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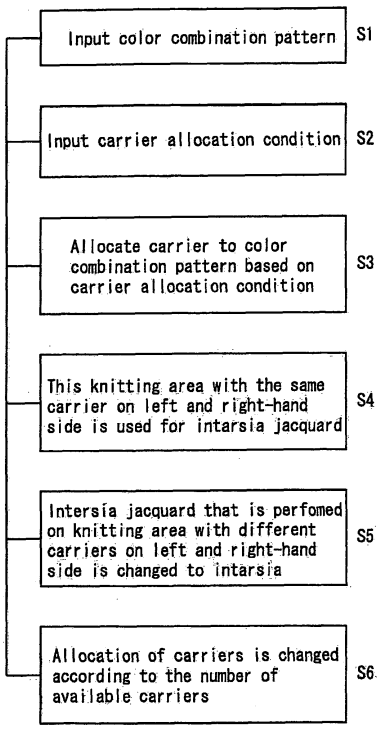
(54) DESIGN DEVICE, DESIGN PROGRAM, AND DESIGN METHOD FOR KNITTED FABRIC USING INTARSIA JACQUARD

(57) A storage unit is provided to store application conditions for applying intarsia jacquard knitting to color combination patterns in a knitted fabric based on a shape of the pattern and a knitting width. A knitting area satisfying the application conditions for applying intarsia jacquard knitting is used as a floating knitting area. Intarsia jacquard knitting is allocated to a first knitting area with the same color combination on the left and right-hand side in a knitting course direction in the floating knitting area, and intarsia knitting is allocated to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while intarsia knitting is also allocated to knitting areas other than the floating knitting area. Knitting areas to be used for intarsia can be differentiated automatically from knitting areas to be used for intarsia jacquard.

FIG. 2



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Description

[0001] The present invention relates to a design of a knitted fabric using intarsia jacquard, and particularly to determining whether intarsia is to be used or intarsia jacquard is to be used in a knitting structure or knitting method. Note that intarsia jacquard is a jacquard structure provided within an intarsia structure and that the knitting method is a type of jacquard.

[0002] When an intarsia structure has line patterns or other small patterns with narrow knitting width, these patterns can be knitted by intarsia jacquard or intarsia. As with a jacquard knitting method, an intarsia jacquard knitting method creates a thick knitted fabric, due to the presence of yam on the front surface of the knitted fabric and yam passing through the rear surface of the knitted fabric. However, because another yam can pass through the rear surface of the knitted fabric, the same yam carrier (simply referred to as "carrier" hereinafter) can be used on both the left and right-hand side of an intarsia jacquard piece, thereby conserving the number of carriers. In addition, in intarsia jacquard, where to stop the carrier can be controlled easily, and therefore the knitting efficiency is high. In the case of intarsia, on the other hand, the obtained knitted fabric is not thick because the rear surface thereof does not allow another yam to pass therethrough, and generally the quality of the knitted fabric is high. However, for example, in the case where intarsia structures A, B and C are arranged on the left and right-hand side, different carriers need to be allocated to a knitting area A and knitting area C respectively, even when the knitting width of a knitting area B is one stitch and the knitting area A and the knitting area C have the same color combinations. Furthermore, in the case of intarsia, an operation called "kicking back" might have to be performed to change the stop position of each carrier by stopping it and then moving it again, in order to prevent the interference between the carriers and the yarns from the carriers becoming caught carelessly by the needles. The kicking back operation lowers the knitting efficiency.

[0003] It is a difficult problem, even for those knit design experts, to determine whether to use intarsia or intarsia jacquard for certain patterns. For example, it is even troublesome to differentiate between intarsia and intarsia jacquard in all elements of a simple pattern. Such differentiation becomes more and more difficult as patterns get complicated.

[0004] An object of the present invention is to be able to automatically determine whether to perform intarsia or intarsia jacquard on certain parts of a pattern.

[0005] The present invention is a design device for a knitted fabric to determine whether to perform, on a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yam to pass through a rear surface of the knitted fabric, or intarsia jacquard knitting that allows the different yam to pass through the rear surface of the knitted fabric, the design device having: a storage unit that stores application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width; a knitting method allocator that, as initial values of knitting methods, uses a knitting area, which satisfies the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a floating knitting area, allocates intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocates intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and a knitting data generator that generates knitting data of the color combination pattern, based on the allocation of the knitting methods by the knitting method allocator.

[0006] A program of the present invention is a program for a design device for determining whether to perform, on a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yarn to pass through a rear surface of the knitted fabric, or intarsia jacquard knitting that allows the different yarn to pass through the rear surface of the knitted fabric, the program causing the design device to function as: storage means for storing application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width; knitting method allocation means for, as initial values of knitting methods, using a knitting area, which satisfies the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a floating knitting area, allocating intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocating intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and knitting data generating means for generating knitting data of the color combination pattern, based on the allocation of the knitting methods by the knitting method allocation means.

[0007] A design method of the present invention is a design method for using a computer to automatically allocate, to a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yam to pass through a rear surface of the knitted fabric, or intarsia jacquard knitting that allows the different yam to pass through the rear surface of the knitted fabric, the design method causing the computer to execute: a step of providing the computer with a storage unit that stores application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width; an allocation step of, as initial values of knitting methods, using a knitting area, which satisfies the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a float-

ing knitting area, allocating intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocating intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and a step of generating knitting data of the color combination pattern, based on the allocation of the knitting methods in the allocation step.

[0008] In this specification, the descriptions of the design device apply directly to the design method and design program, and the descriptions of the design method apply directly to the design device and design program. The terms used in this specification refer to the known technologies and are broadly interpreted according to the understandings of those skilled in the art.

[0009] In the present invention, whether intarsia knitting is appropriate or whether intarsia jacquard knitting is appropriate is automatically determined, based on the application conditions stored in the storage unit, a pattern satisfying the application conditions conditions, or whether or not the left and right-hand side of a knitting area have the same color combination, and then the initial values of the knitting methods are allocated.

As a result, the number of carriers used can be reduced and the knitting efficiency is increased, by reducing the number of knitting areas to be used for the intarsia knitting. Alternately, the quality of a knitted fabric can be improved by reducing the number of knitting areas to be used for intarsia jacquard knitting.

[0010] Preferably, the knitting method allocator allocates a carrier to each knitting area, allocates a common carrier to a third knitting area and a fourth knitting area, each of which has the same color combination on the left and right-hand side in the knitting course direction in the floating knitting area, and allocates intarsia jacquard knitting to the first knitting area serving as the floating knitting area between the third knitting area and the fourth knitting area. This idea applies to the knitting program and the knitting method as well.

[0011] In this manner, if the left-hand side knitting area and the right-hand side knitting area of a knitting area satisfying the application conditions for applying intarsia jacquard have the same color combination, the common carrier is allocated to these knitting areas. If these knitting areas have different color combinations, different carriers are allocated thereto. If the left-hand side knitting area and the right-hand side knitting area have the common carrier, intarsia jacquard is allocated thereto so that the number of carriers can be reduced.

[0012] It is preferred that the storage unit store the application conditions as a linear pattern or knitting area with a knitting width of a first predetermined value or less, and a knitting area with a knitting width of a fourth predetermined value or less in a pattern having a maximum knitting width of a second predetermined value or less or in a pattern having a knitting length of a third predetermined value or less. This idea applies to the knitting program and the knitting method as well. In this manner, intarsia jacquard is applied to a thin linear pattern or knitting area, as well as a knitting area with a narrow knitting width in a small pattern. Therefore, the quality of the knitted fabric is less affected even when different other yam passes through the back of the knitted fabric.

[0013] It is preferred that the design device be further provided with allocation changing means for changing the allocation of carriers performed by the knitting method allocator. In this manner, intarsia and intarsia jacquard can be changed in accordance with the number of available carriers.

[0014] Fig. 1 is a block diagram of a knit design device according to an embodiment;

Fig. 2 is a flowchart showing a knit design program according to the embodiment;

Fig. 3 is a diagram showing a color combination pattern used in the embodiment;

Fig. 4 is a diagram showing how carriers are allocated to the color combination pattern shown in Fig. 3; and

Fig. 5 is a diagram showing how intarsia and intarsia jacquard are differentiated from each other based on the allocation of the carriers shown in Fig. 4.

[0015] The best mode for implementing the present invention is described below.

[0016] Figs. 1 to 5 show a knit design device, knit design program and knit design method according to an embodiment. In each of the diagrams, reference numeral 2 represents the knit device comprising a computer, and reference numeral 4 represents a bus thereof, to which a color monitor 6, color printer 8, keyboard 10, mouse 12, network interface 14, disc driver 16 and the like are connected. Reference numeral 18 is a storage medium that stores the knit design program of the embodiment. The knit design program is read from the disc driver 16 and stored in, for example, a ROM 20. Reference numeral 22 is a general-purpose RAM, and reference numeral 24 represents an image memory for storing image data in a raster format. Reference numeral 26 is a data converter that converts data created by the design device 2 into knitting data that is executable by a flat knitting machine 36. The knit design program may be transferred from the network interface 14 by a carrier wave and stored into the ROM 20 or the like.

[0017] Reference numeral 28 is a carrier allocating table for determining how the carriers are allocated to color combination patterns or to knitting areas within each of the patterns. In the table 28, for example, a linear pattern the knitting width of which corresponds to one stitch is used as a floating knitting area. More generally, a linear pattern or knitting area the knitting width of which is a first predetermined value or less, e.g., two stitches or less, is used as the floating knitting area. The word "lin-

ear" pattern represents either a straight-line pattern or a curved pattern, the knitting width of which is the first predetermined value. In the table 28, when the maximum knitting width and the knitting length of a pattern satisfy predetermined conditions, this pattern is not considered as a floating target pattern. In other words, a pattern that is equal to or larger than a predetermined size is not considered as the floating target pattern. The floating knitting area also includes a knitting area with a knitting width of, for example, seven stitches or less in a floating target pattern with the maximum knitting width of twenty-five stitches or less or in a floating target pattern with a knitting length of fifty stitches or less. This means that a knitting area with a narrow knitting width within a pattern smaller than the predetermined size is included in the floating knitting area. The knitted fabric is sectioned into a plurality of patterns by color combinations, and each of the patterns is sectioned into the knitting areas according to the knitting width of the pattern. The conditions for defining the floating knitting area correspond to the application conditions for applying the intarsia jacquard based on the shape and knitting width of each pattern.

[0018] A predetermined value for the maximum knitting width of each pattern corresponds to a second predetermined value, a predetermined value for the knitting length a third predetermined value, and a predetermined value for the knitting width of each knitting area a fourth predetermined value. In addition, the floating knitting area sometimes include the entire pattern, such as the linear pattern, or sometimes defines a small knitting area with a knitting width of seven stitches or less within a pattern as a knitting area. The conditions for obtaining the floating knitting area, which are stored in the table 28, are referred to as "floating conditions." When the same carrier is used on both the left and right-hand side in a knitting course direction in the floating knitting area, the floating knitting area is subjected to intarsia jacquard knitting. When the carriers are different between the left-hand side and the right-hand side, the floating knitting area is subjected to intarsia knitting.

[0019] When the color combinations on the left and right-hand side of the floating knitting area are the same, the common carrier is allocated thereto. When the color combinations are different between the left-hand side and the right-hand side, different carriers are allocated. When the color combinations and hence the carriers on the left and right-hand side of the floating knitting area are the same, the floating knitting area is knitted by means of intarsia jacquard. The patterns or knitting areas other than this floating knitting area are knitted by means of intarsia. Therefore, even in the case where the floating conditions are satisfied, as long as the color combinations are different between the left-hand side and the right-hand side, intarsia knitting is carried out. The left-hand side and the right-hand side follow a direction along a knitting course of the knitted fabric, which is also a direction in which a carriage of a flat knitting machine moves. The knitting width is the number of stitches along the course direction of each knitting area, and the course direction normally corresponds to a horizontal direction of the knitted fabric. Furthermore, a wale direction is perpendicular to the course direction within the knitted fabric. The knitting length is the number of stitches along the wale direction of the knitting area. The wale direction normally corresponds to a knitting length direction of the knitted fabric.

[0020] A carrier allocator 30 allocates a carrier to a color combination pattern, which is, in other words, the pattern in which a color combination is designated for each part in the knitted fabric. The design of the knitted fabric includes designs of structures therein including the shape of the knitted fabric and patterns of the structures. When there is a different color combination pattern between the two patterns with the same color combination on the left and right-hand side, the common carrier is allocated to these two patterns as long as this different color combination pattern satisfies the floating conditions. An intarsia/intarsia jacquard allocator 32 allocates intarsia knitting or intarsia jacquard knitting to the patterns or the knitting areas of each of the patterns. The knitting area used for intarsia jacquard knitting satisfies the floating conditions and has the same carrier on both the left and right-hand side. In other cases, intarsia knitting is allocated. The carrier allocator 30 and intarsia/intarsia jacquard allocator 32 are collectively called "knitting method allocator."

[0021] Reference numeral 36 is a flat knitting machine, having a carriage 37, a carrier rail 38 for running the carriers, a needle bed 39 with a number of needles, and a controller 40. The flat knitting machine 36 is connected to the design device 2 by a LAN, not shown, or the storage medium 18, and performs knitting based on the knitting data supplied by the design device 2.

[0022] Fig. 2 shows the processing carried out by the knit design program according to the embodiment. In step 1, a color combination pattern is input by using the keyboard 10 or mouse 12 shown in Fig. 1, to arrange colors in the knitted fabric by using the color monitor 6 or the like. In step 2, a user inputs the conditions for allocating the carriers, i.e., the floating conditions, to the table 28. One of the floating conditions satisfied by a linear pattern is that the knitting width thereof corresponds to, for example, one stitch. The other floating conditions define a knitting area with a knitting width of seven stitches or less, in a pattern with the maximum knitting width of twenty-five stitches or less and a knitting length of fifty stitches or less. These conditions are input by the user using the keyboard 10 or mouse 12. The input results are stored in the table 28. When there is no input, the previous floating conditions, for example, are determined as valid. The condition in which the knitting width of the linear pattern corresponds to one stitch or less may be considered as a fixed condition, which may not be input by the user.

[0023] More broadly, for example, the linear pattern defines a knitting area with a knitting width of two stitches or less within a pattern with a knitting width of two stitches

or less, or within a pattern with the maximum knitting width of three stitches or more. The linear pattern may define not only a knitting area with a knitting width of seven stitches or less within a pattern with the maximum knitting width of twenty-five stitches or less and a knitting length of fifty stitches or less, but also a knitting area with a knitting width of seven stitches or less within a pattern with the maximum knitting width of twenty-five stitches or less and within a pattern with a knitting length of fifty stitches or less. Specific numeric values for the floating conditions are obtained by the input from the user.

[0024] In step 3, the carriers are allocated to color combination patterns according to carrier allocation conditions. In other words, when a color combination pattern A is divided into a left and a right half in the course direction by a color combination pattern B, it is determined whether the color combination pattern B satisfies the floating conditions. When the color combination pattern B satisfies the floating conditions, the same carrier is allocated to the color combination pattern A on each side of the color combination pattern B, but if not, different carriers are allocated. In step 4, intarsia jacquard is performed on the left and right-hand side of thin or linear knitting areas (floating knitting areas) to which the common carrier is allocated, and a knitting area with a knitting width of seven stitches or less within a small pattern. In step 5, for example, the knitting areas satisfying the floating conditions are all subjected to intarsia jacquard knitting. Therefore, even in the case of a knitting area that is supposedly subjected to intarsia jacquard, as long as different carriers are allocated to the left and right-hand side of the knitting area, intarsia jacquard is changed to intarsia. Step 5 is not necessary when intarsia knitting is performed in all of the knitting areas other than the thin knitting areas allocated with the common carrier on the left and right-hand side in step 4.

[0025] In step 6, the allocation of the carriers is changed according to the number of carriers. For instance, the user can input the number of available carriers in step 6. When the number of allocated carriers exceeds the input number, the allocation of the carriers is changed. For example, a knitting area that almost satisfies the floating conditions is selected from among the knitting areas that do not satisfy the floating conditions, and then the knitting method for the selected knitting area is changed to intarsia jacquard, to reduce the number of carriers to be used. On the contrary, when there are sufficient carriers, the knitting method is changed from intarsia jacquard to intarsia even for a knitting area that satisfies the floating conditions and has the same color combination on the left and right-hand side, and then different carriers may be allocated to the left and right-hand side. Step 6 may be executed automatically by inputting the number of carriers or may be executed only when the user orders the execution thereof.

[0026] Figs. 3 to 5 are diagrams each showing an example of how the carriers are allocated in the embodiment and how the knitting method of intarsia or intarsia jacquard is allocated. Fig. 3 shows a color combination pattern, wherein each one of the cells represents one stitch and there are a total of five color combinations with a group of knitting areas 41 to 43 and a pair of linear knitting areas 44 and 45. Fig. 4 shows a result of allocating the carriers to the color combination pattern in Fig. 3. The knitting area 41 is divided into a left and a right half by the knitting areas 42, 43 and therefore separated into two regions of carrier regions 51, 52. Therefore, two carriers are required. Although there are knitting areas 42 at the top and bottom, they can be knitted using the common carrier. Thus, carrier regions 53, 53 are obtained by allocating one carrier. The knitting area 43 is used as a carrier region 54, and the linear knitting areas 44 and 45 are used as carrier regions 55 and 56.

[0027] Of the carrier regions 51 to 56, the carrier regions 55 and 56 are each configured by a linear pattern with a knitting width of one stitch, and therefore satisfy the floating conditions. The maximum knitting width and the knitting length of the carrier region 54 are small, and the knitting areas above, below, right and left side thereof has a knitting width of, for example, seven stitches or less. Therefore, the carrier region 54 satisfies the floating conditions. In the carrier region 54, if the knitting area satisfying the floating conditions has the same color combination on the left and right-hand side, the common carrier can be allocated thereto. Thus, the same carrier region 53 is allocated to the top, bottom, right and left side of the carrier region 54.

[0028] Fig. 5 shows how intarsia knitting or intarsia jacquard knitting is allocated. The carrier regions 51, 52 and 53 are all subjected to intarsia knitting. Intarsia knitting is performed on a section within the carrier region 54 that has the carrier regions 51 and 52 on either side thereof. On the other hand, intarsia jacquard knitting is performed on knitting areas 57, 57 of the carrier region 54 that are sandwiched by the same carrier regions 53. Although most of the carrier regions 55 and 56 are knitted by means of intarsia jacquard, four of small knitting areas 58 with a knitting length of two stitches have different carrier regions on the left and right-hand side, and therefore are subjected to intarsia knitting. As a result, six carriers are used, and intarsia jacquard knitting is performed on the knitting areas 57, 57, and the sections other than the knitting areas 58 in the carrier regions 55 and 56. The rest are subjected to intarsia knitting. In this manner, compared to when intarsia knitting is performed on each knitting area 57, the number of carrier can be reduced by one. Moreover, by performing intarsia knitting on the knitting areas 58, the yam passing through the back of this section of the knitted fabric can be eliminated.

[0029] In this embodiment, the carriers are allocated first, and subsequently the intarsia knitting method or the intarsia jacquard knitting method was allocated. This processing order can be changed accordingly. For example, a section which satisfies the floating conditions and has the same color combination on the left and right-hand side may be subjected intarsia jacquard, and the

rest may be subjected to intarsia. Then, allocation of the carriers may be performed when and after specifying the knitting methods. In addition, intarsia or intarsia jacquard is not necessarily allocated automatically from the beginning. For example, after manually allocating the carriers and allocating intarsia or intarsia jacquard, the processing may be shifted to the embodiment to change allocation of the carriers and the knitting methods.

[0030] The following effects are obtained by the embodiment.

(1) Whether intarsia knitting is appropriate or whether intarsia jacquard knitting is appropriate can be automatically determined.
(2) As a result, the number of carriers used can be reduced and the knitting efficiency is increased, by reducing the number of knitting areas to be used for the intarsia knitting. Alternately, the quality of a knitted fabric can be improved by reducing the number of knitting areas to be used for intarsia jacquard knitting.

[0031]

2	Knit design device
4	Bus
6	Color monitor
8	Color printer
10	Keyboard
12	Mouse
14	Network interface
16	Disc driver
18	Storage medium
20	ROM
22	RAM
24	Image memory
26	Data converter
28	Carrier allocating table
30	Carrier allocator
32	Intarsia/intarsia jacquard allocator
36	Flat knitting machine
37	Carriage
38	Carrier rail
39	Needle bed
40	Controller
41 to 45	Knitting area
51 to 56	Carrier region
57, 58	Knitting area

Claims

1. A design device (2) for a knitted fabric to determine whether to perform, on a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yam to pass through a rear surface of the knitted fabric, or intarsia jacquard knitting that allows the different yam to pass through the rear surface of the knitted fabric, the design device (2) being **characterized in** comprising:

a storage unit that stores application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width;
a knitting method allocator (30, 32) that, as initial values of knitting methods, uses a knitting area, satisfying the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a floating knitting area, allocates intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocates intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and
a knitting data generator that generates knitting data of the color combination pattern, based on the allocation of the knitting methods by the knitting method allocator (30, 32).

2. The design device (2) for a knitted fabric according to claim 1, **characterized in that** the knitting method allocator (30, 32) allocates a carrier to each knitting area, allocates a common carrier to a third knitting area and a fourth knitting area, each haging the same color combination on the left and right-hand side in the knitting course direction in the floating knitting area, and allocates intarsia jacquard knitting to the first knitting area serving as the floating knitting area between the third knitting area and the fourth knitting area.

3. The design device (2) for a knitted fabric according to claim 1 or 2, **characterized in that** the storage unit stores the application conditions as a linear pattern or knitting area with a knitting width of a first predetermined value or less, and a knitting area with a knitting width of a fourth predetermined value or less in a pattern having a maximum knitting width of a second predetermined value or less or in a pattern having a knitting length of a third predetermined value or less.

4. The design device (2) for a knitted fabric according to claim 1 or 2, **characterized in** being further comprising allocation changing means for changing the allocation of carriers performed by the knitting method allocator (30, 32).

5. A program for a design device (2) for determining whether to perform, on a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yam to pass through a rear surface of the

knitted fabric, or intarsia jacquard knitting that allows the different yam to pass through the rear surface of the knitted fabric, the program being **characterized in** causing the design device (2) to function as:

storage means for storing application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width;
knitting method allocation means (30, 32) for, as initial values of knitting methods, using a knitting area, satisfying the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a floating knitting area, allocating intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocating intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and
knitting data generating means for generating knitting data of the color combination pattern, based on the allocation of the knitting methods by the knitting method allocation means (30, 32).

6. The program according to claim 5, **characterized in that** the knitting method allocation means (30, 32) allocates a carrier to each knitting area, allocates a common carrier to a third knitting area and a fourth knitting area, each having the same color combination on the left and right-hand side in the knitting course direction in the floating knitting area, and allocates intarsia jacquard knitting to the first knitting area serving as the floating knitting area between the third knitting area and the fourth knitting area.

7. A knit design method for using a computer to automatically allocate, to a color combination pattern of a knitted fabric, intarsia knitting that does not allow different yam to pass through a rear surface of the knitted fabric, or intarsia jacquard knitting that allows the different yam to pass through the rear surface of the knitted fabric, the knit design method being **characterized in** causing the computer to execute:

a step of providing the computer with a storage unit that stores application conditions for applying intarsia jacquard knitting based on a shape of the pattern and a knitting width;
an allocation step of, as initial values of knitting methods, using a knitting area, satisfying the application conditions for applying intarsia jacquard knitting based on the shape of the pattern and the knitting width, as a floating knitting area, allocating intarsia jacquard knitting to a first knitting area with the same color combination on a left and right-hand side in a knitting course direction in the floating knitting area, and allocating intarsia knitting to a second knitting area with different color combinations on the left and right-hand side in the knitting course direction, while allocating intarsia knitting to knitting areas other than the floating knitting area; and
a step of generating knitting data of the color combination pattern, based on the allocation of the knitting methods in the allocation step.

8. The knit design method according to claim 7, **characterized in that**, in the allocation step, a carrier is allocated to each knitting area, a common carrier is allocated to a third knitting area and a fourth knitting area, each having the same color combination on the left and right-hand side in the knitting course direction in the floating knitting area, and intarsia jacquard knitting is allocated to the first knitting area serving as the floating knitting area between the third knitting area and the fourth knitting area.

FIG. 1

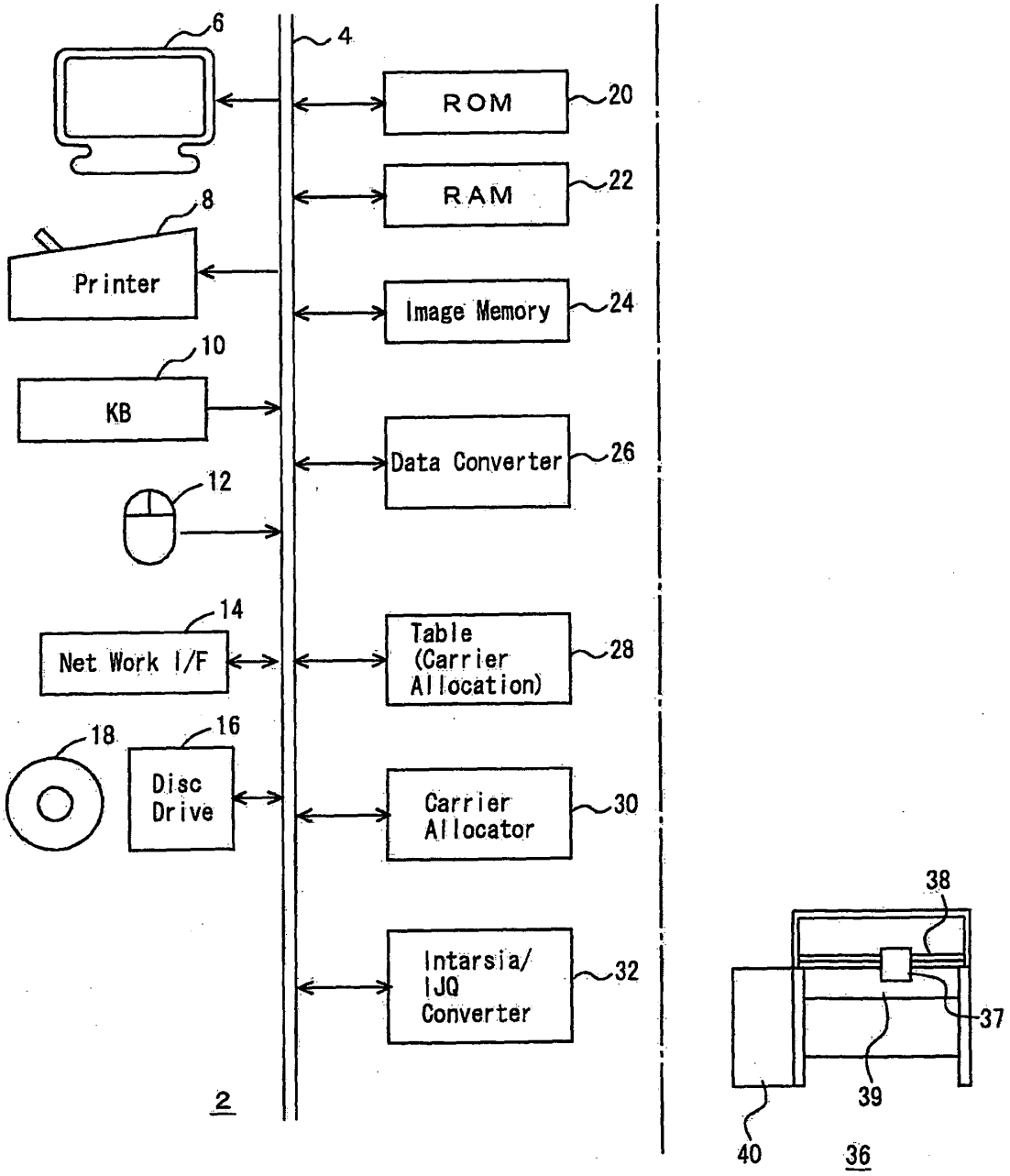

6
4
ROM
20
RAM
22
8
Printer
Image Memory
24
10
KB
Data Converter
26
12
14
Net Work I/F
Table
(Carrier
Allocation)
28
18
16
Disc
Drive
Carrier
Allocator
30
Intarsia/
IJQ
Converter
32
2
38
37
39
40
36

FIG. 2

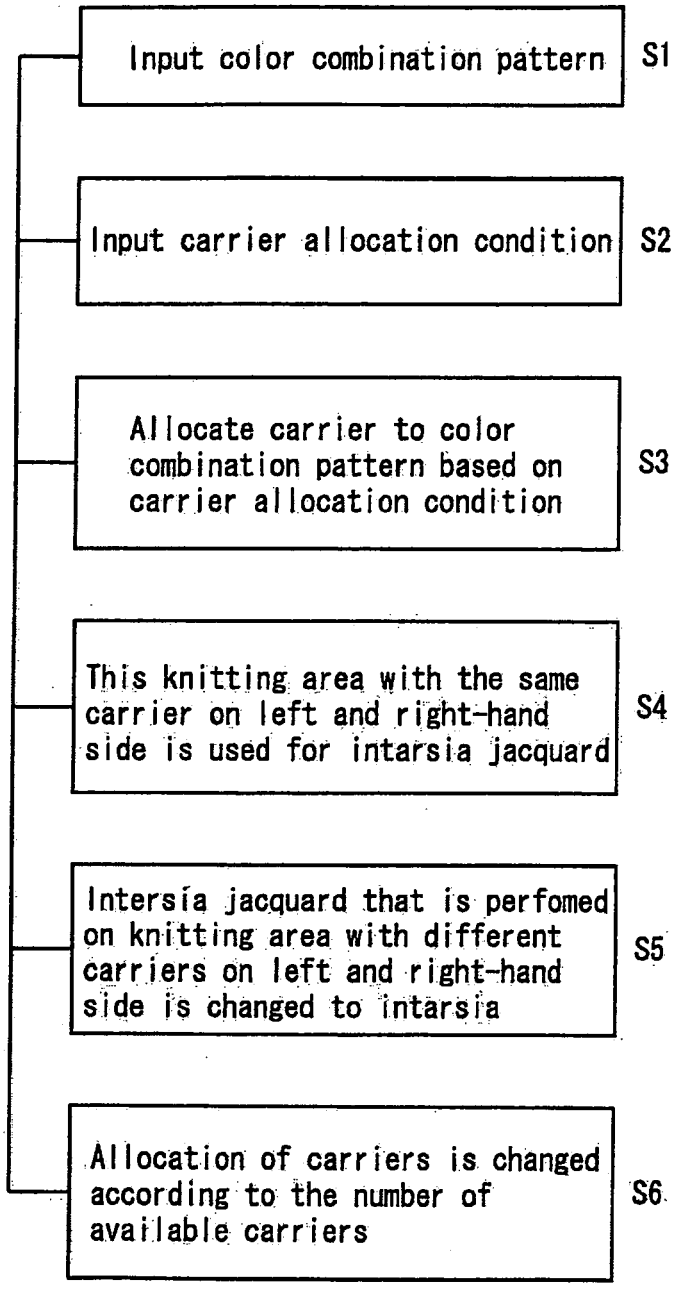

Input color combination pattern
S1
Input carrier allocation condition
S2
Allocate carrier to color combination pattern based on carrier allocation condition
S3
This knitting area with the same carrier on left and right-hand side is used for intarsia jacquard
S4
Intersia jacquard that is perfomed on knitting area with different carriers on left and right-hand side is changed to intarsia
S5
Allocation of carriers is changed according to the number of available carriers
S6

FIG. 3

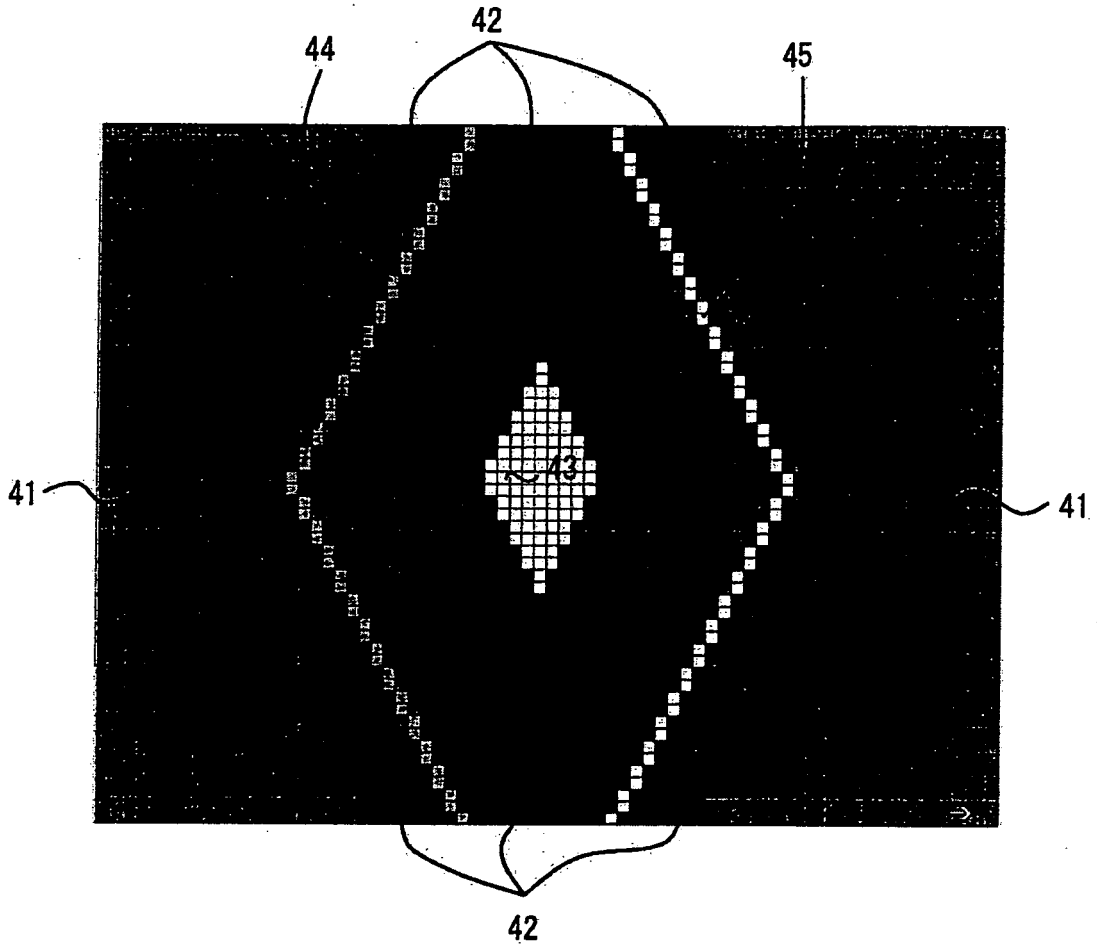


FIG. 4

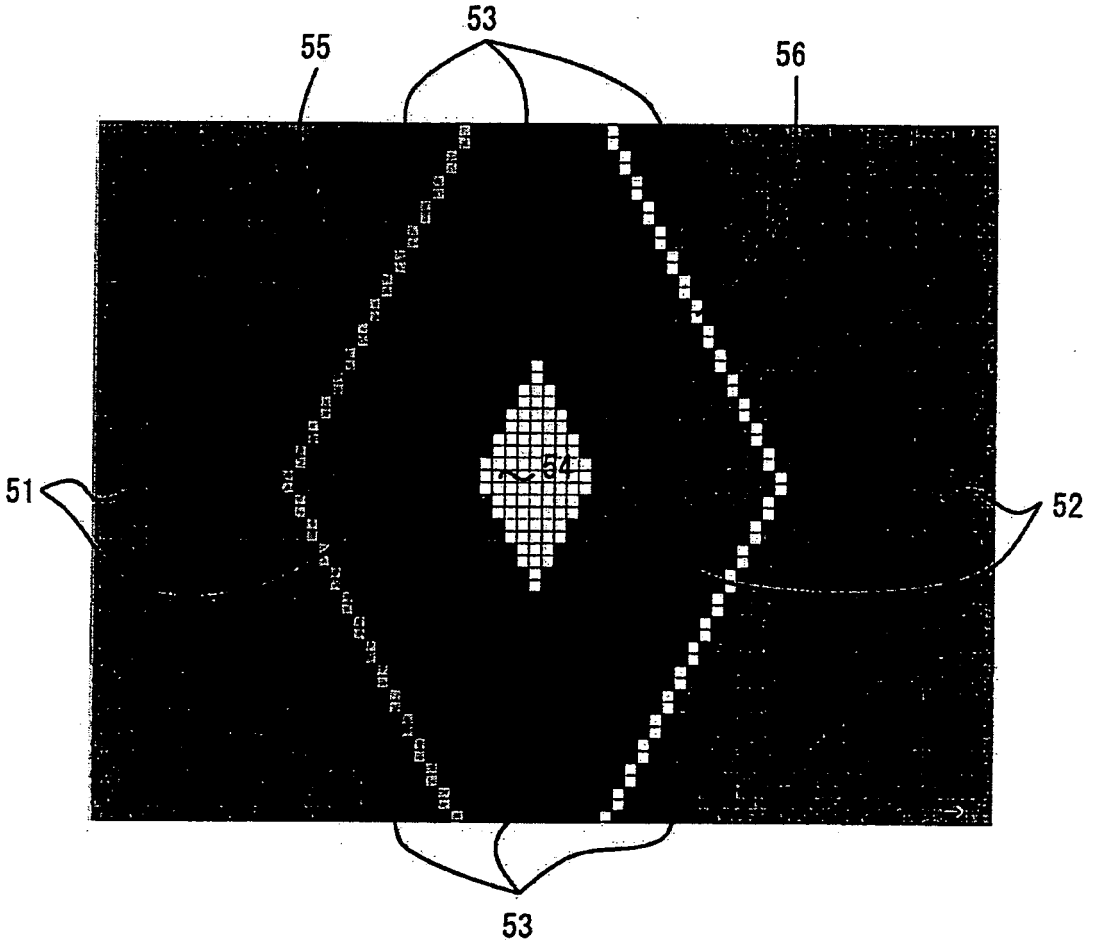
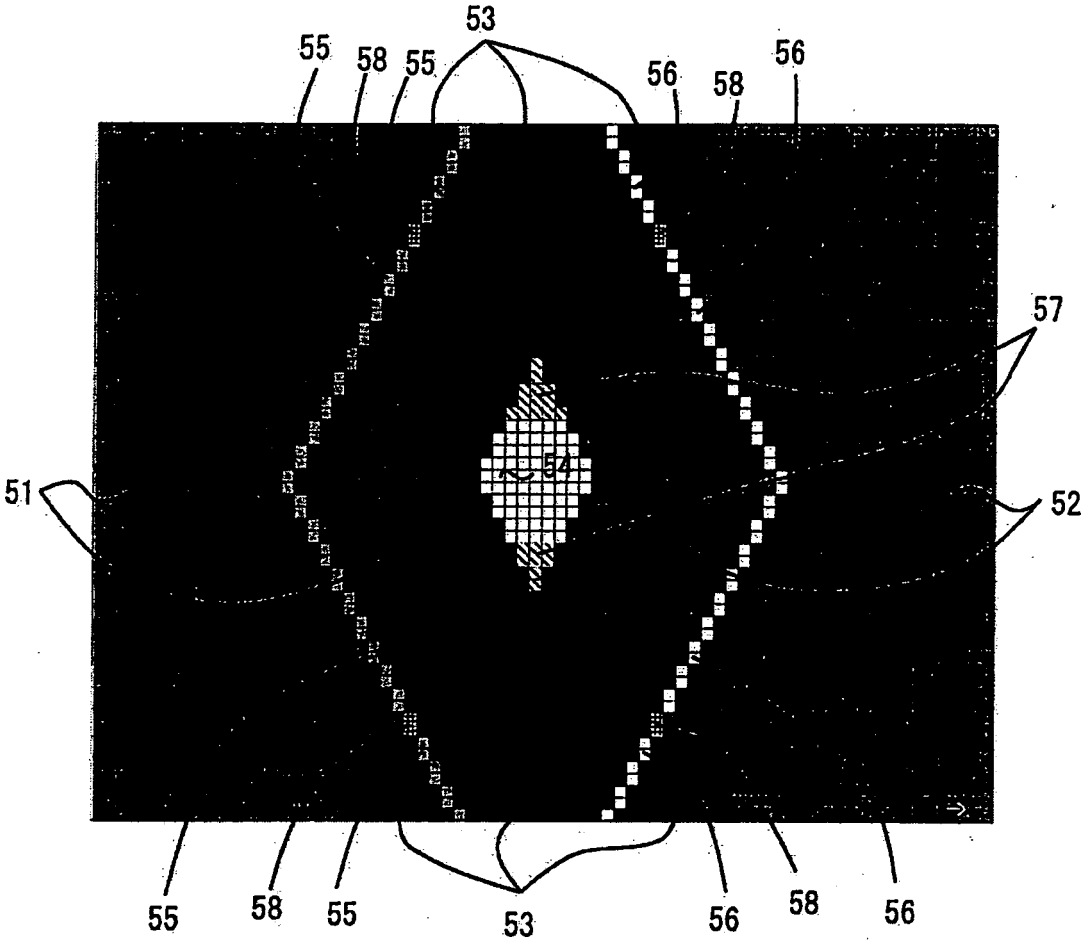


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/060539

A. CLASSIFICATION OF SUBJECT MATTER
D04B35/00(2006.01)i

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

B. FIELDS SEARCHED

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

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009
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	JP 7-119004 A (Shima Seiki Mfg., Ltd.), 09 May, 1995 (09.05.95), & US 5557527 A & EP 640707 A1 & DE 69415616 C & ES 2126066 T	1-8
A	JP 9-78412 A (Shima Seiki Mfg., Ltd.), 25 March, 1997 (25.03.97), & US 5754431 A & EP 763615 A1 & DE 69608866 D	1-8
A	WO 2008/007623 A1 (Shima Seiki Mfg., Ltd.), 17 January, 2008 (17.01.08), & EP 2042631 A1	1-8

☐ 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
29 June, 2009 (29.06.09)	14 July, 2009 (14.07.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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