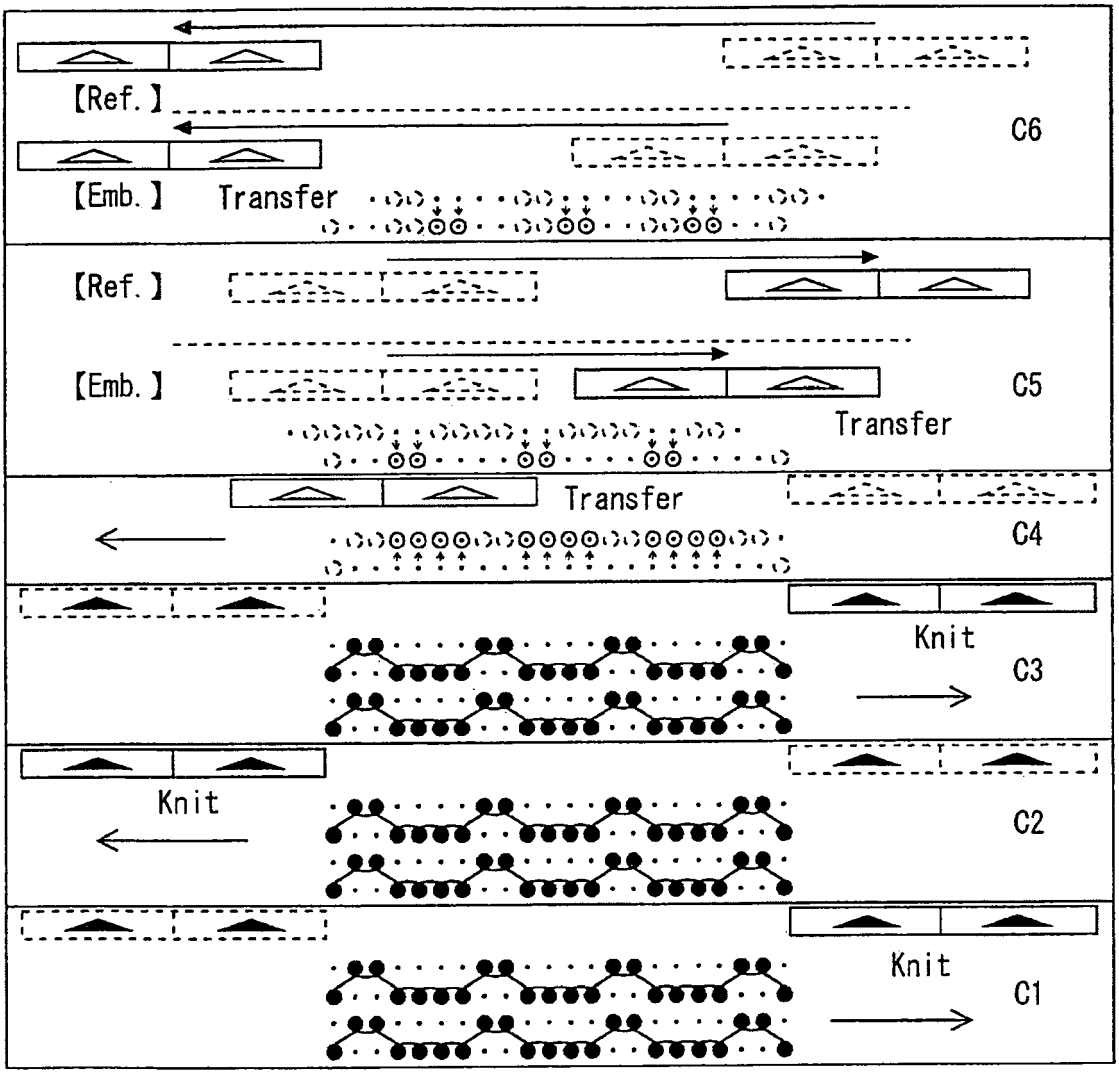

【Ref.】
【Emb.】
Transfer
C6
【Ref.】
【Emb.】
C5
Transfer
Transfer
C4
Knit
C3
Knit
C2
Knit
C1

FIG. 6

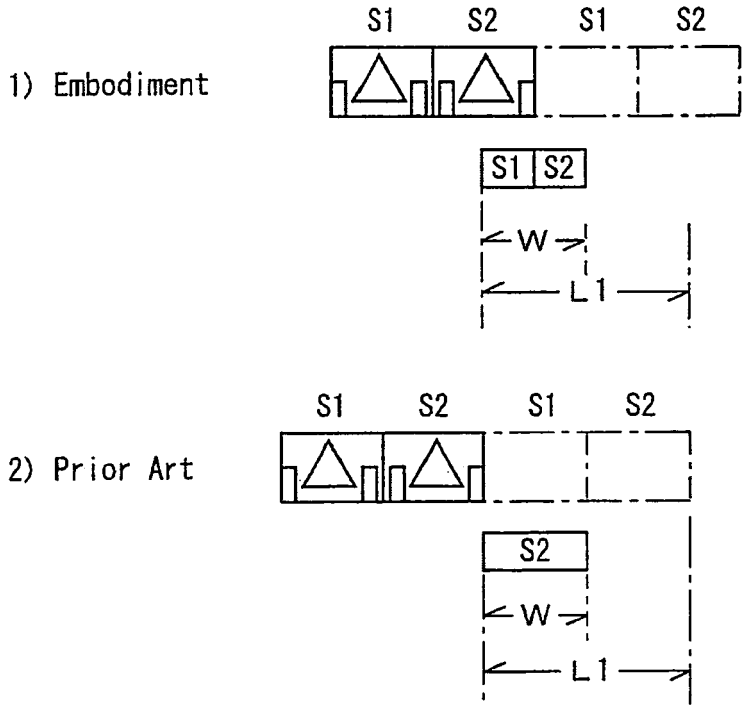


FIG. 7

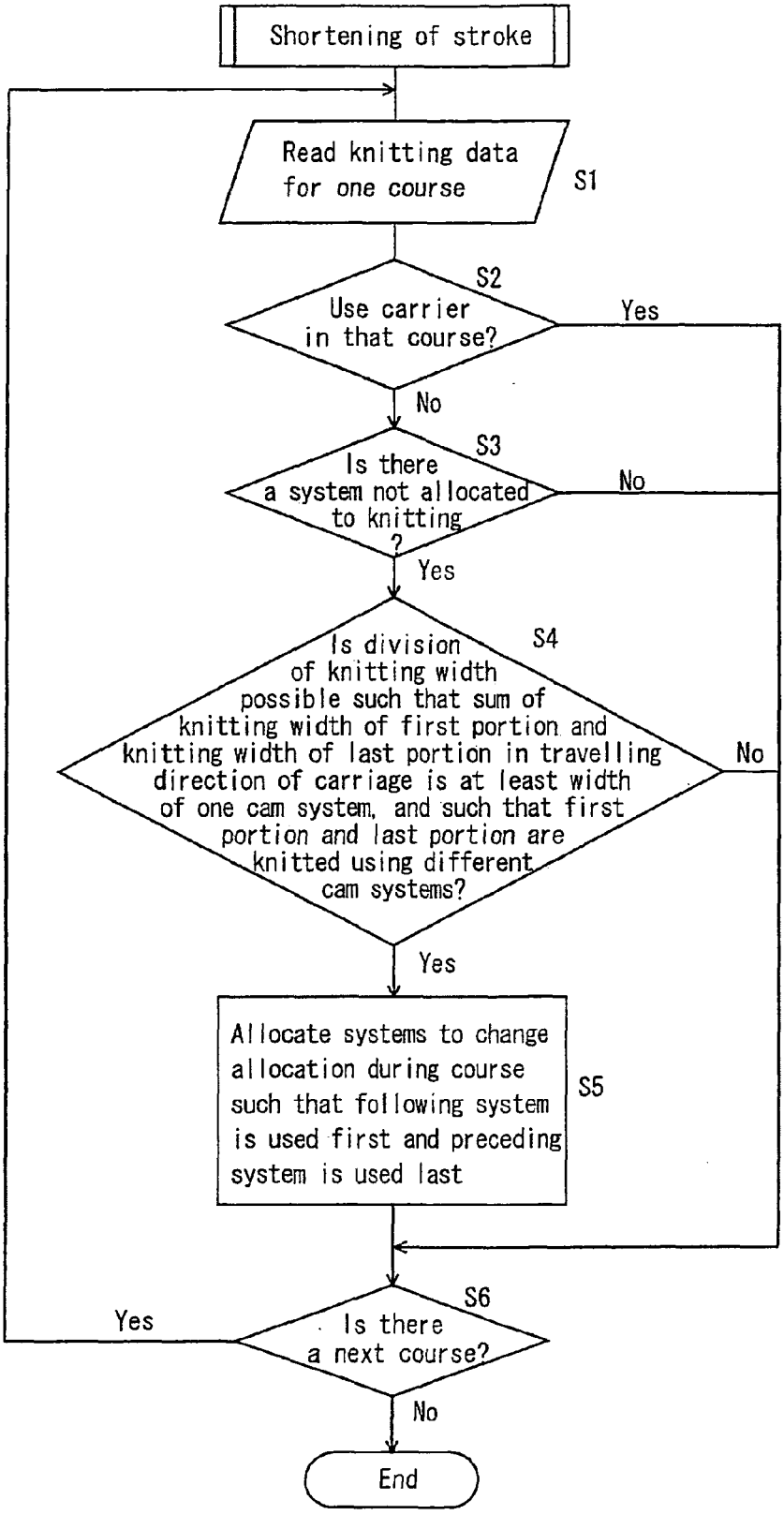

Shortening of stroke
Read knitting data for one course
S1
S2
Use carrier in that course?
Yes
No
S3
Is there a system not allocated to knitting ?
No
Yes
S4
Is division of knitting width possible such that sum of knitting width of first portion and knitting width of last portion in travelling direction of carriage is at least width of one cam system, and such that first portion and last portion are knitted using different cam systems?
No
Yes
Allocate systems to change allocation during course such that following system is used first and preceding system is used last
S5
S6
Is there a next course?
Yes
No
End

FIG. 8

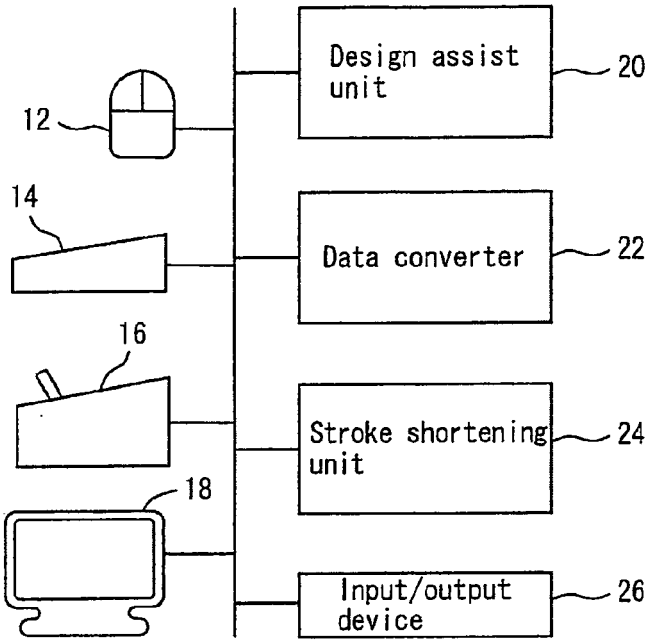

Design assist unit
20
12
14
Data converter
22
16
Stroke shortening unit
24
18
Input/output device
26
10

FIG. 9

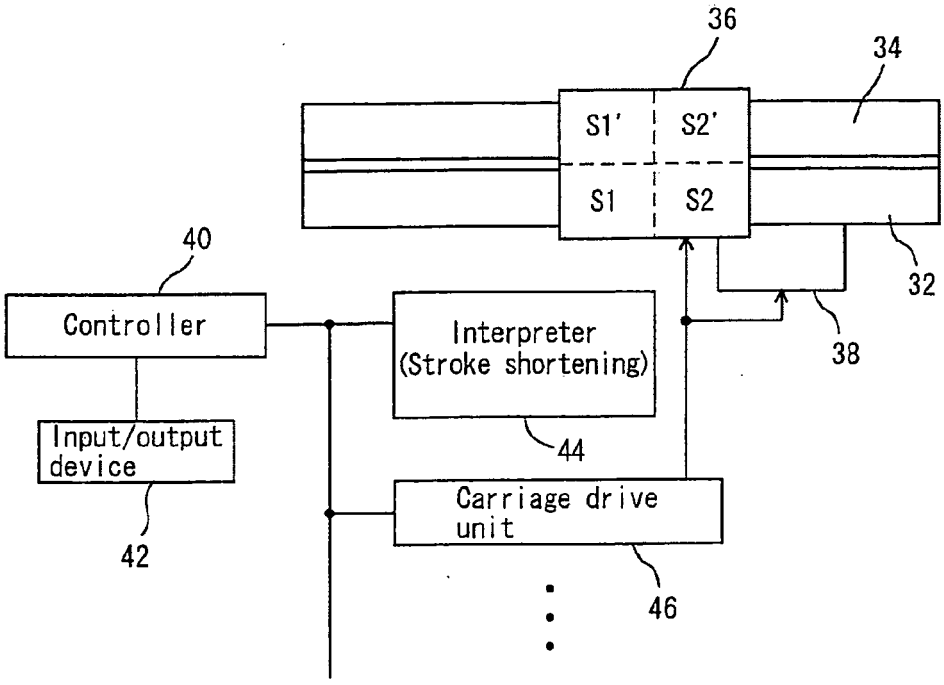
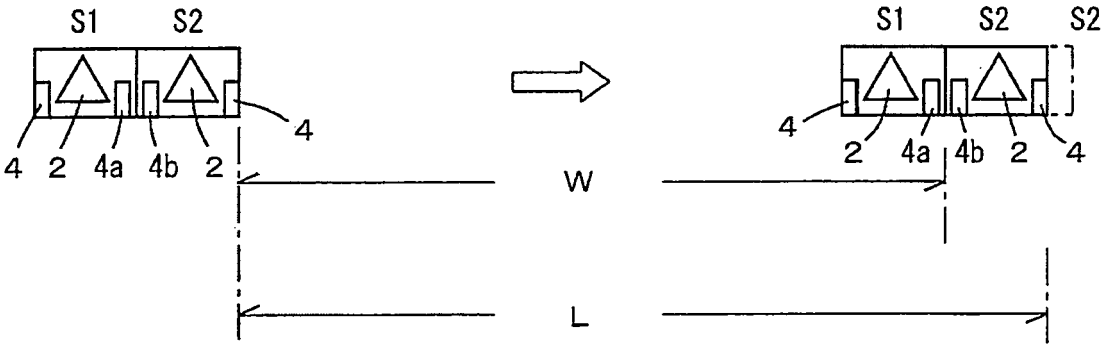

36
34
S1'
S2'
S1
S2
32
40
Controller
Interpreter (Stroke shortening)
38
Input/output device
44
Carriage drive unit
42
46
30

FIG. 10



Prior Art

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 00 6257

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,D	WO 2008/078415 A1 (SHIMA SEIKI MFG [JP]; MINAKATA KATSUJI [JP]) 3 July 2008 (2008-07-03) * abstract *	1-6	INV. D04B7/24 D04B15/66 D04B15/96
A	US 6 308 538 B1 (WOOD WILLIAM T [US] ET AL) 30 October 2001 (2001-10-30) * column 4, lines 13-33; figures 4,5 *	1-6	
A	US 4 774 819 A (GOLLER ERNST [DE] ET AL) 4 October 1988 (1988-10-04) * column 1, lines 6-18 * * column 1, lines 49-68 * * column 2, line 29 - column 3, line 16 *	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 October 2012	Wendl, Helen

CATEGORY OF CITED DOCUMENTS

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18-10-2012

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