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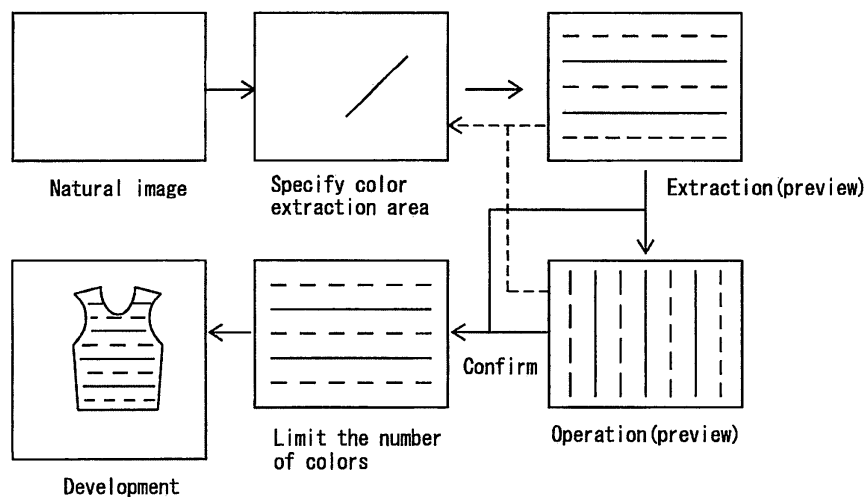
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(54) **BORDER PATTERN DESIGNING DEVICE, DESIGNING METHOD, AND DESIGNING PROGRAM**

(57) A color extraction area is specified in a natural image and a color in the area is extracted and spread. The spread image is displayed as a preview and the ex-

tracted area is modified when required. When the extracted area is confirmed, the number of colors is limited, a knitting pattern is spread to be configuration data. It is possible to easily design a radical new border pattern.

F I G. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to the design of a border pattern (stripe pattern).

BACKGROUND

[0002] Border patterns that are used in apparel products such as garments, curtains and tablecloths are formed by arranging various colors in vertical directions or horizontal directions. When designing a border pattern an operator arranges various colors on a monitor of a designing device. However, because there is a limit to one's idea or imagination, it is difficult to design a large number of original border patterns to prevent the generation of a dull design.

DISCLOSURE OF THE INVENTION

[0003] It is, therefore, an object of the present invention to design original and novel borders easily.

[0004] A border pattern designing device of the present invention is a designing device with original image input means and a color monitor for displaying the input original image, the border pattern designing device being provided with: means for specifying a color extraction area on the original image displayed on the color monitor; means for extracting colors contained in the color extraction area; means for developing the extracted colors into stripes and displaying the developed colors on the color monitor in the form of a preview image such as to accept modifications or confirmation made on the color extraction area; and means for creating a design of a border pattern in which the extracted colors are developed into stripes, when the color extraction area is confirmed.

[0005] Preferably, the border pattern designing device is provided with means for limiting the number of colors of the created border pattern, and means for developing the border pattern, which is obtained after limiting the number of colors thereof, on a pattern of a knit fabric and converting the developed border pattern to knitting data.

[0006] More preferably, the color extraction area is in the form of a straight line of one-pixel width.

[0007] Preferably, the color extraction area is in the form of a free-form curve that can be drawn freely by an operator.

[0008] Preferably, the color extraction area has a width constituted by a plurality of pixels, and the border pattern designing device is provided with means for generating a single color in a width direction on the basis of colors of the plurality of pixels in the width direction.

[0009] A border pattern designing method of the present invention has the steps of: displaying an original image that is input on a color monitor and accepting that an operator specifies a color extraction area on the original image displayed on the color monitor; extracting

colors contained in the accepted color extraction area to develop the colors into stripes; displaying the developed colors on the color monitor in the form of a preview image such as to accept modifications or confirmation made on the color extraction area; and creating a design of a border pattern in which the extracted colors are developed into stripes, when the color extraction area is confirmed by the operator.

[0010] Preferably, the number of colors of the created border pattern is limited, the border pattern, which is obtained after limiting the number of colors thereof, is developed on a pattern of a knit fabric, and the developed border pattern is converted to knitting data.

[0011] A border pattern designing program of the present invention is a program for a designing device having original image input means and a color monitor for displaying an original image that is input, the border pattern designing program being provided with: a command for accepting a color extraction area that is specified by an operator on the original image displayed on the color monitor; a command for extracting colors contained in the color extraction area; a command for developing the extracted colors into stripes and displaying the developed colors in the form of a preview image; a command for accepting modifications or confirmation made on the color extraction area when displaying the preview image; and a command for creating a design of a border pattern in which the extracted colors are developed into stripes, when the color extraction area is confirmed.

Preferably, the border pattern designing program has a command for limiting the number of colors of the created border pattern, and a command for developing the border pattern, which is obtained after limiting the number of colors thereof, on a pattern of a knit fabric. Note that a normal knit designing device has means for converting a pattern to knitting data used for knitting this knit fabric with a knitting machine, once developing the pattern on a pattern of this knit fabric and inputting an image in which is determined what color of yarn to be used on each part of the pattern of the knit fabric.

[0012] According to the present invention, the original image is displayed on the color monitor to specify an extraction area, and colors are extracted from the extraction area and arranged as color values. Then, this arrangement is developed to obtain a border pattern, which is then displayed as a preview image. The operator modifies the color extraction area based on the preview image to confirm the color extraction area, and thereupon develops the extracted colors into stripes to obtain the border pattern. Therefore, the border pattern can be created easily. Moreover, a variety of images such as a landscape and images of an animal and a plant can be used as the original image, so that an original and unique border pattern can be designed easily. Since the color extraction area can be modified while checking the preview image, a border pattern that can satisfy the operator can be created easily.

[0013] The border pattern is important in the design of

a knit fabric, and limiting the number of colors of the created border pattern can convert the border pattern into a pattern that can be knitted by a knitting machine. Next, by developing this pattern on the pattern of the knit fabric, the knitting data can be obtained easily. Therefore, the knit fabric can be designed easily using this border pattern.

[0014] The color extraction area is in the form of, for example, a straight line of one-pixel width or a free-form curve that is drawn by the operator using a mouse or stylus. Moreover, the color extraction area may be in the form of a graphic figure having a width of a plurality of pixels. In this case, the colors of the plurality of pixels in the width direction are analyzed and averaged based on the colors of the plurality of pixels, whereby the arrangement of the plurality of pixel colors can be converted into an arrangement of colors disposed along a longitudinal direction of the color extraction area.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a block diagram of a knit designing device according to an embodiment;
Fig. 2 is a diagram showing a border pattern designing method according to the embodiment; and
Fig. 3 is a block diagram of a border pattern designing program according to the embodiment.

EXPLANATION OF REFERENCE NUMERALS

[0016]

2	Knit designing device
4	Bus
6	Image input
8	Color monitor
10	Keyboard
12	Stylus
14	Color extraction part
16	Image operation part
18	Preview data storage
20	Design data storage
22	Pattern data storage
24	Developing part
26	Data converter
28	Loop simulation part
30	Removable disk
32	Flat knitting machine
40	Border pattern designing program
41	Color extraction area accepting command
42	Color extraction command
43	Preview image creation command
44	Image operation command
45	Developing command

BEST MODE FOR CARRYING OUT THE INVENTION

[0017] The best mode for carrying out the present invention will be described hereinafter.

[0018] Fig. 1 through Fig. 3 show, respectively, border pattern designing device, designing method and designing program by taking a knit designing device 2 as an example. The knit designing device 2 is realized by an appropriate computer, wherein reference numeral 4 is a bus and reference numeral 6 is an image input, which is an input of an image captured by, for example, a scanner or a digital camera. Reference numeral 8 is a color monitor, reference numeral 10 a keyboard, and reference numeral 12 a stylus or a mouse. An operator uses the stylus 12 or the like to specify an area on the color monitor 8 to thereby specify a color extraction area. The color extraction area may be in the form of, for example, a straight line, a free-form curve, or a wide graphic figure of a rectangle. In addition, the operator can move or rotate the color extraction area on an original image and deform the color extraction area by modifying its length or bending it.

[0019] A color extraction part 14 extracts colors from the color extraction area specified by the stylus 12, and outputs an arrangement of the colors. When the color extraction area is in the form of a straight line of, for example, one-pixel width, the color of each pixel is extracted as it is. When the color extraction area is in the form of a free-form curve of one-pixel width, the color of each pixel is extracted along the free-form curve. Also, when the color extraction area is in the form of a rectangle or other graphic figure having a width of a plurality of pixels, an average of the colors of the plurality of pixels in a width direction, for example, is output.

[0020] An image operation part 16 develops the arrangement of the colors extracted by the color extraction part 14 into vertical or horizontal parallel stripes, to obtain a border pattern. The image operation part 16 further performs the operations of rotating a color development direction 90°, for example, converting, within a color space, the colors extracted by the color extraction part 14, and deleting or modifying a color specified by the operator within the border pattern. Then, a color image that is developed into stripes by the image operation part 16 is displayed on the monitor 8 as a preview image so that the operator can modify or confirm the color extraction area by means of a pointing device such as the stylus 12.

[0021] Reference numeral 18 is a preview data storage, which stores the preview image of the border pattern created by the image operation part 16 or a color arrangement obtained by compressing the preview image. A design data storage 20 stores the preview image as design data when the preview image is confirmed. Note that the preview data storage 18 and the design data storage 20 may be handled as a single storage, and the preview image and the design image may be handled as the same image. Reference numeral 22 is a pattern data storage,

which stores pattern data representing the shape of a knit fabric. The shape of the knit fabric may be a rectangular shape, the shape of a part such as a front body or a back body of a sweater or other garment, or the shape of a piece of seamless knit or the like having a front body and a back body connected to each other.

[0022] When the operator confirms the color extraction area and thereby confirms the design data, a developing part 24 develops the design data in the pattern of the knit fabric and fills the pattern of the knit with the border pattern. A data converter 26 converts the pattern data in which the border pattern is already developed by the developing part 24, into knitting data. When knitting the knit fabric having the border pattern, carriers that supply colored yarns are switched to realize the border pattern. Therefore, it is preferred that the knitting data have a carrier control instruction and a color image of the yarn supplied to each carrier. Note that the number of courses to perform knitting using the carriers is preferably an even number for each carrier. The knitting data is converted into a simulation image in which each loop of the knit fabric is shown realistically by a loop simulation part 28, and this simulation image is displayed on, for example, the color monitor 8. Moreover, the knitting data is converted into knitting data of a knitting machine such as a flat knitting machine 32, and thus obtained knitting data is output through communication, a removable disk 30 or the like. The data converter 26 does not have to create the knitting data for driving the actual flat knitting machine 32, hence it is enough that the loop simulation part 28 can create the knitting data sufficient to create a loop simulation image.

[0023] Fig. 2 shows a process starting from the input of a natural image as the original image and ending up with the development of the border pattern into the pattern data. A landscape or an image of a plant or an animal is used as the natural image, which may be then input by the digital camera or scanner or taken out of a library. Next, the natural image is displayed on the color monitor, and then the operator specifies the color extraction area by means of the pointing device such as the stylus 12. In Fig. 2 a color extraction area in the form of a straight line is specified. When the operator specifies the straight line, the line width of which constitutes one pixel, which is a line segment of a section specified by the operator. When a free-form curve is additionally drawn using the stylus, a free-form curve equivalent of one-pixel in width is obtained. Note that in the case of specifying a rectangular shape or the like as the color extraction area, for example color values in the width direction of the color extraction area are averaged to arrange thus obtained average color value along a longitudinal direction of the rectangle.

[0024] The arrangements of extracted color data are stretched parallel in the form of stripes, converted into the design data of horizontal stripes or vertical stripes, and displayed on the color monitor 8 in the form of the preview image. On the other hand, the operator can per-

form the operations of modifying the color extraction area by expanding, contracting or bending it, rotating the directions of the stripes 90°, for example, modifying the color values, and deleting the specified color. Then, once the color extraction area is confirmed and other processes of modifying or deleting the color values are completed, the border pattern is obtained. The obtained border pattern can be used as it is when using it as print data.

[0025] However, when the border pattern is used as the knitting data, a limit is placed on the number of colors of the border pattern because there is a limit to the number of colors that can be used by the knitting machine. Specifically, when the number of colors existing in the border pattern is equal to or larger than the limited number, adjacent colors are combined into one color to keep the total number of colors within the limit. Moreover, the operator may, for example, specify a desired area within the border pattern in which the number of colors is already limited, and develop this area repeatedly to create the border pattern. This process is an example of editing the border pattern using only the desired area within an original border pattern. Next, for example, the pattern data shown in the lower left of Fig. 2 is filled up with no space formed therein, to develop the border pattern. In addition, a process for facilitating the knitting operation of the flat knitting machine 32 may be performed. For example, when a process of knitting a row of stitches by supplying the colored yarns from the carriers is called "one course," the number of courses is preferably an even number for each colored yarn. Here, the developing part 24 corrects the number of courses of each colored yarn to an even number, or performs other processing. Although Fig. 2 displays a front body of a sweater, the border pattern may be developed similarly on the front body and back body of a knit fabric or a sweater in which its front body and back body are connected seamlessly.

[0026] Fig. 3 shows a border pattern designing program 40 according to the embodiment. The program 40 is executed by a computer, such as the knit designing device, which as the original image input means, the color monitor, the stylus or mouse for specifying a position on the color monitor, and the like. The program 40 realizes, on an appropriate computer, the color extraction part 14, the image operation part 16, the developing part 24 and the like of the knit designing device 2 shown in Fig. 1. A color extraction area accepting command 41 accepts that the operator specifies the color extraction area on the natural image displayed on the color monitor, and accepts modifications or confirmation made on the color extraction area by the operator when the preview image is displayed. A color extraction command 42 extracts colors from the color extraction area that is tentatively specified or confirmed. A preview image creation command 43 creates the preview image in which the extracted colors are arranged in the form of stripes, and displays the preview image on the color monitor. An image operation command 44 performs the operations of rotating the color extraction area 90°, for example, converting the

colors of the color extraction area or preview image in a color space, deleting or modifying a color specified by the operator, and expanding, contracting or bending the color extraction area. A developing command 45 places a limit on the types of colors within the border pattern, and repeats the border pattern so as to fill up the pattern of the knit fabric to obtain the design data of the knit fabric. The design data can be converted to knitting data by means of the data converter 26 shown in Fig. 1, and used for performing loop simulation or controlling the knitting machine.

[0027] The following effects can be achieved in the embodiment.

(1) Since a variety of images such as a landscape and images of an animal and a plant can be used as the original image, the scope of creating the border pattern is extremely wide.

(2) It is enough that the color extraction area is specified on the color monitor when creating the border pattern, and thus the operations are easy.

(3) The color extraction area and the like can be modified until the border pattern that can satisfy the operator is obtained.

(4) Therefore, original and diverse border patterns can be designed easily.

(5) A border pattern is an important design in a knit fabric and thus makes the designing of a knit fabric simple.

[0028] Although the embodiment has illustrated an example of using the created border pattern in the knitting data, the present invention is not limited to this embodiment. The border pattern can be used in print data such as, for example, a knit fabric, a textile and a curtain.

Claims

1. A border pattern designing device provided with original image input means and a color monitor for displaying an original image that is input, the border pattern designing device comprising:

means for specifying a color extraction area on the original image displayed on the color monitor;

means for extracting colors contained in the color extraction area;

means for developing the extracted colors into stripes and displaying the developed colors on the color monitor in the form of a preview image so as to accept modifications or confirmation made on the color extraction area; and
means for creating a design of a border pattern in which the extracted colors are developed into stripes, when the color extraction area is confirmed.

2. The border pattern designing device according to claim 1, further comprising means for limiting a number of colors of the created border pattern, and means for developing the border pattern, which is obtained after limiting the number of colors thereof, on a pattern of a knit fabric and converting the developed border pattern to knitting data.

3. The border pattern designing device according to claim 1, wherein the color extraction area is in the form of a straight line of one-pixel width.

4. The border pattern designing device according to claim 1, wherein the color extraction area is in the form of a free-form curve that is drawn freely by an operator.

5. The border pattern designing device according to claim 1, wherein the color extraction area has a width constituted by a plurality of pixels, and the border pattern designing device further comprises means for generating a single color in a width direction on the basis of colors of the plurality of pixels in the width direction.

6. A border pattern designing method, comprising the steps of:

displaying an original image that is input on a color monitor and accepting that an operator specifies a color extraction area on the original image displayed on the color monitor;
extracting colors contained in the accepted color extraction area to develop the colors into stripes;
displaying the developed colors on the color monitor in the form of a preview image so as to accept modifications or confirmation made on the color extraction area; and
creating a design of a border pattern in which the extracted colors are developed into stripes, when the color extraction area is confirmed by the operator.

7. The border pattern designing method according to claim 6, wherein a number of colors of the created border pattern is limited, the border pattern, which is obtained after limiting the number of colors thereof, is developed on a pattern of a knit fabric, and the developed border pattern is converted to knitting data.

8. A border pattern designing program for a designing device having original image input means and a color monitor for displaying an original image that is input, the border pattern designing program comprising:

a command for accepting a color extraction area that is specified by an operator on the original

image displayed on the color monitor;
a command for extracting colors contained in
the color extraction area;
a command for developing the extracted colors
into stripes and displaying the developed colors 5
in the form of a preview image;
a command for accepting modifications or con-
firmation made on the color extraction area
when displaying the preview image; and
a command for creating a design of a border 10
pattern in which the extracted colors are devel-
oped into stripes, when the color extraction area
is confirmed.

9. The border pattern designing program according to 15
claim 8, further comprising a command for limiting a
number of colors of the created border pattern, and
a command for developing the border pattern, which
is obtained after limiting the number of colors thereof,
on a pattern of a knit fabric. 20

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FIG. 1

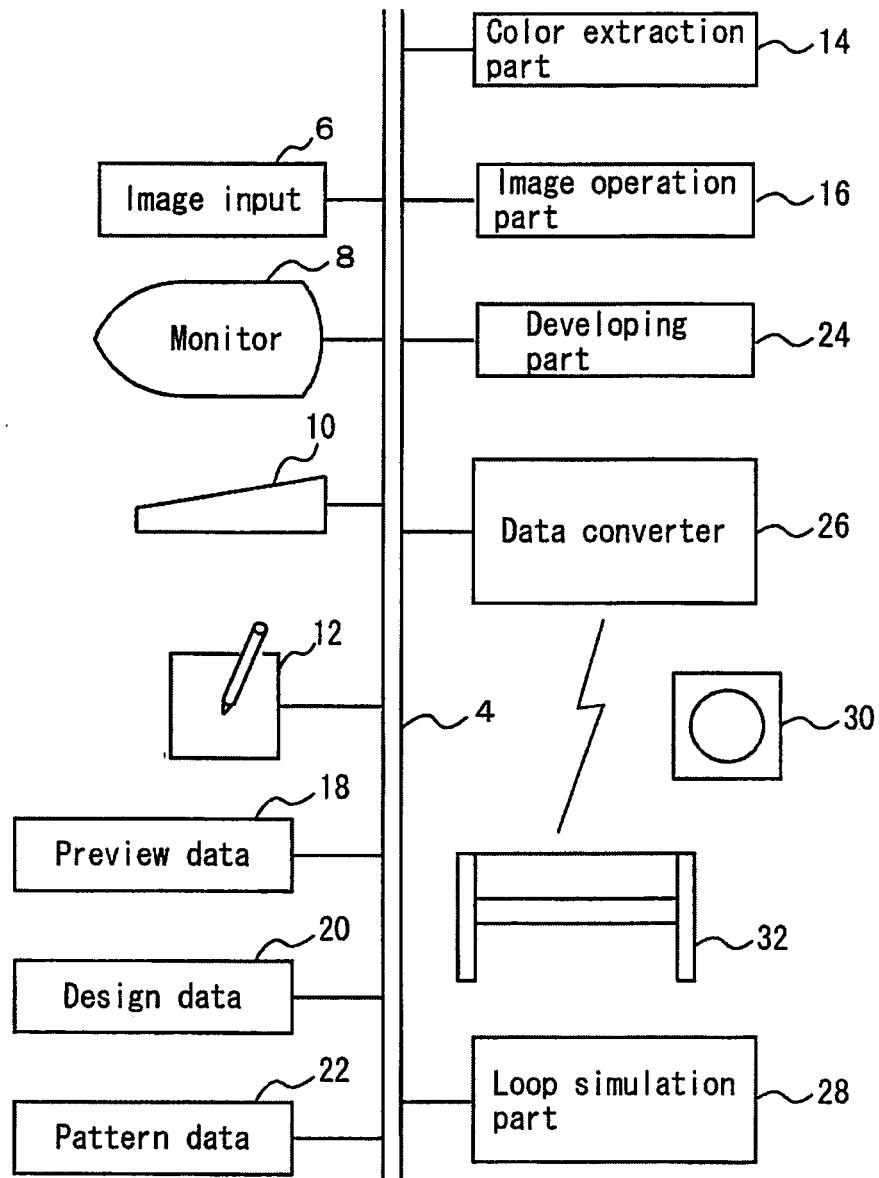
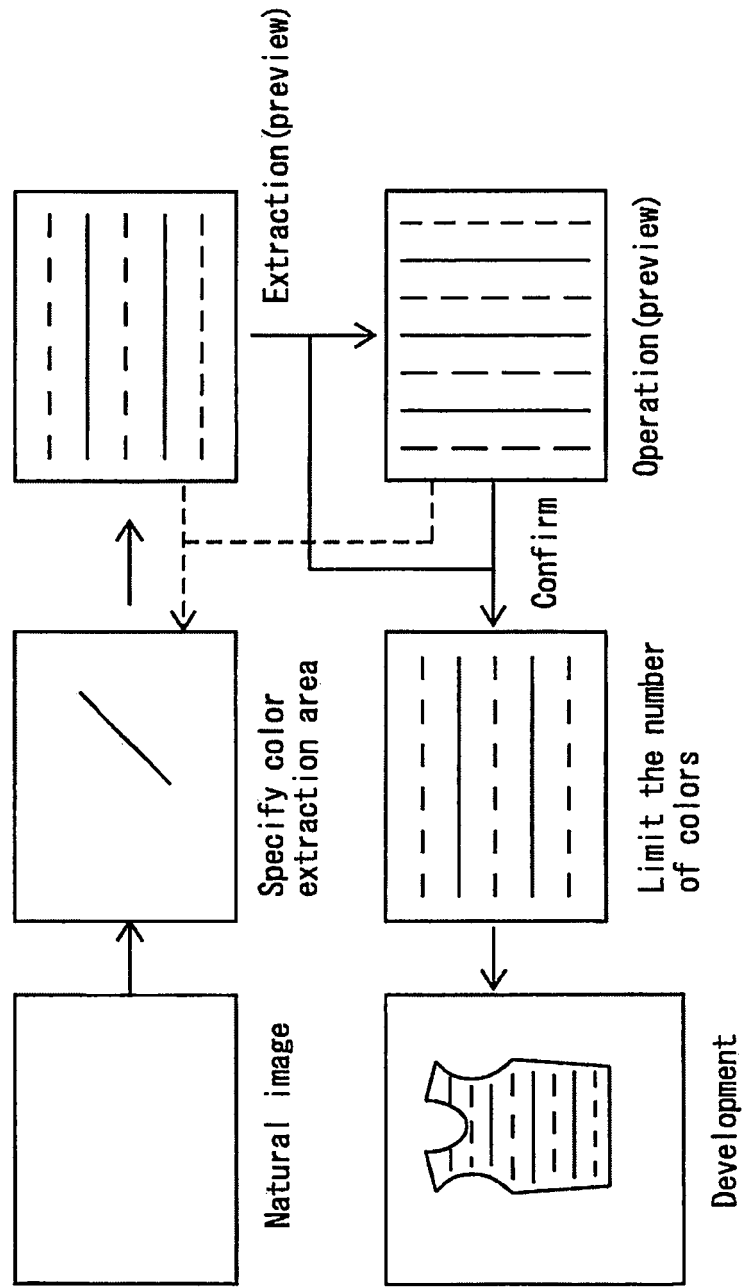
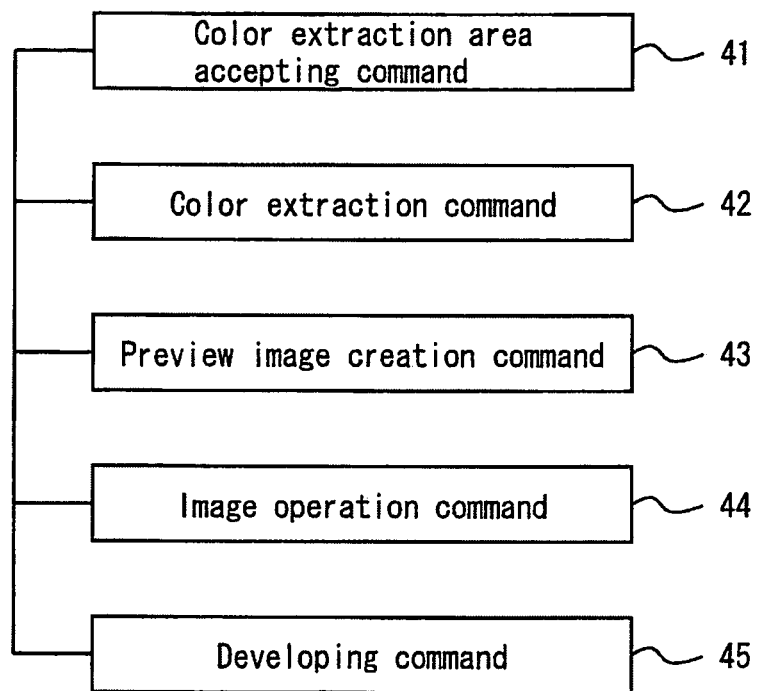


FIG. 2



F I G. 3



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/322463

A. CLASSIFICATION OF SUBJECT MATTER

G06F17/50(2006.01) i, 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)

G06F17/50, D04B35/00

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 1996-2007

Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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.
Y	JP 10-96149 A (Daiichi Knit Marketing Co., Ltd.), 14 April, 1998 (14.04.98), Full text; Figs. 1 to 3 (Family: none)	1-9
Y	JP 7-70891 A (Shima Seiki Mfg., Ltd.), 14 March, 1995 (14.03.95), Full text; Figs. 1 to 21 (Family: none)	1-9
Y	JP 2001-207355 A (Wakayama-Ken), 03 August, 2001 (03.08.01), Full text; Figs. 1 to 9 (Family: none)	1-9

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search

25 January, 2007 (25.01.07)

Date of mailing of the international search report

06 February, 2007 (06.02.07)

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