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(54) **Method and apparatus for generating knitting data for flat knitting machine**

Verfahren und Vorrichtung zur Erzeugung von Strickdaten für eine Flachstrickmaschine

Procédé et appareil de génération de données de tricotage pour machine à tricoter rectiligne

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(73) Proprietor: **SHIMA SEIKI MFG. LTD.**
Wakayama-shi
Wakayama 641-0003 (JP)

(72) Inventor: **Mori, Atsushi**
Wakayama, 641-0003 (JP)

(74) Representative: **Wagner, Karl H.**
Wagner & Geyer
Gewürzmühlstrasse 5
80538 Munich (DE)

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Description

Technical Field

[0001] The present invention relates to the generation of knitting data for a flat knitting machine, and particularly relates to the determination of stop positions of carriers in knitting data while preventing interference between the carriers.

Background Art

[0002] A flat knitting machine includes, for example, a pair of elongated needle beds, wherein a knitted fabric is knitted by causing a carriage that travels back and forth on the needle beds to operate needles, and feeding a yarn from carriers to the needles. A plurality of carrier rails are arranged above the needle beds in parallel to the longitudinal direction of the needle beds. The carriers are also referred to as yarn feeders, each having a lower end as a yarn feeding port for feeding a yarn and an upper end supported by the carrier rail. The carriers are elastic such that they may be slightly bent in the front-and-rear direction of the flat knitting machine. The carriers are slidingly moved along the carrier rails when being conveyed by the carriage, and stopped when the conveyance is cancelled.

[0003] Since the yarn feeding ports of the carriers move directly above a gap between the needle beds, when the carriers pass each other, the yarn feeding ports are brought into contact with each other. At that time, the carriers are slightly bent such that the yarn feeding ports are allowed to pass each other. The carriage includes not only cams for operating the needles but also other constituent elements such as stitch pressers, and these constituent elements are positioned above the gap between the needle beds. Accordingly, when a plurality of carriers are stopped at the same position, the yarn feeding ports are brought into contact with these other constituent elements such as stitch pressers. Thus, processing is performed such that carriers are not stopped at the same position, that is, carriers are stopped at positions on the outer side of the knitting width by parameters called reset correction. It is possible to prevent a plurality of carriers from being stopped at the same position, by providing different reset correction values for the respective carriers. However, for this purpose, the reset correction values have to be manually input. Note that the reset correction values are part of the knitting data because they directly affect factors such as movement distance and operation of the carriers.

[0004] Patent Literature 1 (JP H5-93348A) discloses correction of a position at which the conveyance of carriers is cancelled, in consideration of the slippage amount of the carriers. Furthermore, Patent Literature 2 (JP 2011-106059A) describes arrangement of carrier rails and carriers with respect to needle beds. However, automatic generation of data indicating a carrier stop position is not known.

Citation List

Patent Literature

[0005]

[Patent Literature 1] JP H5-93348A
[Patent Literature 2] JP 2011-106059A

[0006] Prior art document DE 27 30 306 A1 discloses a method for knitting intarsia fabric on a flatbed knitting machine comprising separate yarn feeders for each portion of the intarsia fabric, and a carriage with two cam systems whereby the first, third, fifth etc. intarsia portions in a stitch row are knitted by the leading camp system and the second, fourth and sixth intarsia portion are knitted by the lagging cam system.

Summary of the Invention

Technical Problem

[0007] It is an object of the present invention to automatically generate knitting data including data indicating stop positions of carriers while preventing the carriers from interfering with each other.

Means for Solving Problem

[0008] This and other objects are solved by a method for automatically generating knitting data, having the features as set forth in claim 1. The object is also met by an apparatus for automatically generatin knitting data for a flat knitting machine as defined in claim 2. Preferred embodiments of the mentioned apparatus are stated in the subclaims 3 to 5.

[0009] The present invention is directed to a method for automatically generating knitting data for a flat knitting machine including at least a pair of front and rear needle beds, a carriage that operates needles on the needle beds, a plurality of carrier rails, and a plurality of carriers that are conveyed by the carriage along the respective carrier rails and feed at least a yarn to the needles on the needle beds, characterized by including:

a step of obtaining, for each carrier used for knitting, data indicating at least a course of the carriage using the carrier and a movement range of the carrier in one part of a garment;
a step of determining, for each carrier, a stop position of the carrier based on the data; and
a step of, when it is detected that the stop positions of the carriers are to overlap each other in a direction that is at a right angle to a longitudinal direction of the needle beds in a horizontal plane, changing the stop positions such that the stop positions do not

overlap each other.

[0010] Furthermore, the present invention is directed to an apparatus for automatically generating knitting data for a flat knitting machine including at least a pair of front and rear needle beds, a carriage that operates needles on the needle beds, a plurality of carrier rails, and a plurality of carriers that are conveyed by the carriage along the respective carrier rails and feed at least a yarn to the needles on the needle beds, characterized by including:

an analysis means for obtaining, for each carrier used for knitting, data indicating at least a course of the carriage using the carrier and a movement range of the carrier in one part of a garment; and
a stop position determination means for determining, for each carrier, a stop position of the carrier based on the data, and, when it is detected that the stop positions of the carriers are to overlap each other in a direction that is at a right angle to a longitudinal direction of the needle beds in a horizontal plane, changing the stop positions such that the stop positions do not overlap each other.

[0011] With this configuration, based on data indicating the usage frequency and the movement ranges of the carriers, the stop positions of the carriers are automatically determined. Furthermore, the stop positions of the carriers are prevented from overlapping each other in a direction that is at a right angle to the longitudinal direction of the needle beds in a horizontal plane, and, thus, the carriers are prevented from interfering with each other. The stop positions of the carriers may be positions directly above the edge of the knitting width, as well as positions that are remote to the position directly above the edge of the knitting width obtained by the minimum value in FIG. 4. The analysis means corresponds to, for example, the usage frequency extractor or the block extractor in FIG. 2, and the stop position determination means corresponds to, for example, the reset correction value allocation unit in FIG. 2. In this specification, the description regarding the knitting data generation method is applicable as it concerns the knitting data generation apparatus, and the description regarding the knitting data generation apparatus is applicable as it concerns the knitting data generation method.

[0012] It is preferable that the stop position determination means determines the stop positions such that a carrier having a high usage frequency is stopped at a position close to an edge of a knitting width and a carrier having a low usage frequency is stopped at a position away from the edge of the knitting width. With this configuration, since carriers having a high usage frequency are stopped at positions close to the edge of the knitting width, the distance in which the carriage moves the carriers is short. Accordingly, one part is knitted in a shorter period of time. Note that the usage frequency level may be obtained with an appropriate level of precision, and, for example, if the level of resolution is set to "three times", the numbers of times used of 51 and 49 are classified into the same usage frequency. Regarding the stop positions of carriers, what matters are values of carriers having high usage frequencies, and the stop positions of carriers having, for example, the two lowest usage frequencies do not have to follow the order of usage frequency.

[0013] It is preferable that the stop position determination means determines the stop positions based on the usage frequency in each part. With this configuration, the stop positions are easily determined.

[0014] Furthermore, it is preferable that the analysis means divides one part into a plurality of blocks in a wale direction, and in that the stop position determination means determines the stop positions based on the usage frequency in each block. With this configuration, for example, when carriers that are to be used are changed along the wale direction, the stop positions are determined such that the total distance in which the carriers are conveyed is short.

Brief Description of the Drawings

[0015]

FIG. 1 is a plan view of needle beds and carrier rails.
FIG. 2 is a block diagram of a knitting data generation apparatus according to an embodiment.
FIG. 3 is a flowchart showing an algorithm for determining a carrier stop value according to the embodiment.
FIG. 4 is a diagram showing a relationship between the knitting width of one part, the minimum value, and the reset correction value.
FIG. 5 is a diagram schematically showing the stop positions of carriers a, b, and c with respect to one part.
FIG. 6 is a flowchart showing an algorithm for determining a carrier stop value according to a modified example.
FIG. 7 is a diagram schematically showing the stop positions of the carriers a, b, and c with respect to one part according to the modified example.
FIG. 8 is a diagram schematically showing the stop positions of carriers a to d with respect to one part in intarsia knitting according to the modified example.

Description of Embodiment

[0016] Hereinafter, an optimal embodiment for carrying out the present invention will be described.

Embodiment

[0017] FIGS. 1 to 8 show an embodiment and its modified example. FIG. 1 schematically shows carrier rails above needle beds, wherein reference numeral 2 de-

notes a front bed, 4 denotes a rear bed, and 6 denotes a gap between the beds. A plurality of carrier rails 8 to 11 are present above the beds 2 and 4, and carriers 12 are slidingly moved along the carrier rails 8 to 11 when being conveyed by a carriage (not shown). In this drawing, it is assumed that shaped knitting is performed, wherein 14 reference numeral denotes a knitting width of a front body or the like, 15 denotes a knitting width of a left sleeve or the like, and 16 denotes a knitting width of a right sleeve or the like. One garment is configured by a plurality of parts, and the knitting width of each part may be changed during knitting. A garment may have a fixed knitting width, and, furthermore, one garment may be configured by one part as in the case of non-sewing knitting. In this specification below, in a horizontal plane, a direction that is parallel to the longitudinal direction of the beds 2 and 4 is referred to as a left-and-right direction, and a direction that is orthogonal to the longitudinal direction of the beds 2 and 4 is referred to as a front-and-rear direction.

[0018] Reference numeral 20 denotes a knitting data generation apparatus, 21 denotes a user interface that is configured by an input means such as a mouse, a track ball, a digitizer, and a keyboard, together with a color monitor, and 22 denotes a network interface that exchanges data and programs with a network. Furthermore, reference numeral 23 denotes a disc driver that exchanges data, programs, and the like with a disc (not shown), 24 denotes a memory that stores various type of data, in particular, knitting data, and 25 denotes a program memory that stores programs for the knitting data generation apparatus 20.

[0019] A converter 26 converts knitted fabric design data input from the user interface 21, the network interface 22, the disc driver 23, or the like, to knitting data. In this conversion, data indicating stop positions of the carriers is not generated, or is allocated to an appropriate default value. A usage frequency extractor 27 extracts a usage frequency and a movement range in each course of each carrier used in knitting data. A block extractor 28 is used to execute the algorithm in FIG. 6, and divides one part into a plurality of blocks based on which carrier to use. In the case where the algorithm in FIG. 3 is executed, the block extractor 28 is not necessary. One part is divided into blocks along the wale direction of the part, the block length along the wale direction is provided with a minimum value, and a block having a length less than the minimum value is merged into either its upper or lower block.

[0020] A reset correction value allocation unit 29 allocates reset correction values to the carriers. The reset correction value may be fixed throughout knitting of one part, or may be changed during knitting of one part. An interference check unit 30 checks interference between the carriers, the interference being an event in which a plurality of carriers are stopped at positions that overlap each other in the front-and-rear direction of the flat knitting machine. When carriers interfere with each other, that is, when a plurality of carriers have been stopped in an overlapped manner in the front-and-rear direction, if the carriage (not shown) moves so as to cross the carriers, the stitch pressers and the like on the carriage may be damaged by interference with the carriers.

[0021] The reset correction value allocation unit 29 initially allocates, for example, a reset correction value of 0 to each carrier. Then, when the interference check unit 30 detects that the carriers are to interfere with each other, the interference is eliminated, for example, by increasing a reset correction value for a carrier having a low usage frequency so as to avoid the interference. Note that the knitting data generation apparatus 20 may be disposed inside a flat knitting machine, or may be disposed inside a design apparatus that generates design data of a garment or the like and converts it to knitting data.

[0022] FIGS. 3 to 5 show a method for determining carrier stop positions. When a design of one part is determined and then converted to knitting data, the knitting width, the stitch types, the number of courses, and which carrier is to be moved in which course over which range, and other types of data are determined. Thus, in Step 1, for each carrier, courses using the carrier and a movement range in each course in one part are obtained. This processing is performed at least on carriers that are to be actually used. The usage frequency of the carriers in one part is determined for each carrier, and the stop position of each carrier is set to a minimum value. In other words, the reset correction value for each carrier is set at 0 (Step 2). Carriers that are not to be used are, for example, withdrawn to an end of the needle beds or the like.

[0023] FIG. 4 illustrates the reset correction values. The carriers are moved back and forth along the left and the right of the knitting width, and the carrier stop position is a position that is away from an edge of the knitting width by a distance of a minimum value corresponding to approximately zero to three needles. For example, the minimum value is 0 in the case of intarsia knitting, and is a value corresponding to two or three needles in the case of other types of knitting. The carrier movement range in the knitting data is obtained by adding the knitting width and the minimum values. The reset correction value is 0 at a position shifted from an edge of the knitting width by the minimum value to the outer side, which corresponds to a minimum reset correction value. The reset correction value increases toward the outer side of the knitting width. Furthermore, the reset correction value is expressed by, for example, a width of one yarn feeding port. In the reset correction value, "reset" means cancellation of the conveyance of the carrier by the carriage, and "correction value" means the amount of shift from the minimum value. When the reset correction value is minimum, the carrier is stopped at a position shifted from an edge of the knitting width by the minimum value to the outer side, and, as the reset correction value increases, the carrier is stopped at a position shifted further away

from the edge of the knitting width to the outer side.

[0024] Steps 4 to 7 are performed on the carriers, for example, in descending order of the usage frequency (Steps 3 to 7). In Step 4, the position of a carrier when it is stopped in each course is checked, and it is detected whether or not there is interference with any other carrier. If there is interference with any other carrier, the interference is eliminated by shifting the stop position to the outer sides, that is, by increasing the reset correction value (Step 5). If the stop positions of the carriers that are to cause interference are changed, interference with other carriers may occur as a chain reaction, and, thus, the stop positions of the carriers are changed until elimination of interference is completed. After Steps 4 and 5 are performed on all the courses, for example, the same processing is performed on a carrier having the next highest usage frequency. The algorithm in FIG. 3 ends if the processing is completed for all the carriers that are to be used.

[0025] FIG. 5 shows reset correction values (dashed dotted lines) and actual stop positions (dashed double dotted lines) of carriers a, b, and c during knitting of one part 32, wherein the reference symbols a, b, and c in the part 32 each indicate a carrier that is to be used. Furthermore, in this specification, a course direction refers to a direction that is parallel to a direction in which a carriage travels back and forth, and a wale direction is a direction that is at a right angle to the course direction. In the part 32, the usage frequency of the carriers is in order of c > a > b, so that a smallest reset correction value is allocated to the carrier c, a second smallest reset correction value is allocated to the carrier a, and a largest reset correction value is allocated to the carrier b. If the knitting width of the part 32 does not increase or decrease, there is no interference between the carriers when the reset correction values are determined as above. The dashed dotted lines in FIG. 5 indicate the carrier stop positions following the reset correction values.

[0026] If the knitting width of the part 32 increases or decreases, the carrier stop positions may be the same even when the reset correction values are different from each other. For example, in the block using the carrier c, the knitting width increases to the right side, but the carriers a and b are not used and are kept stationary in this block, and, thus, the carrier c interferes with the carriers a and b. Thus, the stop positions of the carriers a and b are automatically changed in Step 5 in FIG. 3 to positions as indicated by the dashed double dotted lines in FIG. 5, or manually changed. In the last block using the carrier a, the knitting width gradually decreases, and the carrier a interferes with the carrier c, and, thus, the stop position of the carrier c is changed, for example, to a position as indicated by the dashed double dotted line in FIG. 5. Note that, although FIG. 5 shows a case in which the carrier stop positions are shifted from the trajectories indicated by the dashed dotted lines to the trajectories indicated by the dashed double dotted lines in one pass of the carriage, the carrier stop positions may be gradually shifted between courses to avoid interference. Furthermore, it is sufficient that the carrier stop positions are shifted before a course where interference occurs. When it is assumed that the reset correction values are variables that are allowed to change during knitting of one part, the reset correction values may be determined such that the trajectories are as indicated by the dashed double dotted lines on the right side in FIG. 5.

[0027] According to the above-described processing, it is possible to:

- automatically generate data indicating the stop positions of the carriers a, b, and c;
- shorten the carrier conveyance distance, thereby shortening the carriage travelling distance, and improving the productivity; and
- eliminate interference between the carriers.

[0028] FIGS. 6 to 8 show a modified example that is the same as the embodiment in FIGS. 1 to 5 unless otherwise specified. First, Step 1 in FIG. 3 is performed, and the procedure advances to Step 11 where one part is divided into a plurality of blocks along the wale direction based on which carrier to use. At that time, it is preferable that a small block having a number of courses of a predetermined value or less is prevented from being formed, by setting a minimum value for the block length along the wale direction, for example. Furthermore, in Step 11, the usage frequency of the carriers is obtained for each block. The following process is performed in each block, and, in Step 12, the stop position of each carrier is set to a minimum value. Then, interference in the block is eliminated, for example, as in Steps 4 to 7 in FIG. 3 (Step 13).

[0029] FIG. 7 shows reset correction values for one part 33 as dashed dotted lines, wherein X marks indicate switching of the reset correction values. In the part 33, the small block shown at the lowermost position using the carrier a and the following small block using the carriers a and b are merged into one block, and, thus, for example, four blocks are formed in total. Then, the reset correction values are switched for the unit of each block. In the first block, the carrier a is mainly used, and the carrier b is also used, so that the reset correction value for the carrier a is set at 0, which is the minimum value, the reset correction value for the carrier b is set at 1, and the reset correction value for the carrier c is set at 2. In the next block using the carrier b, the carrier a is not used, so that, for example, the reset correction values are switched between the carriers a and b. In a similar manner, in the next block using the carrier c, the carrier b is not used, so that the reset correction values are switched between the carriers b and c. In the last block using the carrier a, the carrier c is not used, so that the reset correction values are switched between the carriers c and a. Furthermore, in the block using the carrier b and the block using the carrier c, interference occurs, for example, between the carrier a whose stop position is fixed because it is not used, and the carriers b and c whose

stop positions are shifted to the right side as the knitting width increases. Thus, as in FIG. 5, interference is avoided by shifting the stop positions of the carriers that are to cause interference to a side away from the knitting width.

[0030] FIG. 8 shows reset correction values in intarsia knitting according to the modified example, wherein carriers for intarsia knitting are allowed to be stopped at positions directly above an edge of the knitting width and directly above a yarn change point such that a yarn is oriented downward in the vertical direction. In this case, the area knitted by one carrier is taken as one knitting width, and one part 34 is processed as having two knitting widths in the course direction. Since the minimum value is 0, the stop positions with a reset correction value of 0 match the boundaries between both edges of the part 34 and the areas. The part 34 is divided into two upper and lower blocks. In the first block, the carriers a and b are used, so that small reset correction values are allocated to the carriers a and b. In the next block, the carriers c and d are used, so that small reset correction values are allocated to the carriers c and d. If the fact that the block using the carriers a and b is larger than the block using the carriers c and d is focused, and the reset correction values for the lower block are taken as being effective also for the upper block, this processing is the same as that in the embodiment in FIGS. 1 to 5.

[0031] According to the embodiment, the following effects are obtained, that is, it is possible to:

(1) automatically generate data indicating the stop positions of the carriers;
(2) eliminate interference between the carriers; and
(3) determine the reset correction value according to the carrier usage frequency, thereby shortening the carriage travelling distance, and reducing the time necessary to perform knitting.

List of Reference Numerals

[0032]

2	Front bed
4	Rear bed
6	Gap
8 to 11	Carrier rails
12	Carrier
14 to 16	Knitting width
20	Knitting data generation apparatus
21	User interface
22	Network interface
23	Disc driver
24	Memory
25	Program memory
26	Converter
27	Usage frequency extractor
28	Block extractor
29	Reset correction value allocation unit
30	Interference check unit
32 to 34	Part

Claims

1. A method for automatically generating knitting data for a flat knitting machine including at least a front and rear needle bed (2, 4), a carriage that operates needles on the needle beds (2, 4), a plurality of carrier rails (8-11), and a plurality of carriers (12) that are conveyed by the carriage along the respective carrier rails (8-11) and feed at least a yarn to the needles on the needle beds (2, 4), comprising:

   a step of obtaining, for each carrier (12) used for knitting, data indicating at least courses in which the carrier (12) is used and a movement range of the carrier (12) in each course in one part (32-34) of a garment;
   a step of determining, for each carrier (12), a stop position of the carrier (12) based on the data; **characterized by**
   a step of, when it is detected that the stop positions of the carriers (12), initially set to a position that is away from an edge of a knitted width (14, 15, 16) by a distance of a minimum value, are to overlap each other in a direction that is at a right angle to a longitudinal direction of the needle beds (2, 4) in a horizontal plane, changing the stop positions such that the stop positions do not overlap each other, wherein

      a) for one of the carriers (12) to be used, the stop position of the one of the carriers (12) is checked in each course to detect whether there is interference with another carrier (12) and
      b) if an interference is detected, the stop position of said another carrier (12) is shifted further to the outer side of the knitted width (14, 15, 16) and
      c) the steps a) and b) are repeated for the other carriers (12) one carrier (12) by one carrier (12).

2. An apparatus (20) for automatically generating knitting data for a flat knitting machine including at least a front and rear needle bed (2, 4), a carriage that operates needles on the needle beds (2, 4), a plurality of carrier rails (8-11), and a plurality of carriers (12) that are conveyed by the carriage along the respective carrier rails (8-11) and feed at least a yarn to the needles on the needle beds (2, 4), further comprising:

   an analysis means (27, 28) for obtaining, for each carrier (12) used for knitting, data indicat-

ing at least courses in which the carrier (12) is used, and a movement range of the carrier (12) in each course in one part (32-34) of a garment; and

a stop position determination means (29) for determining, for each carrier (12), a stop position of the carrier (12) based on the data, **characterized in that**, when it is detected that the stop positions of the carriers (12), initially set to a position that is away from an edge of a knitted width (14, 15, 16) by a distance of a minimum value, are to overlap each other in a direction that is at a right angle to a longitudinal direction of the needle beds (2, 4) in a horizontal plane, changing the stop positions such that the stop positions do not overlap each other., wherein

the stop position determination means (29) is designed for

a) checking for one of the carriers (12) to be used, the stop position of the one carrier (12) in each course to detect whether there is an interference with another carrier (12),

b) if an interference is detected, shifting the stop position of said another carrier (12) further to the outer side of the knitted width (14-16); and

c) repeating the steps a) and b) for the other carriers (12) one carrier (12) by one carrier (12)

3. The apparatus (20) for generating knitting data for a flat knitting machine according to claim 2, **characterized in that** the stop position determination means (29) determines the stop positions such that a carrier (12) having a high usage frequency is stopped at a position close to an edge of a knitting width (14-16) and a carrier (12) having a low usage frequency is stopped at a position away from the edge of the knitting width (14-16).

4. The apparatus (20) for generating knitting data for a flat knitting machine according to claim 3, **characterized in that** the stop position determination means (29) determines the stop positions based on the usage frequency in each part (32-34) of the garment.

5. The apparatus (20) for generating knitting data for a flat knitting machine according to claim 3, **characterized in that** the analysis means (28) divides one part (32-34) of the garment into a plurality of blocks in a wale direction, and **in that** the stop position determination means (29) determines the stop positions based on the usage frequency in each block.

Patentansprüche

1. Verfahren zum automatischen Generieren von Strickdaten für eine Flachstrickmaschine mit wenigstens einem vorderen und einem hinteren Nadelbett (2, 4), einem Schlitten, der Nadeln an den Nadelbetten (2, 4) betätigt, einer Vielzahl von Trägerschienen (8-11) und einer Vielzahl von Trägern (12), die durch den Schlitten entlang der entsprechenden Trägerschienen (8-11) transportiert werden und wenigstens einen Faden zu den Nadeln an den Nadelbetten (2, 4) zuführen, umfassend:

einen Schritt zum Erhalten, für jeden für das Stricken verwendeten Träger (12), von Daten, die wenigstens Maschenreihen, in denen der Träger (12) verwendet wird, und einen Bewegungsbereich des Trägers (12) in jeder Maschenreihe in einem Teil (32-34) eines Kleidungsstücks angeben, und

einen Schritt zum Bestimmen, für jeden Träger (12), einer Stoppposition des Trägers (12) basierend auf den Daten,

gekennzeichnet durch:

einen Schritt, wenn erfasst wird, dass die Stopppositionen der Träger (12), die zu Beginn auf eine mit einer Distanz eines Mindestwerts von einem Rand einer Strickbreite (14, 15, 16) entfernte Position gesetzt sind, einander in einer Richtung mit einem rechten Winkel zu einer Längsrichtung der Nadelbetten (2, 4) in einer horizontalen Ebene überlappen würden, zum Ändern der Stopppositionen derart, dass die Stoppposition einander nicht überlappen,

wobei:

a) für einen der zu verwendenden Träger (12) die Stoppposition des einen der Träger (12) in jeder Maschenreihe geprüft wird, um zu erfassen, ob eine Behinderung mit einem anderen Träger (12) gegeben ist,

b) wenn eine Behinderung erfasst wird, die Stoppposition des anderen Trägers (12) weiter nach außen in der Strickbreite (14, 15, 16) verschoben wird, und

c) die Schritte a) und b) für die anderen Träger (12) nacheinander jeweils Träger (12) für Träger (12) wiederholt werden.

2. Vorrichtung (20) zum automatischen Generieren von Strickdaten für eine Flachstrickmaschine mit wenigstens einem vorderen und einem hinteren Nadelbett (2, 4), einem Schlitten, der Nadeln an den Nadelbetten (2, 4) betätigt, einer Vielzahl von Träger-

schienen (8-11) und einer Vielzahl von Trägern (12), die durch den Schlitten entlang der entsprechenden Trägerschienen (8-11) transportiert werden und wenigstens einen Faden zu den Nadeln an den Nadelbetten (2, 4) zuführen, umfassend:

eine Analyseeinrichtung (27, 28) zum Erhalten, für jeden für das Stricken verwendeten Träger (12), von Daten, die wenigstens die Maschenreihen, in denen der Träger (12) verwendet wird, und einen Bewegungsbereich des Trägers (12) in jeder Maschenreihe in einem Teil (32-34) eines Kleidungsstücks angeben, und
eine Stopppositions-Bestimmungseinrichtung (29) zum Bestimmen, für jeden Träger (12), einer Stoppposition des Trägers (12) basierend auf den Daten,
dadurch gekennzeichnet, dass:

wenn erfasst wird, dass die Stopppositionen der Träger (12), die zu Beginn auf eine mit einer Distanz eines Mindestwerts von einem Rand einer Strickbreite (14, 15, 16) entfernte Position gesetzt sind, einander in einer Richtung mit einem rechten Winkel zu einer Längsrichtung der Nadelbetten (2, 4) in einer horizontalen Ebene überlappen würden, die Stopppositionen derart geändert werden, dass die Stopppositionen einander nicht überlappen,
wobei die Stopppositions-Bestimmungseinrichtung (29) ausgebildet ist zum:

a) Prüfen, für jeden der zu verwendenden Träger (12), der Stoppposition des einen der Trägers (12) in jeder Maschenreihe, um zu erfassen, ob eine Behinderung mit einem anderen Träger (12) gegeben ist,
b) wenn eine Behinderung erfasst wird, Verschieben der Stoppposition des anderen Trägers (12) weiter nach außen in der Strickbreite (14-16), und
c) Wiederholen der Schritte a) und b) für die anderen Träger (12) jeweils Träger (12) für Träger (12).

3. Vorrichtung (20) zum Generieren von Strickdaten für eine Flachstrickmaschine nach Anspruch 2, **dadurch gekennzeichnet, dass** die Stopppositions-Bestimmungseinrichtung (29) die Stopppositionen derart bestimmt, dass ein Träger (12) mit einer hohen Nutzungsfrequenz an einer Position nahe an einem Rand einer Strickbreite (14-16) gestoppt wird, und ein Träger (12) mit einer niedrigen Nutzungsfrequenz an einer von dem Rand der Strickbreite (14-16) entfernten Position gestoppt wird.

4. Vorrichtung (20) zum Generieren von Strickdaten für eine Flachstrickmaschine nach Anspruch 3, **dadurch gekennzeichnet, dass** die Stopppositions-Bestimmungseinrichtung (29) die Stopppositionen basierend auf der Nutzungsfrequenz in jedem Teil (32-34) des Kleidungsstücks bestimmt.

5. Vorrichtung (20) zum Generieren von Strickdaten für eine Flachstrickmaschine nach Anspruch 3, **dadurch gekennzeichnet, dass** die Analyseeinrichtung (28) einen Teil (32-34) des Kleidungsstücks in eine Vielzahl von Blöcken in einer Maschenstäbchenrichtung teilt, und dass die Stopppositions-Bestimmungseinrichtung (29) die Stopppositionen basierend auf der Nutzungsfrequenz in jedem Block bestimmt.

Revendications

1. Procédé pour générer automatiquement des données de tricotage pour une machine à tricoter à plat comprenant au moins une fonture avant et une fonture arrière (2, 4), un chariot qui actionne des aiguilles sur les fontures (2, 4), une pluralité de rails de porteurs (8-11), et une pluralité de porteurs (12) qui sont transportés par le chariot le long des rails de porteurs (8-11) respectifs et fournissent au moins un fil aux aiguilles sur les fontures (2, 4), comprenant :

une étape consistant à obtenir, pour chaque porteur (12) utilisé pour le tricotage, des données indiquant au moins des courses dans lesquelles le porteur (12) est utilisé et une plage de mouvement du porteur (12) dans chaque course dans une partie (32-34) d'un vêtement ;
une étape consistant à déterminer, pour chaque porteur (12), une position d'arrêt du porteur (12) sur la base des données ; **caractérisé par**
une étape consistant à, lorsqu'il est détecté que les positions d'arrêt des porteurs (12), initialement réglées à une position qui est éloignée d'un bord d'une largeur tricotée (14, 15, 16) d'une distance d'une valeur minimale, vont se chevaucher entre elles dans une direction qui est à l'angle droit par rapport à une direction longitudinale des fontures (2, 4) dans un plan horizontal, changer les positions d'arrêt de telle sorte que les positions d'arrêt ne se chevauchent pas entre elles, dans laquelle

a) pour l'un des porteurs (12) à utiliser, la position d'arrêt dudit un des porteurs (12) est vérifiée dans chaque course pour détecter s'il y a une interférence avec un autre porteur (12), et
b) si une interférence est détectée, la posi-

tion d'arrêt de l'autre porteur (12) est décalée davantage vers le côté extérieur de la largeur tricotée (14, 15, 16), et
c) les étapes a) et b) sont répétés pour les autres porteurs (12), porteur (12) par porteur (12).

2. Dispositif (20) pour générer automatiquement des données de tricotage pour une machine à tricoter à plat comprenant au moins une fonture avant et une fonture arrière (2, 4), un chariot qui actionne des aiguilles sur les fontures (2, 4), une pluralité de rails de porteurs (8-11), et une pluralité de porteurs (12) qui sont transportés par le chariot le long des rails de porteurs (8-11) respectifs et fournissent au moins un fil aux aiguilles sur les fontures (2, 4), comprenant en outre :

des moyens d'analyse (27, 28) pour obtenir, pour chaque porteur (12) utilisé pour le tricotage, des données indiquant au moins des courses dans lesquelles le porteur (12) est utilisé, et une plage de mouvement du porteur (12) dans chaque course dans une partie (32-34) d'un vêtement ; et
des moyens de détermination de position d'arrêt (29) pour déterminer pour chaque porteur (12), une position d'arrêt du porteur (12) sur la base des données, **caractérisés en ce que**,
lorsqu'il est détecté que les positions d'arrêt des porteurs (12), initialement réglées à une position qui est éloignée d'un bord d'une largeur tricotée (14, 15, 16) d'une distance d'une valeur minimale, vont se chevaucher entre elles dans une direction qui est à angle droit par rapport à une direction longitudinale des fontures (2, 4) dans un plan horizontal, changer les positions d'arrêt de telle sorte que les positions d'arrêt ne se chevauchent pas, les moyens de détermination de position d'arrêt (29) étant conçus pour :

a) vérifier pour l'un des porteurs (12) à utiliser, la position d'arrêt dudit porteur (12) dans chaque course pour détecter s'il y a une interférence avec un autre porteur (12),
b) si une interférence est détectée, décaler la position d'arrêt de l'autre porteur (12) davantage vers le côté extérieur de la largeur tricotée (14-16) ; et
c) répéter les étapes a) et b) pour les autres porteurs (12), porteur (12) par porteur (12).

3. Dispositif (20) pour générer des données de tricotage pour une machine à tricoter à plat selon la revendication 2, **caractérisé en ce que** les moyens de détermination de position d'arrêt (29) déterminent les positions d'arrêt de telle sorte qu'un porteur (12) ayant forte fréquence d'utilisation est stoppé à une position proche d'un bord d'une largeur de tricotage (14-16) et un porteur (12) ayant une faible fréquence d'utilisation est stoppé à une position éloignée du bord de la largeur de tricotage (14-16).

4. Dispositif (20) pour générer des données de tricotage pour une machine à tricoter à plat selon la revendication 3, **caractérisé en ce que** les moyens de détermination de position d'arrêt (29) déterminent les positions d'arrêt sur la base de la fréquence d'utilisation dans chaque partie (32-34) du vêtement.

5. Dispositif (20) pour générer des données de tricotage pour une machine à tricoter à plat selon la revendication 3, **caractérisé en ce que** les moyens d'analyse (28) divisent une partie (32-34) du vêtement en une pluralité de blocs dans une direction de colonne de mailles, et **en ce que** les moyens de détermination de position d'arrêt (29) déterminent les positions d'arrêt sur la base de la fréquence d'utilisation dans chaque bloc.

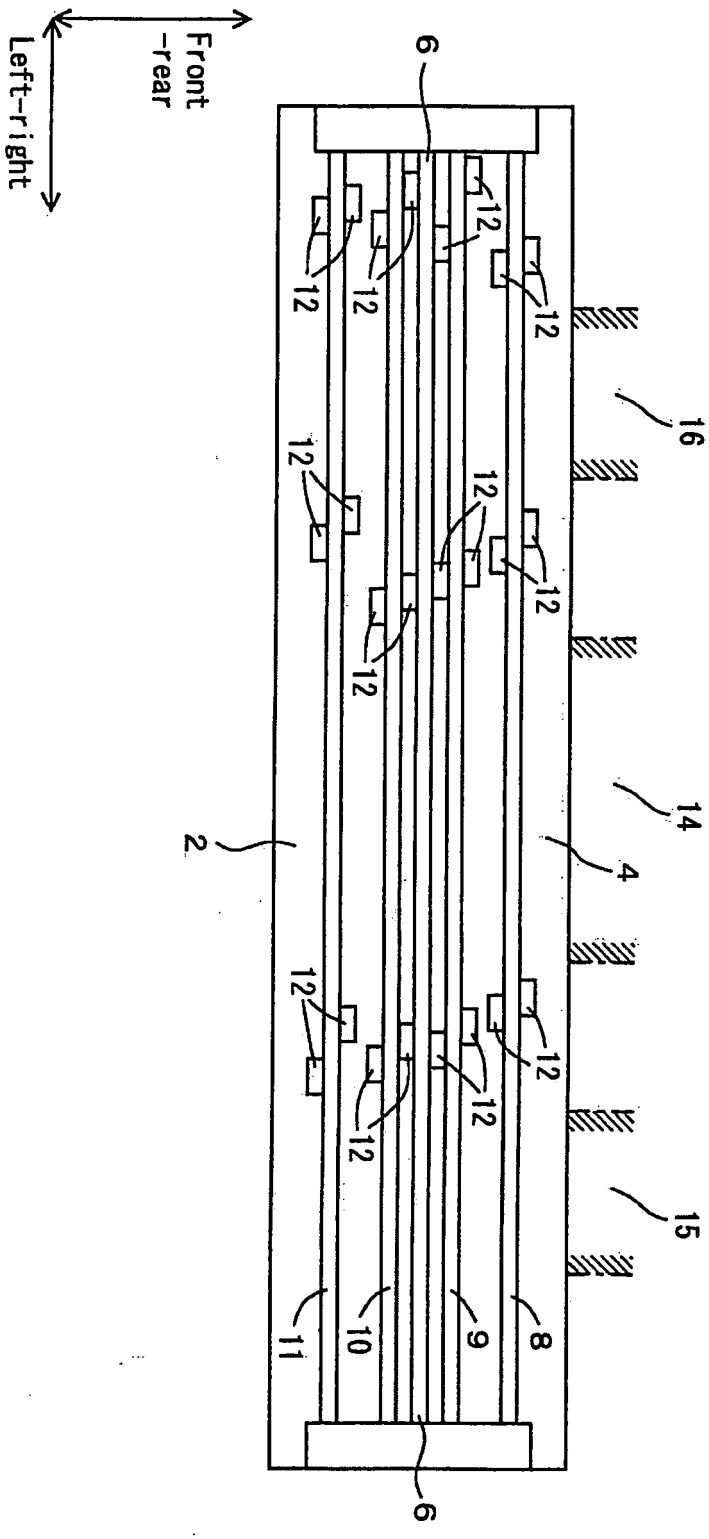


FIG. 1

FIG. 2

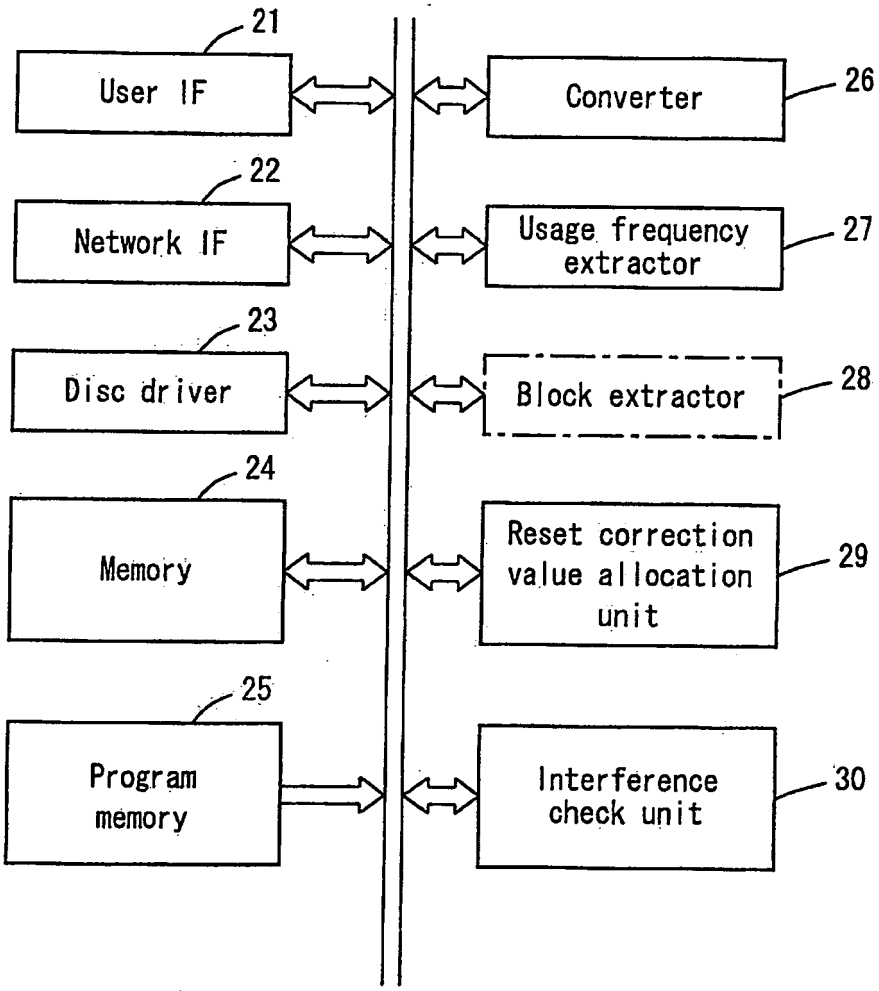

21
User IF
22
Network IF
23
Disc driver
24
Memory
25
Program memory
26
Converter
27
Usage frequency extractor
28
Block extractor
29
Reset correction value allocation unit
30
Interference check unit
20

FIG. 3

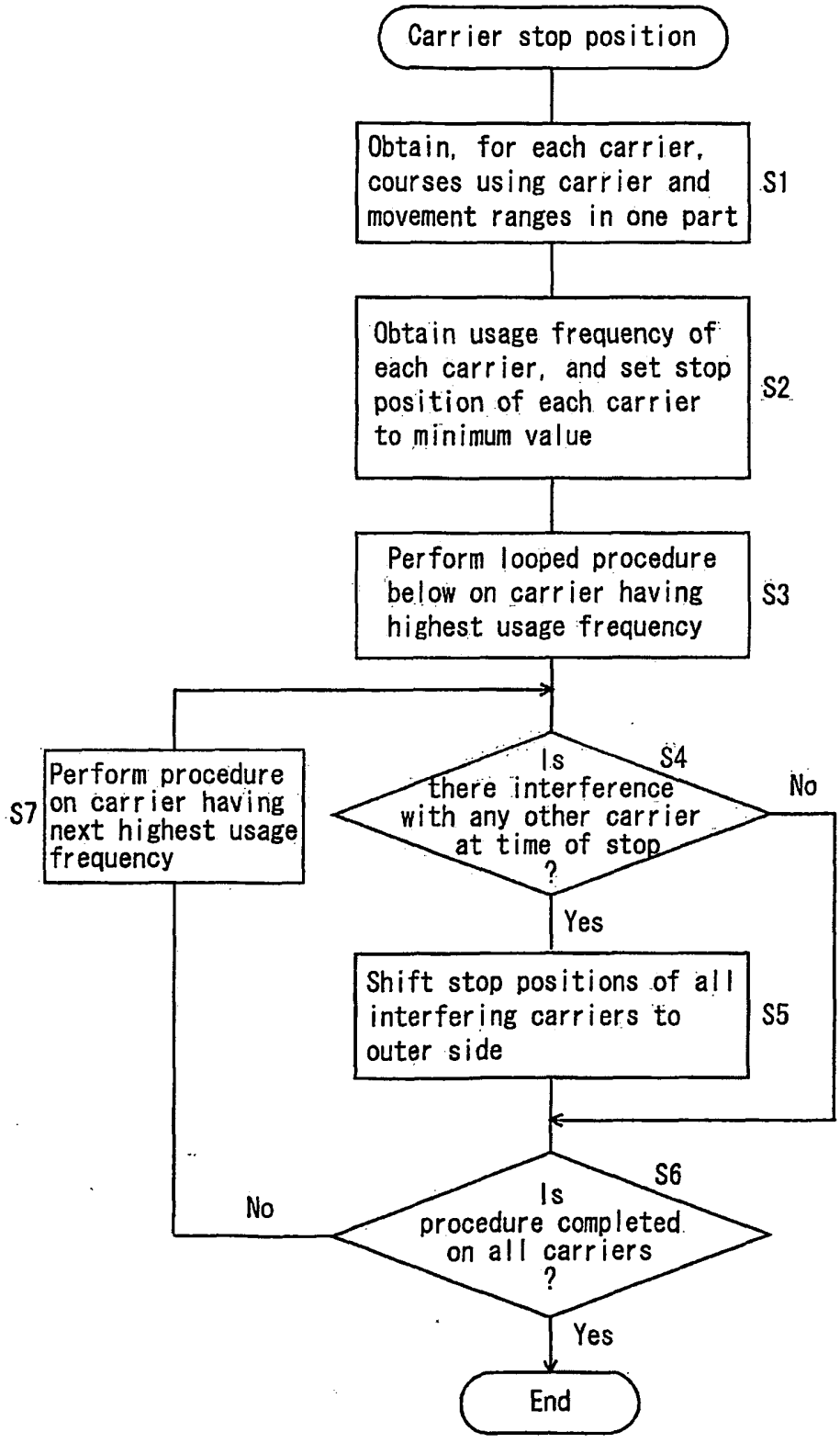

Carrier stop position
Obtain, for each carrier, courses using carrier and movement ranges in one part
S1
Obtain usage frequency of each carrier, and set stop position of each carrier to minimum value
S2
Perform looped procedure below on carrier having highest usage frequency
S3
Is there interference with any other carrier at time of stop ?
S4
No
Yes
Shift stop positions of all interfering carriers to outer side
S5
Perform procedure on carrier having next highest usage frequency
S7
Is procedure completed on all carriers ?
S6
No
Yes
End

FIG. 4

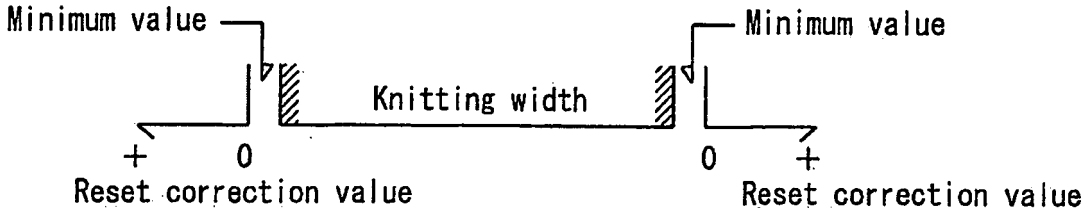

Minimum value
Minimum value
Knitting width
+
0
0
+
Reset correction value
Reset correction value

FIG. 5

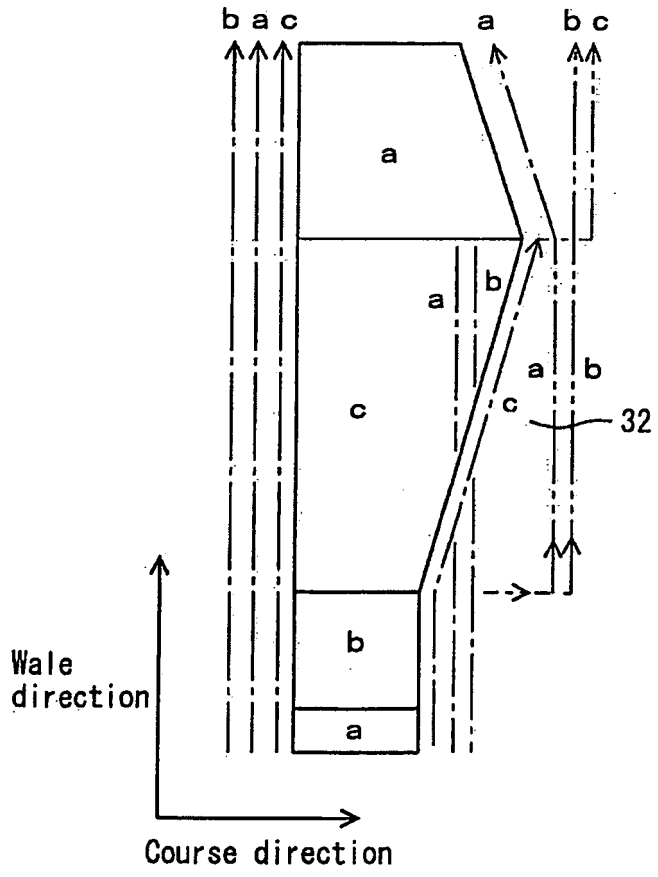

b a c
a
b c
a
b
a
b
c
c
32
b
a
Wale direction
Course direction

FIG. 6

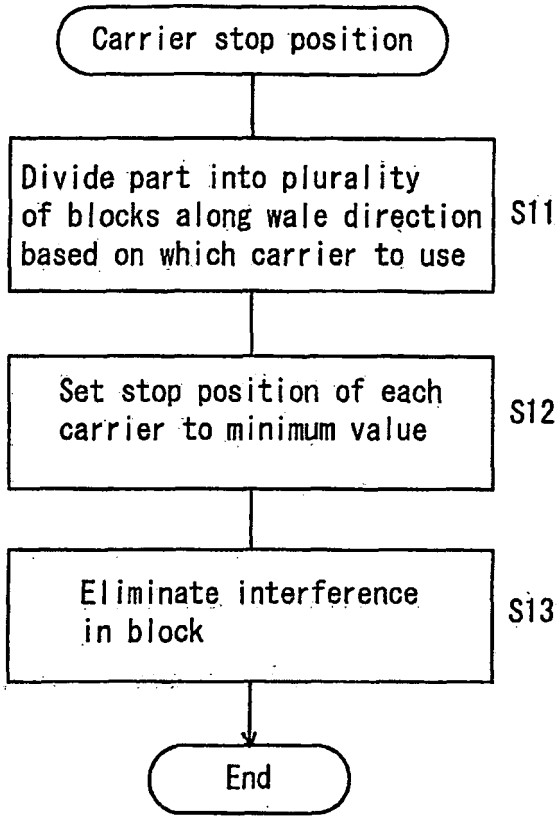

Carrier stop position
Divide part into plurality of blocks along wale direction based on which carrier to use
S11
Set stop position of each carrier to minimum value
S12
Eliminate interference in block
S13
End

FIG. 7

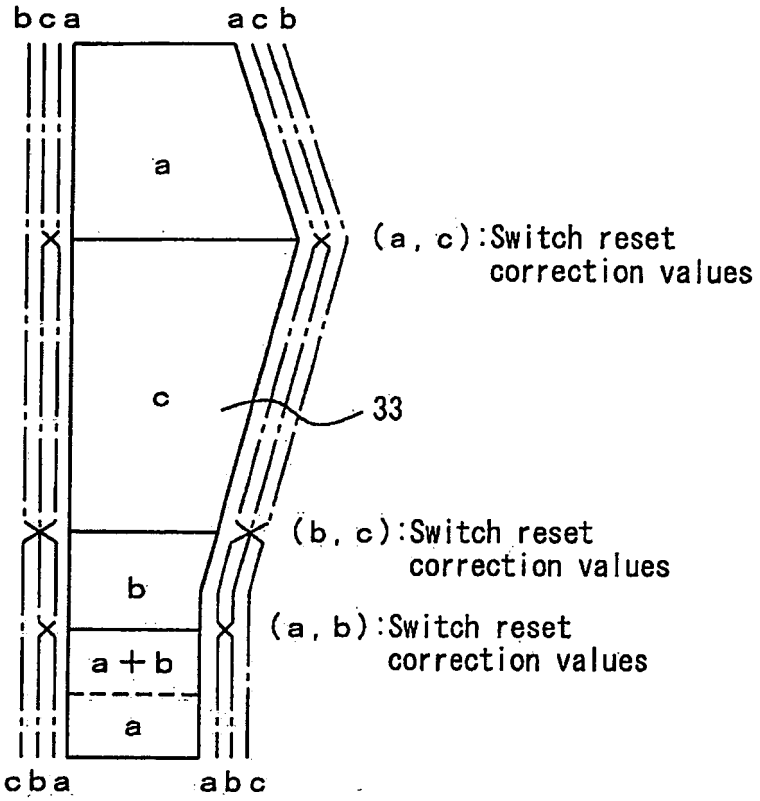
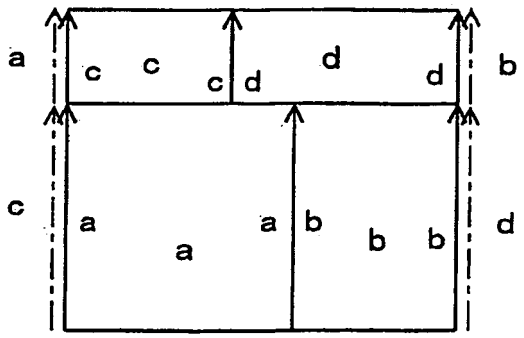

bca
acb
a
(a, c):Switch reset correction values
c
33
(b, c):Switch reset correction values
b
(a, b):Switch reset correction values
a+b
a
cba
abc

FIG. 8


a
c c c d d d b
c
a a a b b b d

34

REFERENCES CITED IN THE DESCRIPTION

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- DE 2730306 A1 **[0006]**