(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 808 517 A2

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**18.07.2007 Bulletin 2007/29**

(51) Int Cl.:
***D03D 51/00*** *(2006.01)* ***D03J 1/00*** *(2006.01)*

(21) Application number: **06026080.9**

(22) Date of filing: **15.12.2006**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**
Designated Extension States:
**AL BA HR MK YU**

(30) Priority: **16.01.2006 JP 2006007274**

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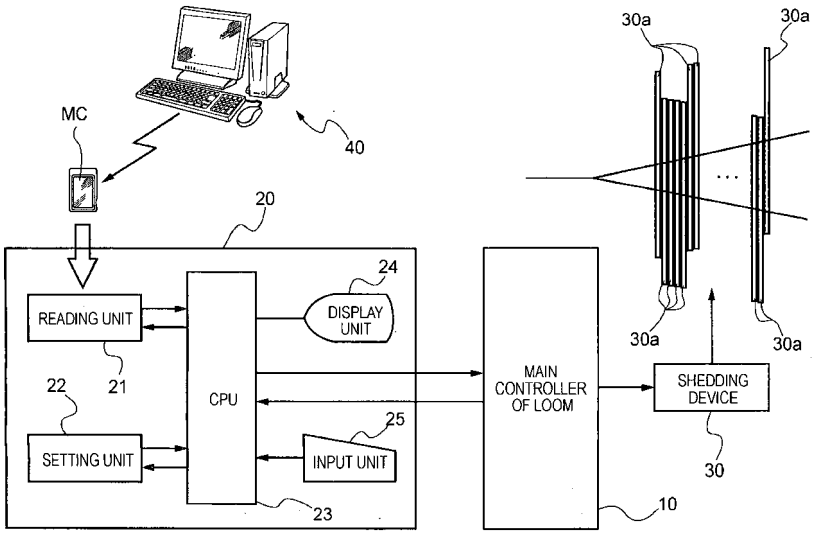
## (54) Display setting device for setting selective operating modes for weaving-related elements in a loom

(57) A display setting device is provided for setting operating modes for a plurality of weaving-related elements (30a) included in a loom, the operating modes including two selective operating modes from which one is selected for each weaving cycle in a plurality of weaving cycles. The loom further includes a setting unit (22) in which the operating modes selected for the weaving-related elements (30a) for each weaving cycle are set; and a display unit (24) that displays the selected operating modes set in the setting unit (22) for the weaving-related elements (30a) for the plurality of weaving cycles on a display window, such that the operating modes selected for the weaving-related elements (30a) are displayed for each cycle. The display setting device is characterized by including input means for setting the operating modes of the weaving-related elements (30a) selected for each weaving cycle in the setting unit (22). The input means has a function that allows display modes of the two selective operating modes for the weaving-related elements to be arbitrarily selected from a plurality of preliminarily set display modes.

FIG. 4

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## Description

### BACKGROUND OF THE INVENTION

1. Field of the Invention

**[0001]** The present invention relates to display setting devices for looms, and particularly, to a display setting device for setting display modes of selective operating modes selected for a plurality of weaving-related elements included in a loom, the operating modes including two selective operating modes from which one is selected for each weaving cycle in a plurality of weaving cycles, the loom further including a setting unit in which the operating modes selected for the weaving-related elements for each weaving cycle are set, and a display unit that displays the selected operating modes set in the setting unit for the weaving-related elements for the plurality of weaving cycles on a display window, such that the operating modes selected for the weaving-related elements are displayed for each cycle.

2. Description of the Related Art

**[0002]** The term "weaving-related elements" refers to elements used for weaving. An example of weaving-related elements is heald frames included in a shedding device. In that case, the term "two selective operating modes" refers to modes corresponding to positions of the heald frames at the time of warp shedding in weaving cycles, such that one mode corresponds to an uppermost position and the other mode corresponds to a lowermost position of the heald frames. In other words, each of the heald frames will be positioned at the uppermost position or the lowermost position at the time of warp shedding in accordance with the operating mode preliminarily selected for each weaving cycle.

**[0003]** Furthermore, other than the heald frames, the weaving-related elements may include, for example, devices included in a pile loom, such as a device for switching the pile length, a device for driving a pile tension roller, and a device for switching to ground weaving. These devices will be described below in detail.

**[0004]** Conventionally, in a loom equipped with a display device, the display device displays the operating modes selected for each weaving cycle for the plurality of weaving-related elements on a display window. Fig. 6A illustrates an example of a display content on a display window, which shows shedding patterns set in a loom that performs a weaving operation with 20 heald frames. Specifically, the set conditions related to the positions (i.e. uppermost and lowermost positions) of the first to twentieth heald frames for a plurality of shedding steps (i.e. weaving cycles) are displayed in a matrix. For each heald frame, the uppermost position and the lowermost position are displayed in different display modes such that the shedding pattern of the heald frame can be visually confirmed readily.

**[0005]** Each shedding pattern is composed or edited by an operator by means of input means and is set in a setting unit included in a display device. When composing each shedding pattern, the operator implements an input process on an editing window shown in Fig. 6B and sets one of the selective operating modes (uppermost/lowermost positions) for each heald frame for each shedding step. This setting process is implemented by changing the display mode of a box that corresponds to one heald frame with respect to one shedding step. In detail, referring to Fig. 6B, the display mode of boxes corresponding to heald frames to be set at the uppermost position for each shedding step is changed so that the display mode thereof is distinguishable from that of boxes corresponding to heald frames to be set at the lowermost position. The display mode of each of the boxes is changed by, for example, placing a cursor on the box and then operating a button.

**[0006]** As an alternative to the display device provided in the loom (such as a display device having a touch-panel display portion), the abovementioned input means may include, for example, a personal computer for composing the shedding patterns. In that case, the shedding patterns may be set in the setting unit provided in the loom by means of a storage medium, such as a memory card.

**[0007]** In a conventional loom, the two operating modes (i.e. the uppermost position and the lowermost position in a shedding pattern) of the weaving-related elements (i.e. the heald frames) are displayed such that one operating mode is distinguishable from the other regardless of the different intended purposes or different types of weaving-related elements. Consequently, in the conventional art, only one kind of changeable display mode is prepared, and the operating modes of the heald frames for each weaving cycle are distinguished from one another on the basis of whether or not the display mode for each box is changed.

**[0008]** On the other hand, regarding the shedding patterns, not all 20 heald frames are necessarily used (as the same purpose) for weaving a ground portion of a fabric. For example, of the first to twentieth heald frames, there are cases where the eighteenth to twentieth heald frames are used for weaving a selvage portion of a fabric. In such cases, with the display modes of the shedding patterns in the conventional art, the shedding patterns of the heald frames to be used for weaving the ground portion of the fabric (which will be referred to as ground frames hereinafter) and the shedding patterns of the heald frames to be used for weaving the selvage portion (which will be referred to as selvage frames hereinafter) are displayed in the same display mode. This implies that the shedding patterns of the selvage frames are not readily distinguishable from the shedding patterns of the ground frames. In particular, the more complicated the shedding patterns, the more difficult it is to distinguish the shedding patterns from one another. Consequently, when the shedding patterns of the selvage frames are to

be edited or when an operator who performs the maintenance of the loom tries to confirm the shedding patterns of the selvage frames, the shedding patterns of the desired selvage frames are not readily distinguishable, thus unfavorably requiring extra time and effort for the editing and confirmation processes.

## SUMMARY OF THE INVENTION

**[0009]** Accordingly, it is an object of the present invention to provide a display setting device in which operating patterns indicating operating modes selected for specific weaving-related elements are readily distinguishable from operating patterns of other weaving-related elements so as to facilitate the editing and confirmation processes of the operating patterns.

**[0010]** The present invention provides a display setting device for setting operating modes for a plurality of weaving-related elements included in a loom, the operating modes including two selective operating modes from which one is selected for each weaving cycle in a plurality of weaving cycles. The loom further includes a setting unit in which the operating modes selected for the weaving-related elements for each weaving cycle are set; and a display unit that displays the selected operating modes set in the setting unit for the weaving-related elements for the plurality of weaving cycles on a display window, such that the operating modes selected for the weaving-related elements are displayed for each cycle. The display setting device is characterized by including input means for setting the operating modes of the weaving-related elements selected for each weaving cycle in the setting unit. The input means has a function that allows display modes of the two selective operating modes for the weaving-related elements to be arbitrarily selected from a plurality of preliminarily set display modes.

**[0011]** Furthermore, the input means may have a restricting function for restricting the selection of the display modes such that when one of the two selective operating modes is to be input for at least two of the weaving-related elements having the same operating mode for at least one of the weaving cycles, the same display mode is set for the same operating mode for the at least two of the weaving-related elements.

**[0012]** Furthermore, the input means may allow input of information related to each of the weaving-related elements and may set the information in the setting unit. In that case, the display unit may display the information of a selected one of the weaving-related elements.

**[0013]** According to the display setting device for setting the operating modes for the weaving-related elements in the loom of the present invention, an operating pattern indicating the operating modes selected for a plurality of weaving cycles for a specific weaving-related element can be arbitrarily set to a display mode that is different from display modes set for operating patterns of other weaving-related elements. Therefore, the operating pattern (indicating the selective operating modes) of the specific weaving-related element is readily distinguishable from the operating patterns of other weaving-related elements, thereby facilitating the editing and confirmation processes for the operating pattern of the specific weaving-related element.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]**

Fig. 1 is a schematic diagram illustrating a first embodiment of the present invention;
Fig. 2 is a schematic diagram illustrating the first embodiment of the present invention;
Fig. 3 is a schematic diagram illustrating the first embodiment of the present invention;
Fig. 4 is a block diagram illustrating a loom according to the first embodiment of the present invention;
Fig. 5 is a schematic diagram illustrating a second embodiment of the present invention; and
Figs. 6A and 6B are schematic diagrams illustrating a conventional example.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0015]** Embodiments of the present invention will now be described with reference to the drawings.

**[0016]** Figs. 1 to 4 illustrate a first embodiment of the present invention. In the first embodiment, weaving-related elements correspond to heald frames in a shedding device, and a display device displays shedding patterns of the heald frames. One shedding pattern is given to each weaving-related element (i.e. one heald frame) and is defined by operating modes selected for the weaving-related element for a plurality of weaving cycles. Specifically, each operating mode in a shedding pattern corresponds to an upper or lower position selected for one weaving-related element for one weaving cycle. Furthermore, in the drawings, a loom performs a weaving operation using 20 heald frames 30a, and these heald frames 30a are driven vertically by a shedding device 30, such as an electronic dobby shedding device and an electric shedding device, for electrically driving the heald frames 30a. Moreover, referring to Fig. 4, each shedding pattern is composed using a shedding-pattern composing device defined by a personal computer 40 that is independent of the loom, and is set in a display device 20 by means of a storage medium MC, such as a memory card.

**[0017]** The storage medium MC storing the shedding patterns composed using the personal computer 40 is inserted into a reading unit 21 in the display device 20 where the shedding patterns are read. The shedding patterns are then set in a setting unit 22 via a CPU 23. Accordingly, in the first embodiment, the personal computer 40 (more precisely, the personal computer 40 and a pattern composing program (software) run by the personal computer 40), the storage medium MC, and the reading unit 21 correspond to input means for setting the shed-

ding patterns in the setting unit 22. However, the input means according to the present invention is not limited to the above. For example, the shedding patterns may entirely be composed in the display device 20 provided in the loom. Consequently, the input means is not limited as long as it allows the shedding patterns to be set in the setting unit 22 and be editable.

**[0018]** When an operator operates an input unit 25 to send a display command from the input unit 25 to the CPU 23, the CPU 23 reads out the shedding patterns set in the setting unit 22 and commands a display unit 24 to display the shedding patterns.

**[0019]** Furthermore, in response to a request from a main controller 10 of the loom, the shedding patterns set in the setting unit 22 are output to the main controller 10 via the CPU 23. In accordance with the shedding patterns, the main controller 10 outputs a signal corresponding to the selected operating modes of the heald frames 30a to the shedding device 30 for every weaving cycle. Based on the signal from the main controller 10, the shedding device 30 vertically moves the heald frames 30a at predetermined timings.

**[0020]** A composing (editing) process of the shedding patterns using the personal computer 40 will be described below.

**[0021]** First, the operator commands the personal computer 40, to display a pattern-editing window on a display screen thereof, as shown in Fig. 1. Although the pattern-editing window is shown in a state where the shedding patterns are already set in Fig. 1, all boxes 51 arranged in a matrix are actually displayed in white in an initial state.

**[0022]** The pattern-editing window in Fig. 1 will be described in more detail. The left section of the window having the boxes 51 arranged in a matrix is where the shedding patterns are to be set. This section will be referred to as a box section hereinafter. The numerals written in a number section 52 provided above the box section indicate the numbers given to the heald frames 30a in correspondence to the boxes 51. In other words, a column of boxes 51 given a numeral 1 represents an operating pattern of a first heald frame 30a, while a column of boxes 51 given a numeral 20 represents an operating pattern of a twentieth heald frame 30a.

**[0023]** Furthermore, a number section 53 to the left of the box section provides step numbers for the shedding patterns. The step numbers for the shedding patterns indicate the order of shedding conditions that proceed in units of one weaving cycle. Consequently, each row in the box section shows the upper/lower positions of the heald frames 30a at the time of warp shedding in one weaving cycle.

**[0024]** Furthermore, a display box 54 provided at an upper portion of the pattern-editing window shows the number of heald frames 30a used for weaving, and a display box 61 shows information related to one of the heald frames 30a.

**[0025]** In the pattern-editing window, the setting (composing) process for the shedding patterns is implemented by determining whether the heald frames 30a are to be positioned at the uppermost position or lowermost position at the time of warp shedding for each shedding step and then, for example, changing the display color of the boxes 51 that correspond to the heald frames 30a to be positioned at the uppermost position (or the lowermost position). The display color can be changed by placing a cursor 56 on a desired box 51 and then operating a button to change the display mode of the box 51.

**[0026]** The cursor 56 may be manipulated by using cursor-controlling buttons 62 provided at the right side of the pattern-editing window or by using cursor keys provided on a keyboard of the personal computer 40. Furthermore, the display mode of each box 51 may be changed by using an upper-position designation button 63a or a lower-position designation button 63b provided at the right side of the pattern-editing window or by using specific positional designation keys provided on the keyboard of the personal computer 40. Alternatively, if possible, the display mode may be changed by using, for example, a mouse to place a pointer directly on a desired box 51 and then clicking a button provided on the mouse.

**[0027]** Accordingly, the upper or lower position (i.e. selective operating mode) of each of the heald frames 30a (i.e. the first to twentieth heald frames 30a) is set for each shedding step (each weaving cycle). As mentioned above, if the eighteenth to twentieth heald frames 30a of the 20 heald frames 30a are to be used as selvage frames, it may be difficult only from the above-described setting process to distinguish the shedding patterns of the heald frames used as ground frames from the shedding patterns of the heald frames used as selvage frames on the displayed window. This may make it difficult to perform the subsequent confirmation process.

**[0028]** Therefore, in the present invention, the input means is provided with a function for changing the display mode of the shedding patterns of specific heald frames (i.e. the selvage frames corresponding to the eighteenth to twentieth heald frames in the first embodiment) so that the shedding patterns thereof can be displayed in a mode different from that of the shedding patterns of the remaining heald frames (i.e. the ground frames corresponding to the first to seventeenth heald frames in the first embodiment).

**[0029]** In detail, after setting the operating modes of the heald frames 30a for each shedding step, a color setting button 64 provided at a lower right portion of the pattern-editing window is operated. Thus, a color-setting window opens on the display screen of the personal computer 40, as shown in Fig. 2. For the selected operating modes of the heald frames 30a, a display color to indicate the uppermost position and a display color to indicate the lowermost position can be arbitrarily selected from a plurality of preliminarily set colors provided on the color-setting window. For the sake of convenience, the boxes shown in the drawing are given different markings and different reference characters to indicate that they are

displayed in different colors. However, in an actual device, the boxes are fully distinguishable simply from the different colors. In Fig. 2, the reference characters B, W, Y, G, O, R, N, P indicate eight settable colors, which are blue, white, yellow, green, orange, red, navy, and purple, respectively.

**[0030]** In the color-setting window in Fig. 2, a display color indicating the uppermost position and a display color indicating the lowermost position in the shedding pattern for each of the first to twentieth heald frames 30a are displayed in corresponding color designation sections 71. By changing the color displayed in each color designation section 71, the display color of the corresponding shedding pattern set in the pattern-editing window in Fig. 1 switches to the display color changed in the color-setting window in Fig. 2.

**[0031]** For the eighteenth to twentieth heald frames 30a, which serve as selvage frames, the display color indicating the uppermost position and the display color indicating the lowermost position in the shedding patterns thereof are set different from those of the remaining heald frames 30a so that the shedding patterns of these specific heald frames 30a can be readily distinguished from the shedding patterns of the remaining heald frames 30a. This facilitates the subsequent editing and confirmation processes of the shedding patterns.

**[0032]** To describe the drawing in more detail, for example, the setting process of the shedding patterns is implemented in a state where the display colors are not designated in the pattern-editing window in Fig. 1 (i.e. default setting). As a result, the shedding patterns for all the heald frames 30a are displayed in a manner such that the boxes 51 corresponding to the heald frames 30a to be positioned at the uppermost position are set in blue (B) and the boxes 51 corresponding to the heald frames 30a to be positioned at the lowermost position are set in white (W) for each weaving cycle. In this state where the display colors are not yet changed, the color designation sections 71 corresponding to the eighteenth to twentieth heald frames 30a in the color-setting window in Fig. 2 have their display color indicating the uppermost position displayed in blue and their display color indicating the lowermost position displayed in white, which are the same as for the remaining heald frames 30a. From this state, the display colors of the color designation sections 71 corresponding to the eighteenth to twentieth heald frames 30a are changed to yellow (Y) for the uppermost position and to green (G) for the lowermost position. As a result, of the shedding patterns set in the pattern-editing window in Fig. 1, the display mode of the shedding patterns for the eighteenth and twentieth heald frames 30a is changed to the display mode shown in Fig. 3, whereby the shedding patterns of the eighteenth and twentieth heald frames 30a are readily distinguishable from the shedding patterns of the remaining heald frames 30a.

**[0033]** With respect to the color designation sections 71 in the color-setting window shown in Fig. 2, the display color indicating the uppermost position and the display color indicating the lowermost position are individually changeable for each of the heald frames 30a. This color changing process is implemented by placing a cursor 72 on a color designation section 71 that corresponds to a heald frame 30a whose display color indicating the uppermost position or display color indicating the lowermost position is to be changed, selecting a desired color from the plurality of colors indicated by color designation buttons 73 provided at the lower right portion of the window, and then operating an enter button 74 provided below the color designation buttons 73 so as to change the display color of the section designated by the cursor 72. This color changing process is performed for all the heald frames 30a whose display color is to be desirably changed. Subsequently, by operating an enter button 75 provided at the upper right portion of the window, the changed contents are reflected in the shedding patterns set in the pattern-editing window.

**[0034]** In the above example, the color changing process for the display colors in the color-setting window in Fig. 2 is performed after the shedding patterns are set in the pattern-editing window in Fig. 1. Alternatively, the color changing process and the setting process of the shedding patterns may be reversed. In other words, prior to setting the shedding patterns in the pattern-editing window, the display colors for the specific heald frames 30a may be set different from those of the remaining heald frames 30a in the color-setting window shown in Fig. 2. Thus, in the course of setting the shedding patterns, the display mode for the specific heald frames 30a is set different from that for the remaining heald frames 30a by simply selecting between the uppermost position and the lowermost position for the specific heald frames 30a.

**[0035]** Furthermore, in addition to the aforementioned function for changing the display mode, the input means according to the present invention may be provided with a function for displaying information of each of the heald frames 30a. Specifically, the color-setting window in Fig. 2 has information input sections 76 that are provided to the right of the color designation sections 71. Information related to the heald frames 30a can be freely input to the corresponding information input sections 76. The information related to each heald frame 30a input to the corresponding information input section 76 can be displayed in the display box 61 provided in the pattern-editing window shown in Figs. 1 and 3. In Fig. 2, the term "main" input to the information input sections 76 represents heald frames used for weaving a ground portion of a fabric, whereas the term "selvage" represents heald frames used for weaving a selvage portion.

**[0036]** In order to display the information in the display box 61, a cursor 57 is set on a numeral corresponding to a number given to a desired heald frame 30a in the number section 52 having the plurality of numerals corresponding to the numbers given to the heald frames 30a in the pattern-editing window. Consequently, for the heald frame 30a designated by the cursor 57, the display box 61 displays the information input to the correspond-

ing information input section 76. According to this function, the contents of the heald frames 30a given different display colors can be readily grasped, thereby allowing the shedding patterns to be more easily distinguishable.

**[0037]** As described above, in the color-setting window shown in Fig. 2, a display color to indicate the uppermost position and a display color to indicate the lowermost position in each shedding pattern can be arbitrarily selected. However, when a display color is selected for one of the two operating modes (i.e. the mode corresponding to the uppermost position) for the specific heald frames, it is not desirable to select the same display color for the other operating mode (i.e. the mode corresponding to the lowermost position) for the remaining heald frames since this may be extremely confusing. In other words, with regard to the eighteenth to twentieth heald frames 30a in the above example, if the display color indicating the uppermost position is changed to white, which is used as a display color for indicating the lowermost position for the remaining heald frames 30a, and the display color indicating the lowermost position is changed to blue, which is used as a display color for indicating the uppermost position for the remaining heald frames 30a, the shedding patterns will be displayed in an inverted-like state on the window. For those other than the operator who had changed the display colors, it may be difficult to determine whether the shedding patterns themselves have been inverted or the display colors simply have been changed, thus leading to confusion.

**[0038]** Such a problem may be rare if only a small number of designated display colors are used and if it can be readily confirmed that the same display color is used for different operating modes. However, if a large number of designated display colors are used, there is a high possibility of accidental errors in the setting process. Moreover, even if a small number of designated display colors are used, there may still be a possibility of such accidental errors in the setting process due to carelessness of the operator. In order to prevent this problem from occurring, the input means is additionally provided with a restricting function for the setting of the display colors.

**[0039]** In detail, this restricting function may be incorporated in the input means as a program for restricting a display color set to indicate the uppermost position (or the lowermost position) for a certain heald frame from being selected as a display color for indicating the lowermost position (or the uppermost position) for another heald frame. The same applies to a case where a previously set display color is to be changed.

**[0040]** Furthermore, the set display modes for the operating modes of the heald frames 30a are preferably stored together with the shedding patterns. Specifically, in the example shown in Fig. 2, the display color for indicating the uppermost position and the display color for indicating the lowermost position of the heald frames 30a set in the color designation sections 71 are preferably stored together with the shedding patterns.

**[0041]** In other words, after the setting processes for the shedding patterns and the display modes are completed in the above-described manner, there may be a case where the shedding patterns and the display modes are stored in, for example, the personal computer 40 or the CPU 23 in the display device 20 of the loom based on the assumption that the composed shedding patterns may be used afterward. In that case, if only the shedding patterns are stored but not the set display modes for the operating modes of the heald frames 30a, when the stored shedding patterns are to be used again by rereading or to be re-edited, the setting process for the display modes will need to be performed again. In contrast, if the set display modes are stored together with the corresponding shedding patterns as described above, such a setting process for the display modes does not need to be performed again.

**[0042]** A second embodiment of the present invention will now be described. Although the weaving-related elements are defined by the heald frames, and the two selective operating modes of the weaving-related elements for each weaving cycle correspond to the upper and lower positions of the heald frames in the first embodiment, the present invention is not limited to the above. For example, in a loom for weaving a fabric, such as a towel, which is different from a normal fabric, there are provided other weaving-related elements that are driven by being switched selectively between two operating modes in addition to the heald frames. In this case, the display device may display signal strings to be used for a plurality of weaving cycles, in which the signal in each signal string commands an operation of the corresponding weaving-related element for one weaving cycle.

**[0043]** Referring to Fig. 5, the signal strings are displayed in a box section provided at the right side of the window and having a plurality of boxes 81 arranged in a matrix. A number section 82 provided above this box section includes characters E, E, G, ..., 10, 11 that are assigned to the corresponding weaving-related elements given the signal strings. Each column of boxes 81 given one of the characters represents a signal string including operation command signals to be sent to the weaving-related element corresponding to the character for a plurality of weaving cycles, each operation command signal corresponding to one weaving cycle. In each signal string, the command signals are displayed as ON or OFF with different display modes for a plurality of weaving cycles.

**[0044]** The weaving-related elements may be, for example, devices included in a pile loom, such as a long/short pile switching device, a terry motion device, a weft feeler device, and a tuck-in device.

**[0045]** A long/short pile switching device is a device for switching a pile length of a towel to be woven between two levels, which are long and short levels. In detail, a long/short pile switching device switches the reed shift (i.e. a distance between the cloth fell and the beating

position at the time of loose-pick beating) between two levels. When an operation command signal is ON, the long/short pile switching device sets the reed shift to an amount corresponding to a short pile length, whereas when an operation command signal is OFF, the long/short pile switching device sets the reed shift to an amount corresponding to a long pile length. Accordingly, the two operating modes in the long/short pile switching device include a mode for forming short piles and a mode for forming long piles, and these two operating modes correspond to ON and OFF command signals for the long/short pile switching device. For each weaving cycle, a command signal is selected as ON or OFF so as to set the output state of the signal. The set conditions of the command signals for the plurality of weaving cycles are then displayed as a signal string. When performing a weaving operation other than pile weaving, such as ground weaving, the command signals remain in an ON state.

**[0046]** In a terry motion device, the two operating modes include a mode for performing terry motion and a mode for not performing terry motion. In other words, regarding a cloth-shifting-type pile loom in which one pile forming cycle corresponds to three picks, the terry motion device performs terry motion by driving the cloth guide roller and the like in a manner such that the cloth fell is positioned distant from the beating position for two beating operations and is positioned at the beating position for the subsequent beating operation. On the other hand, when performing a weaving operation other than pile weaving, such as ground weaving, the cloth guide roller and the like are maintained at a stop position without performing such terry motion so that the cloth fell is constantly set at the beating position. The two operating modes including a mode for performing terry motion and a mode for not performing terry motion depend on a command signal sent to the terry motion device. Similar to the above, this command signal is set as ON or OFF for each weaving cycle. The set conditions of the command signals for the plurality of weaving cycles are then displayed as a signal string.

**[0047]** Regarding a weft feeler device, since a weft insertion error in pile weaving is too unnoticeable to be determined as a weaving defect, a single weft insertion error may be overlooked. On the other hand, if two consecutive weft insertion errors are detected, a detection signal may be output. In this case, the two operating modes include operating modes for performing and not performing a detecting operation for overlooking such a single weft insertion error, and are determined based on whether a command signal is ON or OFF. This command signal is set as ON or OFF for each weaving cycle. The set conditions of the command signals for the plurality of weaving cycles are then displayed as a signal string.

**[0048]** Regarding a tuck-in device, during pile weaving, there may be a case where a tuck-in operation is not performed for each weaving cycle, but is performed collectively on a plurality of weft yarns after each pile forming cycle. There may also be a case where a tuck-in operation is performed multiple times during each pile forming cycle. On the other hand, when performing a weaving operation other than pile weaving, such as ground weaving, the tuck-in operation is performed for every weaving cycle. Accordingly, a tuck-in device in a pile loom performs a tuck-in operation at different timings depending on the weaving conditions, and the tuck-in operation is controlled on the basis of whether a command signal is ON or OFF. Similar to the above, this command signal is set as ON or OFF for each weaving cycle. The set conditions of the command signals for the plurality of weaving cycles are then displayed as a signal string.

**[0049]** The devices mentioned above are only examples, and weaving-related elements to which the present invention can be applied are not limited to these devices. The weaving-related elements may include any type of devices included in a loom, in which one of two operating modes is selectable on the basis of whether a command signal set for each weaving cycle is ON or OFF.

**[0050]** Referring to Fig. 5, with regard to the command signals for the plurality of weaving-related elements, the signal strings indicating the ON/OFF set conditions for the plurality of weaving cycles are displayed in a manner such that the display mode (display color) for the signal strings having command signals for specific weaving-related elements is set different from the display mode for the signal strings having command signals for the remaining weaving-related elements, as in the first embodiment. Accordingly, the set conditions of the selective operating modes for the specific weaving-related elements can be readily distinguished from the set conditions for the remaining weaving-related elements.

**[0051]** The color changing process may be performed using the color-setting window shown in Fig. 2 in a manner similar to the first embodiment. However, in the color-setting window shown in Fig. 2, a selecting section 77 provided at the upper left portion of the window is shown in a state where "FRAME" is selected, such that the display window shown in Fig. 2 corresponds to "FRAME". On the other hand, by selecting "SIGNAL" in the selecting section 77, another display window is displayed which corresponds to the characters E, E, G, ..., 10, 11 in the number section 82 assigned to the corresponding weaving-related elements in Fig. 5. In this display window, the display colors can be changed as in the first embodiment. Moreover, by inputting information related to, for example, the name of each weaving-related element given the corresponding character into a corresponding information input section, the input information can be displayed on the display box 61, whereby the signal string of the subject weaving-related element can be readily grasped.

**[0052]** The above description is directed to a case where the color in the boxes is changeable in order to provide different display modes for allowing the selected operating modes of the weaving-related elements (i.e. the upper/lower positions of the heald frames or the ON/OFF conditions of the signals) to be distinguishable.

However, the plurality of display modes in the present invention is not limited to the above. Alternatively, for example, the boxes may be given hatchings such that the boxes are distinguishable based on different types of hatchings. In other words, the plurality of display modes in the present invention may include any kind of modes that have visually distinguishable characteristics.

**[0053]** The technical scope of the present invention is not limited to the above embodiments, and modifications are permissible within the scope and spirit of the present invention.

## Claims

1. A display setting device for setting operating modes for a plurality of weaving-related elements (30a) included in a loom, the operating modes including two selective operating modes from which one is selected for each weaving cycle in a plurality of weaving cycles, the loom further including a setting unit (22) in which the operating modes selected for the weaving-related elements (30a) for each weaving cycle are set; and a display unit (24) that displays the selected operating modes set in the setting unit (22) for the weaving-related elements (30a) for the plurality of weaving cycles on a display window, such that the operating modes selected for the weaving-related elements (30a) are displayed for each cycle, wherein the display setting device is **characterized by** comprising input means for setting the operating modes of the weaving-related elements (30a) selected for each weaving cycle in the setting unit (22), and wherein the input means has a function that allows display modes of the two selective operating modes for the weaving-related elements to be arbitrarily selected from a plurality of preliminarily set display modes.

2. The display setting device according to Claim 1, wherein the input means has a restricting function for restricting the selection of the display modes such that when one of the two selective operating modes is to be input for at least two of the weaving-related elements (30a) having the same operating mode for at least one of the weaving cycles, the same display mode is set for said same operating mode for said at least two of the weaving-related elements (30a).

3. The display setting device according to one of Claims 1 and 2, wherein the input means allows input of information related to each of the weaving-related elements (30a) and sets the information in the setting unit (22), and
wherein the display unit (24) displays the information of a selected one of the weaving-related elements (30a).

FIG. 1

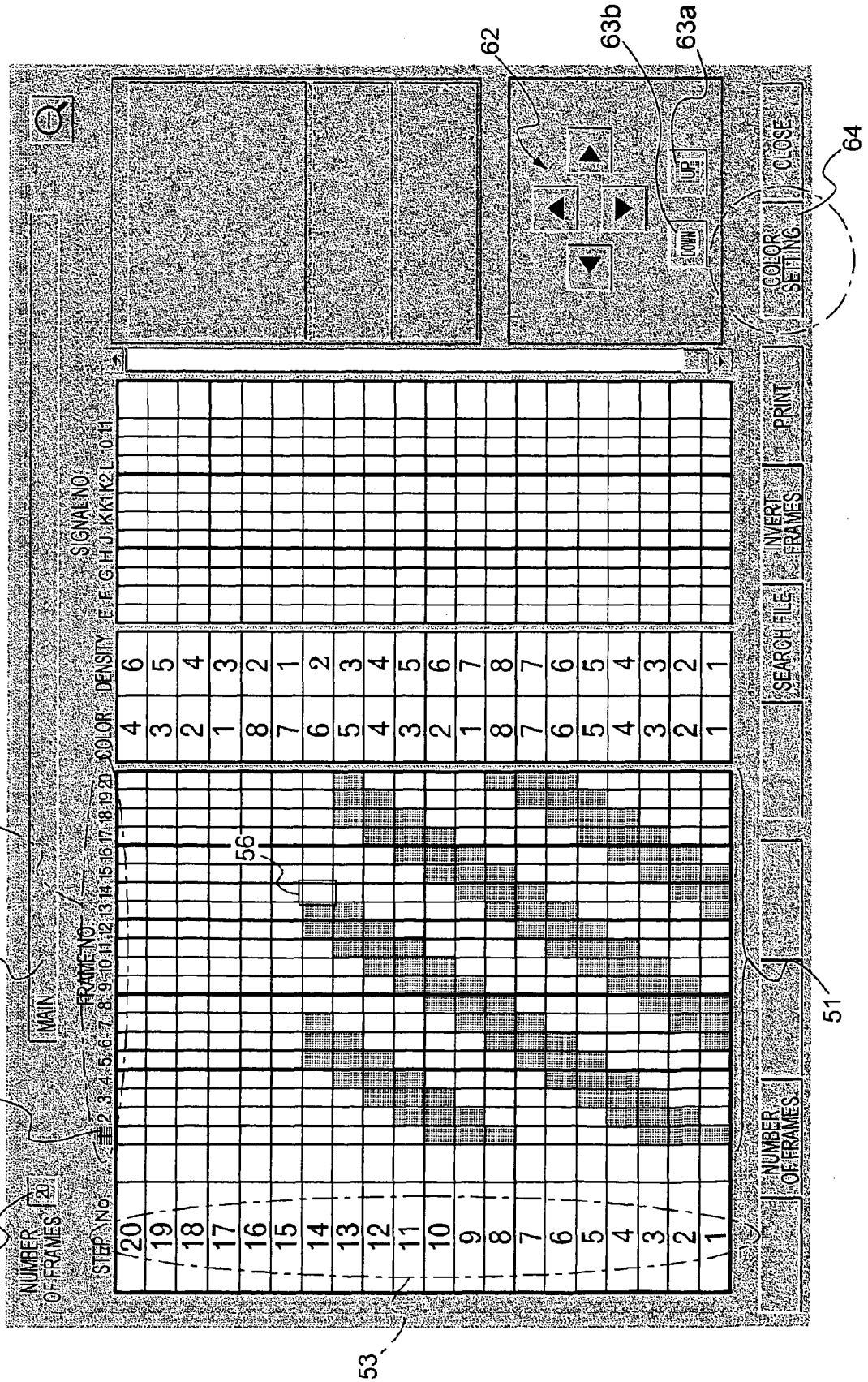

62
63b
63a
64
52
61
57
54
56
53
51
MAIN
FRAME NO.
SIGNAL NO.
COLOR DENSITY
STEP No.
NUMBER OF FRAMES
20
UP
DOWN
COLOR SETTING
CLOSE
INVERT FRAMES
PRINT
SEARCH FILE
NUMBER OF FRAMES

FIG. 2

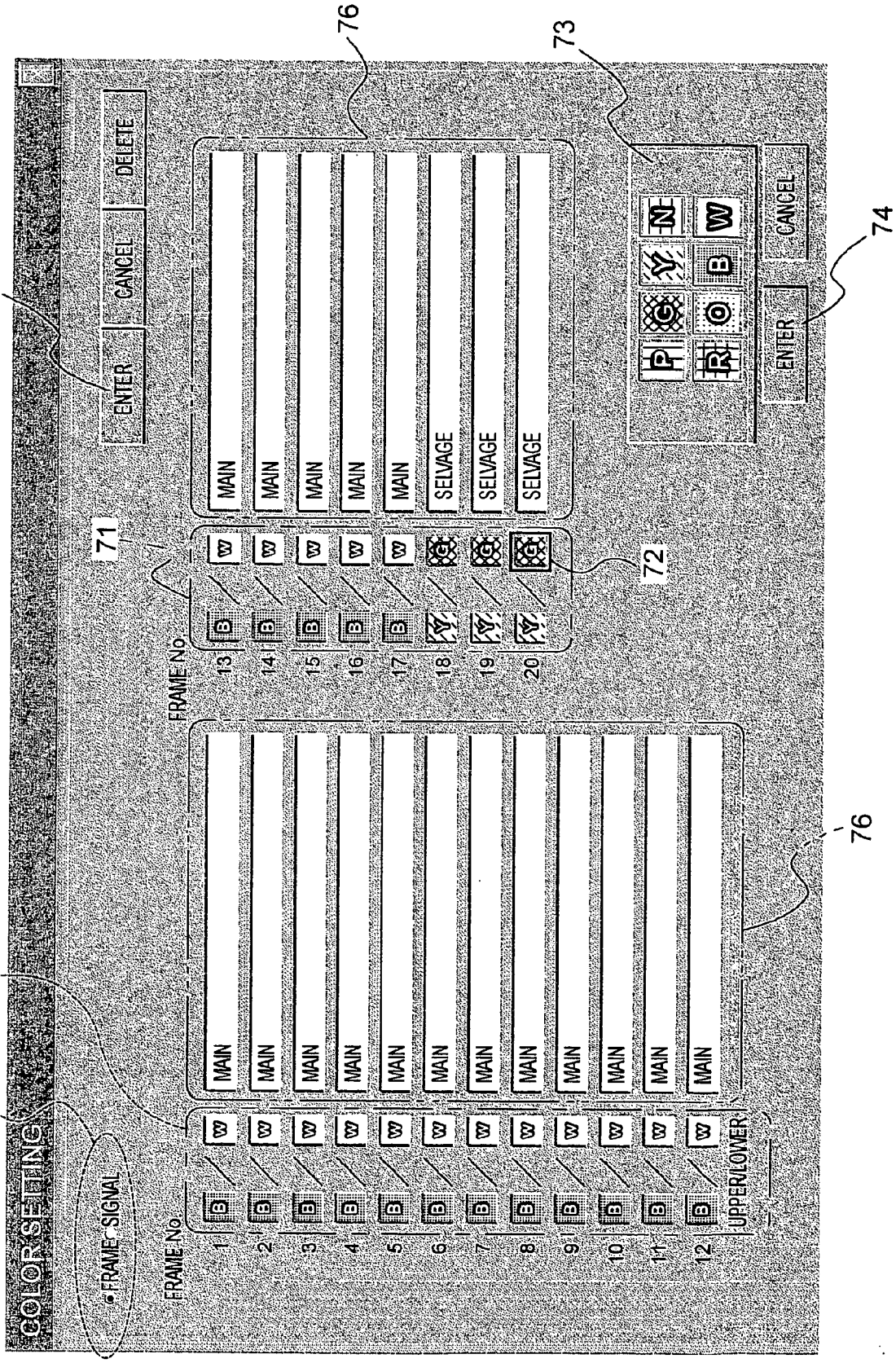

COLOR SETTING
FRAME SIGNAL
ENTER
CANCEL
DELETE
FRAME No.
MAIN
SELVAGE
UPPER/LOWER
P
R
G
O
Y
B
N
W
ENTER
CANCEL
71
72
73
74
75
76
77

FIG. 3

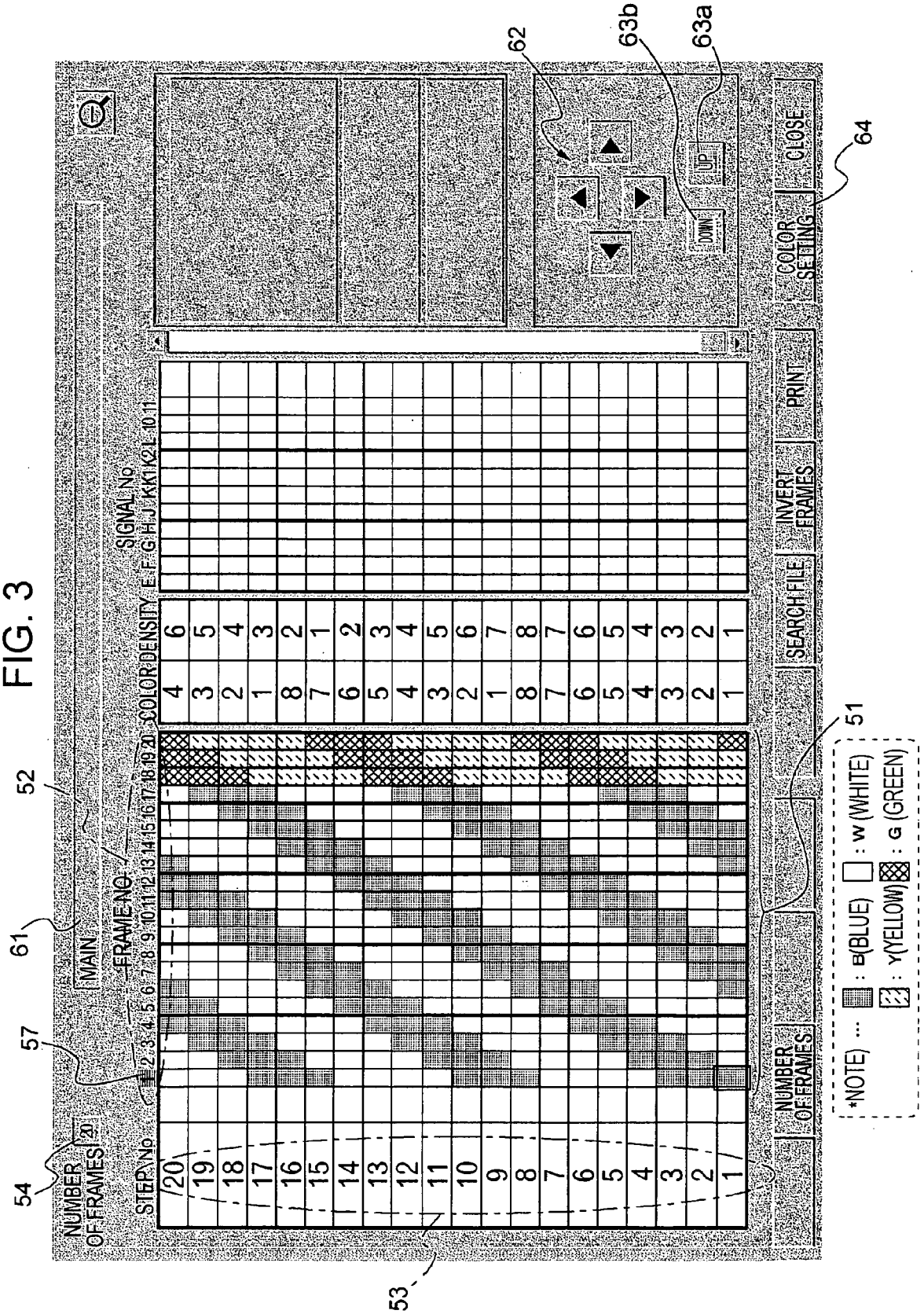

54
NUMBER OF FRAMES
20
57
61
MAIN
52
FRAME NO.
SIGNAL No.
COLOR DENSITY
SEARCH FILE
INVERT FRAMES
PRINT
COLOR SETTING
CLOSE
62
63b
63a
64
UP
DOWN
NUMBER OF FRAMES
53
51
*NOTE) ... : B(BLUE) : W (WHITE)
: Y(YELLOW) : G (GREEN)

FIG. 4

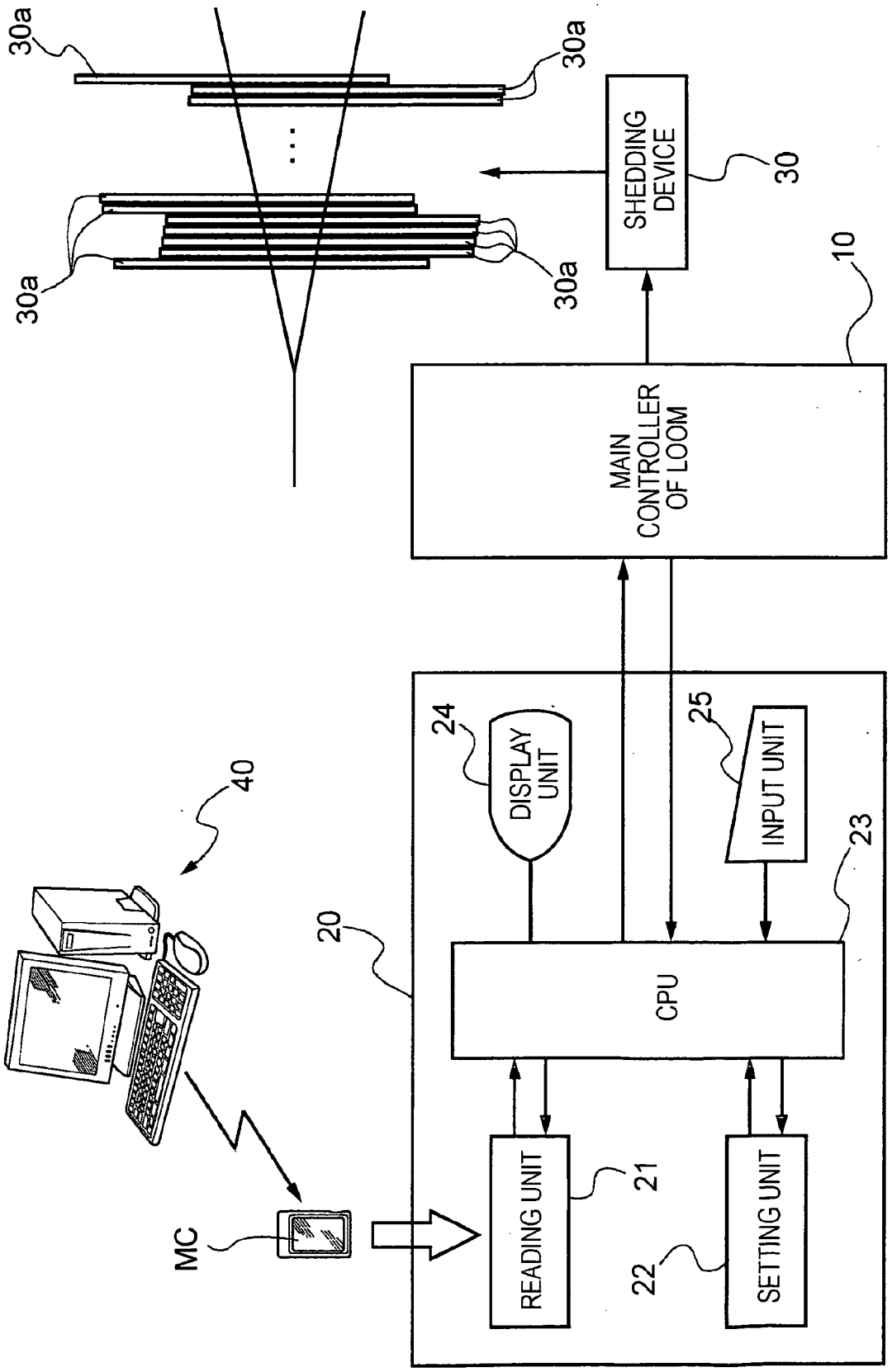

30a
30a
30a
30a
SHEDDING DEVICE
30
10
MAIN CONTROLLER OF LOOM
24
DISPLAY UNIT
25
INPUT UNIT
23
40
20
CPU
MC
READING UNIT
21
22
SETTING UNIT

FIG. 5

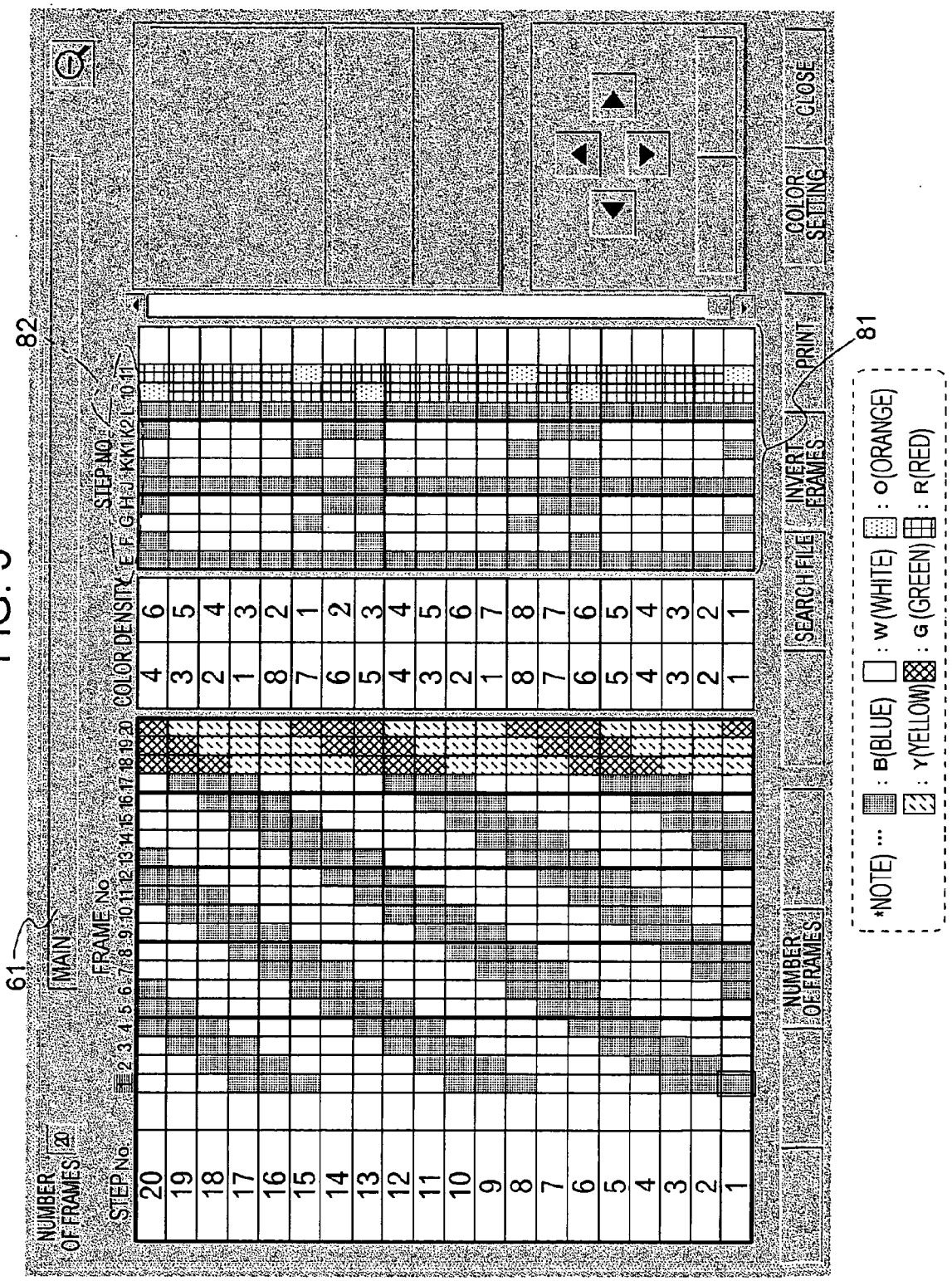

61
82
81
MAIN
NUMBER OF FRAMES
20
STEP No.
FRAME No.
COLOR DENSITY
STEP NO.
SEARCH FILE
INVERT FRAMES
PRINT
COLOR SETTING
CLOSE
NUMBER OF FRAMES
*NOTE) ... : B(BLUE) : W(WHITE) : O(ORANGE)
: Y(YELLOW) : G(GREEN) : R(RED)

FIG. 6A

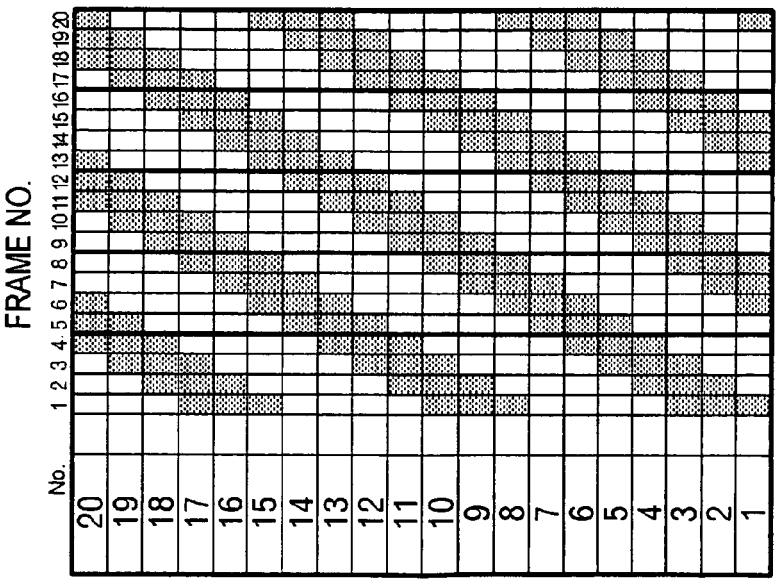
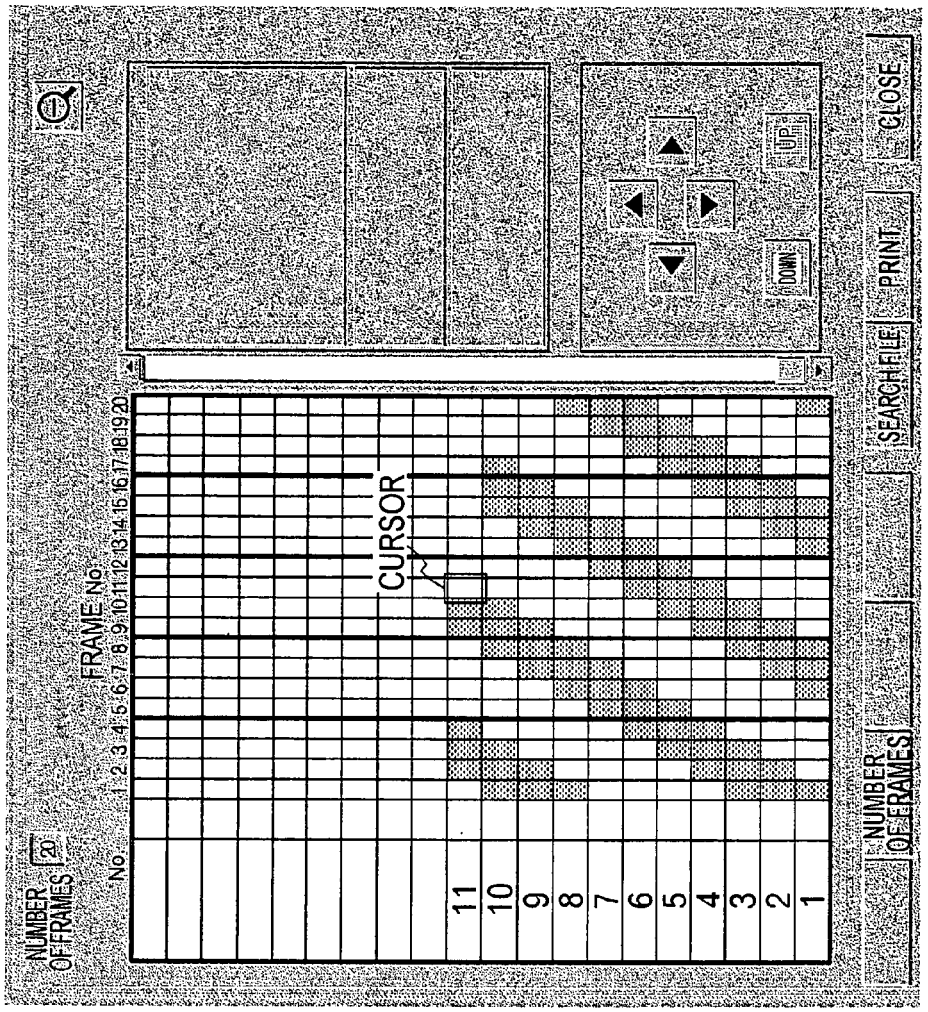

FRAME NO.
No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

FIG. 6B


NUMBER OF FRAMES 20
FRAME No.
No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
CURSOR
11 10 9 8 7 6 5 4 3 2 1
NUMBER OF FRAMES
SEARCH FILE
PRINT
CLOSE
DOWN
UP