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(54) **Shedding-pattern setting device for loom**

(57)   A shedding-pattern setting device (40) is used in a loom including a shedding device (30) capable of electrically controlling the motion of each of a plurality of heald frames (30a), the shedding device (30) being driven to move the heald frames (30a) in accordance with a shedding pattern that shows whether each heald frame (30a) is to be at an upper position or a lower position for each of a plurality of weaving cycles. The shedding-pattern setting device (40) includes a display (41) capable of displaying the shedding pattern on a display screen and a controller (42) for changing the shedding pattern on the display screen of the display (41). The controller (42) has a function of changing the shedding pattern such that patterns set for two of the heald frames (30a) are exchanged between said two of the heald frames (30a).

FIG. 3

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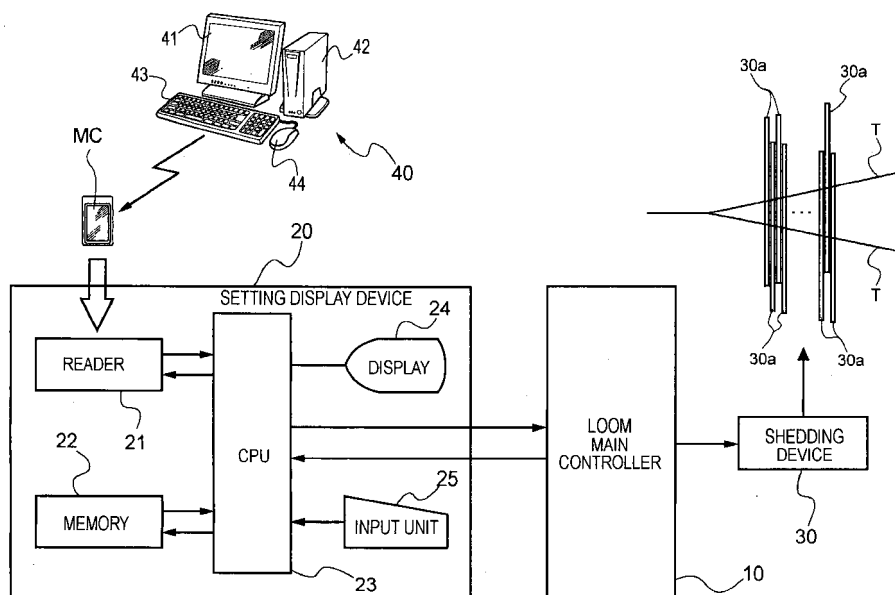
Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to shedding-pattern setting devices for looms. More particularly, the present invention relates to a shedding-pattern setting device for a loom including a shedding device capable of electrically controlling the motion of each of a plurality of heald frames. The shedding device is driven to move the heald frames in accordance with a shedding pattern that shows whether each heald frame is to be at an upper position or a lower position for each of a plurality of weaving cycles.

2. Description of the Related Art

[0002] In a typical loom including a shedding device (e.g., an electronic dobby shedding device, an electric shedding device, etc.) capable of electrically controlling the motion of each of a plurality of heald frames, the shedding device is driven in accordance with a preset shedding pattern. In a weaving process, each heald frame is moved upward and downward in accordance with the shedding pattern, thereby forming a shed between warp yarns (see, for example, Japanese Unexamined Patent Application Publication No. 8-311741.

[0003] The shedding pattern is a combination of driving patterns of the heald frames for obtaining a desired weave structure.

[0004] The shedding pattern is set, for example, in the form shown in Fig. 4A. In this example, a shedding pattern is set for a loom that performs a weaving process using twelve heald frames. In the following description, one of the heald frames that is closest to a cloth fell is defined as the first frame, and the other heald frames are defined as the second frame, the third frame, ..., and the twelfth frame in that order from the cloth fell. More specifically, in the shedding pattern shown in Fig. 4A, the position of each of the heald frames (the first to twelfth frames) is set to the highest or lowest position for each of a plurality of shedding steps (= weaving cycles), and the thus-set positions of the heald frames are shown in the form of a matrix. Accordingly, each column of the matrix shown in Fig. 4A corresponds to a driving pattern for the corresponding heald frame, the driving pattern being carried out in steps of weaving cycles.

[0005] The above-mentioned shedding pattern is created or edited by an operator and is input to the loom's setting device. The operator creates the shedding pattern using a shedding-pattern setting device. For example, as shown in Fig. 4B, the operator sets the position of each heald frame (the highest or lowest position) for each shedding step on an edit screen shown on a display of the shedding-pattern setting device.

[0006] More specifically, the shedding pattern is created by selectively changing the display states of cells corresponding to the heald frames for each shedding step.

In the example shown in Fig. 4B, for each shedding step, the display states of the cells corresponding to the heald frames that are to be placed at the highest position are changed to those distinguishable from the display states of the cells corresponding to the heald frames that are to be placed at the lowest position. In the thus-set shedding pattern, the cells corresponding to each heald frame are shown in different display states depending on whether the heald frame is to be at the highest position or the lowest position. Thus, the driving pattern of each heald frame can be visually recognized. The display state of each cell can be changed by, for example, moving a cursor to the cell and performing a button operation or the like.

[0007] The shedding-pattern setting device may include a display device (for example, a display device having a touch-panel display) provided on the loom. Alternatively, as described below, the shedding pattern may be created using a personal computer or the like that is disposed outside the loom and be read into the loom's setting device using a storage medium, such as a memory card, or via a local area network (LAN).

[0008] The creation of the shedding pattern is performed as one of weave preparation processes before starting the weaving process. In another weave preparation process, warp yarns to be used in the weaving process are threaded through healds supported by the heald frames. Normally, the process of creating the shedding pattern and the process of threading the warp yarns through the healds are performed by different operators.

[0009] In the process of threading the warp yarns, the warp yarns are let off from a warp beam and are threaded through the healds supported by the corresponding heald frames in accordance with the positions and kinds of the warp yarns. In this process, failure may occur in which the warp yarns are threaded through healds supported by a heald frame that is different from the intended heald frame by mistake. In this case, if the driving pattern set for the intended heald frame in the shedding pattern differs from the driving pattern set for the heald frame at which the warp yarns are actually threaded, the weave structure of a cloth obtained after the weaving process will be different from the desired weave structure. In addition, there is a risk that warp streaks will appear on the woven cloth depending on the shedding pattern, and the quality of the woven cloth will be severely degraded in such a case. Accordingly, in the process of threading the warp yarns through the healds, the operator must correctly pass the warp yarns through the healds supported by the corresponding heald frames.

[0010] However, the above-described failure due to the operator's mistake in the process of threading the warp yarns cannot be completely avoided. Since such failure causes degradation in the quality of woven cloth, correction based on the shedding pattern must be per-

formed if the failure is detected. However, the process of threading the warp yarns through the healds requires considerable time and labor, and therefore it is a heavy burden on the operator to redo the process. In addition, since this process takes a long time, the operating rate is reduced. Accordingly, as another countermeasure, the shedding pattern may be changed. For example, a case is considered in which warp yarns intended to be threaded through the healds on heald frame A are all threaded through the healds on heald frame B and the driving pattern set for the heald frame A in the shedding pattern differs from the driving pattern set for the heald frame B. In this case, there is a possibility that the above-described quality problem can be prevented by inputting the driving pattern for the heald frame B in the column corresponding to the heald frame A and inputting the driving pattern for the heald frame A in the column corresponding to the heald frame B in the shedding pattern.

[0011]   If the problem can be prevented by changing the shedding pattern, it is more preferable to change the shedding pattern rather than to redo the process of threading the warp yarns, considering the burden on the operator and other factors. However, to change the shedding pattern using the known shedding-pattern setting device, it is necessary to perform a cumbersome process of deleting the driving patterns and setting them again. Therefore, the process of changing the shedding pattern also requires time and labor, although not as much as the process of re-threading the warp yarns. In particular, the shedding pattern corresponds to a weave structure of a single repeat that includes a plurality of weaving cycles, and a single repeat may include a large number of weaving cycles. For example, the number of picks may be as large as several thousands in dobby weaving. In such a case, the process of changing the shedding pattern also requires considerable time and labor.

SUMMARY OF THE INVENTION

[0012]   Accordingly, it is an object of the present invention to provide a shedding-pattern setting device that facilitates a process of changing a shedding pattern by exchanging driving patterns in units of heald frames, thereby reducing the burden on an operator and the time required for changing the shedding pattern.

[0013]   In order to achieve the above-described object, according to the present invention, a shedding-pattern setting device for a loom having the above-described structure includes a display capable of displaying the shedding pattern on a display screen and a controller for changing the shedding pattern on the display screen of the display. The controller has a function of changing the shedding pattern such that patterns set for two of the heald frames are exchanged between the two heald frames.

[0014]   In the shedding-pattern setting device for the loom according to the present invention, when the shedding pattern is changed, driving patterns set for the re-

spective heald frames can be automatically exchanged between two of the heald frames simply by designating the two heald frames. Therefore, the process of changing the shedding pattern can be easily performed within a short time.

[0015]   In addition to the case in which the above-described failure occurs in the process of threading the warp yarns, the above-described process of changing the shedding pattern may also be used in the case of changing a shedding pattern created (set) in advance to create a new shedding pattern for another weave structure. More specifically, depending on the weave structure, there may be a case in which a new shedding pattern can be obtained simply by exchanging driving patterns between two or more heald frames in a shedding pattern that is already completed. In such a case, compared to the case in which the entire part of the new shedding pattern is created from the start, the new shedding pattern can be more easily and quickly created by using the shedding pattern that is already completed and exchanging the driving patterns between the heald frames.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a schematic diagram illustrating an embodiment of the present invention;
Fig. 2 is another schematic diagram illustrating the embodiment of the present invention;
Fig. 3 is a block diagram illustrating a loom according to the embodiment of the present invention; and
Figs. 4A and 4B are schematic diagrams illustrating the known structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017]   An embodiment of the present invention will be described below with reference to the accompanying drawings.

[0018]   Figs. 1 to 3 illustrate an embodiment of the present invention. In this embodiment, a shedding pattern is created and edited using a personal computer, and is read into a setting display device of a loom using a storage medium, such as a memory card. Referring to Fig. 3, in the present embodiment, a shedding-pattern setting device 40 corresponds to the combination of a display 41, a computer main unit 42 which includes a program (software) executed for creating the shedding pattern to be precise, a keyboard 43, a mouse 44, etc. In addition, the computer main unit 42 corresponds to control means. However, a device for creating the shedding pattern and a device for changing the shedding pattern may also be separately provided. More specifically, if the shedding pattern is created using the personal computer as described above, the shedding pattern may be changed using another device (for example, the setting display device of the loom). In such a case, the device

for changing the shedding pattern corresponds to the shedding-pattern setting device according to the present invention.

[0019] The shedding pattern created by the shedding-pattern setting device 40 is stored in a storage medium MC. The storage medium MC is inserted into a reader 21 provided in a setting display device 20 of the loom, and the shedding pattern is read out by the reader 21. Then, the shedding pattern is stored in a memory 22 through a central processing unit (CPU) 23.

[0020] When an operator operates an input unit 25 to issue a display request command to the CPU 23 through the input unit 25, the shedding pattern stored in the memory 22 is read out by the CPU 23 and displayed on a display 24.

[0021] The shedding pattern stored in the memory 22 is also output to a main controller 10 of the loom via the CPU 23 in response to a request issued by the main controller 10. The main controller 10 outputs a signal based on the shedding pattern to a shedding device 30, the signal representing the state of selection (between the highest and lowest positions) of heald frames 30a for each weaving cycle. The shedding device 30 moves the heald frames 30a upward and downward at predetermined timing on the basis of the signal from the main controller 10.

[0022] A process of creating (editing) the shedding pattern on the display 41 included in the shedding-pattern setting device 40 will be described below.

[0023] First, the operator displays a pattern-editing screen 50 shown in Figs. 1 and 2 on the display 41 using the computer main unit 42, which functions as the control means. Figs. 1 and 2 show the state in which the shedding pattern is already set on the pattern-editing screen 50. However, driving patterns for only some of the heald frames are shown in Figs. 1 and 2, and driving patterns for the remaining heald frames are omitted.

[0024] The pattern-editing screen 50 will be described in more detail below. In Figs. 1 and 2, the shedding pattern is set in a section (hereinafter called a "cell section 55") at the left of the screen in which cells 51 are arranged in a matrix. The numbers shown in a number field 52 above the cell section 55 indicate the frame numbers of the heald frames 30a corresponding to the respective columns of the cells 51. More specifically, the column of the cells 51 numbered 1 shows the driving pattern for the first frame, the column of cells 51 numbered 2 shows the driving pattern for the second frame, and the column of the cells 51 numbered 12 shows the driving pattern for the twelfth frame.

[0025] The numbers shown in a number field 53 on the left of the cell section 55 indicate the step numbers of the shedding pattern. The step numbers of the shedding pattern show the order of steps of the shedding motion that is performed in steps of weaving cycles. Accordingly, each row in the cell section 55 shows the positions (highest or lowest) of the heald frames 30a (i.e., the state of selection) in the corresponding weaving cycle at the time

when a shed is formed between warp yarns T.

[0026] The shedding pattern is created, that is, the driving patterns for the heald frames 30a are set on the pattern-editing screen 50 by the following method. That is, for each shedding step, it is checked whether each heald frame 30a is to be at the highest position or the lowest position at the time when the shed is formed between the warp yarns T. Then, the display state (color or the like) of each of the cells 51 that correspond to the heald frames 30a to be placed at the highest position is changed.

[0027] When the shedding pattern is created using a personal computer as in the present embodiment, the display state of each cell 51 may be changed by moving a mouse pointer (not shown) to the cell 51 using the mouse 44 and clicking on the cell 51. Alternatively, the display state of each cell 51 may also be changed using a cursor (not shown) displayed on the cell section 55. In this case, the cursor is moved to the cell 51 using cursor buttons 62 shown in Fig. 4B or cursor keys provided on the keyboard 43. Then, a "high" button 63a or a "low" button 63b (see Fig. 4B) is operated. The display state may also be changed by operating specific keys on the keyboard 43 that are assigned to the position-setting operation.

[0028] The process of changing the shedding pattern when the above-described failure occurs in the process of threading the warp yarns in a weave preparation step will be described below. Here, a case will be considered in which the warp yarns T to be threaded through the healds on the seventh frame are threaded through the healds on the first frame by mistake and the warp yarns T to be threaded through the healds on the eighth frame are threaded through the healds on the second frame by mistake. The process of changing the shedding pattern is performed on the display 41 included in the shedding-pattern setting device 40.

[0029] To prevent problems caused by the failure in threading the warp yarns, the shedding pattern is changed such that the driving patterns are exchanged between the seventh frame and the first frame and also between the eighth frame and the second frame. The process of exchanging the driving patterns is performed by a program installed in the control means (computer main unit) 42.

[0030] To change the shedding pattern, first, the operator reads out the shedding pattern stored in the control means 42 and causes the display 41 to display the shedding pattern on the pattern-editing screen 50. Then, the operator operates a "pattern exchange" button 54 in a "command" field at the right of the pattern-editing screen 50. Accordingly, the control means 42 executes a program for exchanging the driving patterns. When this program is executed, first, a pattern-exchange setting window 70 shown in Fig. 1 is displayed on the pattern-editing screen 50 of the display 41.

[0031] Next, in this state, one or more heald frames which are to exchange the driving patterns with other

heald frames are selected. In the present embodiment, the warp yarns to be threaded through the healds on the seventh and eighth frames are threaded through the healds on the first and second frames, respectively, by mistake and accordingly the seventh and eighth frames are selected. The heald frames can be selected by, for example, clicking the corresponding frame numbers in the number field 52. Then, the display state (color or the like) of the columns corresponding to the selected frame numbers may be changed. A plurality of heald frames can be selected by, for example, clicking on one of the frame numbers and dragging the mouse pointer in a horizontal direction. In such a case, the heald frames can be selected without clicking on each of the corresponding frame numbers. However, the method of selecting the heald frames is not limited to the above-mentioned methods, and other kinds of methods may also be used. For example, the heald frames may also be selected by directly inputting the corresponding frame numbers.

[0032] When the frames to be selected (the seventh and eighth frames) are determined, the frame numbers (7-8) of the selected frames are displayed on the pattern-exchange setting window 70 as the selected frames. Then, the heald frames which are to exchange the driving patterns with the selected frames are designated as target frames. In Fig. 1, the frame numbers of the heald frames designated as the target frames may be input to a "target frame" input field 71 in the setting window 70.

[0033] In the example shown in the figure, the frame number "1" is input instead of inputting both of the frame numbers "1" and "2" corresponding to the first and second frames which are to exchange the driving patterns with the seventh and eighth frames, respectively. In this case, not only the driving pattern for the first frame but also the driving pattern for the second frame can be exchanged at the same time. More specifically, when a plurality of successive heald frames are to exchange the driving patterns with other heald frames, it is not necessary to input all of the frame numbers of the heald frames designated as the target frames if the smallest one of the frame numbers is input. In this case, a plurality of heald frames can exchange the drive patterns with other heald frames automatically. More specifically, the control means 42 determines the number of target frames on the basis of the number of selected frames, and then determines the heald frames which are to exchange the driving patterns with the selected frames on the basis of the number of target frames and the frame number input in the input field 71. However, it is not necessary that the control means 42 have such a function, and all of the frame numbers of the heald frames designated as the target frames may be input in the input field 71.

[0034] After the selected frames and the target frames are set, an "OK" button 72 in the setting window 70 is operated. Accordingly, the driving patterns are exchanged between the seventh frame and the first frame and between the eighth frame and the second frame. As a result, the shedding pattern is changed to that shown in Fig. 2. When the driving patterns are exchanged in the above-described manner, the control means 42 terminates the program for exchanging the driving patterns and finishes the process of changing the shedding pattern.

[0035] In the example shown in Figs. 1 and 2, a "cancel" button 73 on the pattern-exchange setting window 70 is used to change the frame number input in the input field 71. When the cancel button 73 is operated, the input frame number is deleted so that another frame number can be input.

[0036] The control means 42 may also have a function of displaying an error message if an unused heald frame is designated as a target frame. For example, referring to Fig. 1, a case is considered in which "16" is input in the input field 71 although the number of frames being used is twelve. In this case, the control means compares the number of frames being used with the value input in the input field 71 (frame number of target frame), and displays an error message if the number of frames being used is smaller than the value in the input field 71. The error message may be, for example, "values higher than the number of frames cannot be input". In addition, even when the number of frames being used is equal to or higher than the value in the input field 71, an error message similar to that provided above is displayed if the frame number of one or more of the target frames determined in accordance with the number of selected frames is higher than the number of frames being used.

[0037] In the above-described embodiment, the shedding pattern is created using the personal computer 40 provided outside the loom, and is changed using the same personal computer 40. However, the present invention is not limited to this, and a device for creating the shedding pattern and a device for changing the shedding pattern may be separately provided. For example, the shedding pattern may be created using the personal computer 40 provided outside the loom, and be changed using the setting display device 20 of the loom. In this case, the setting display device 20 of the loom corresponds to the shedding-pattern setting device according to the present invention and the CPU 23 functions as the control means.

[0038] The present invention is not limited to the above-described embodiment, and various modifications are possible within the scope of the present invention.

Claims

1. A shedding-pattern setting device (40) for a loom including a shedding device (30) capable of electrically controlling the motion of each of a plurality of heald frames (30a), the shedding device (30) being driven to move the heald frames (30a) in accordance with a shedding pattern that shows whether each heald frame (30a) is to be at an upper position or a

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lower position for each of a plurality of weaving cycles, the shedding-pattern setting device (40) comprising:

a display (41) capable of displaying the shedding pattern on a display screen; and
control means (42) for changing the shedding pattern on the display screen of the display (41), the control means (42) having a function of changing the shedding pattern such that patterns set for two of the heald frames (30a) are exchanged between said two of the heald frames (30a).

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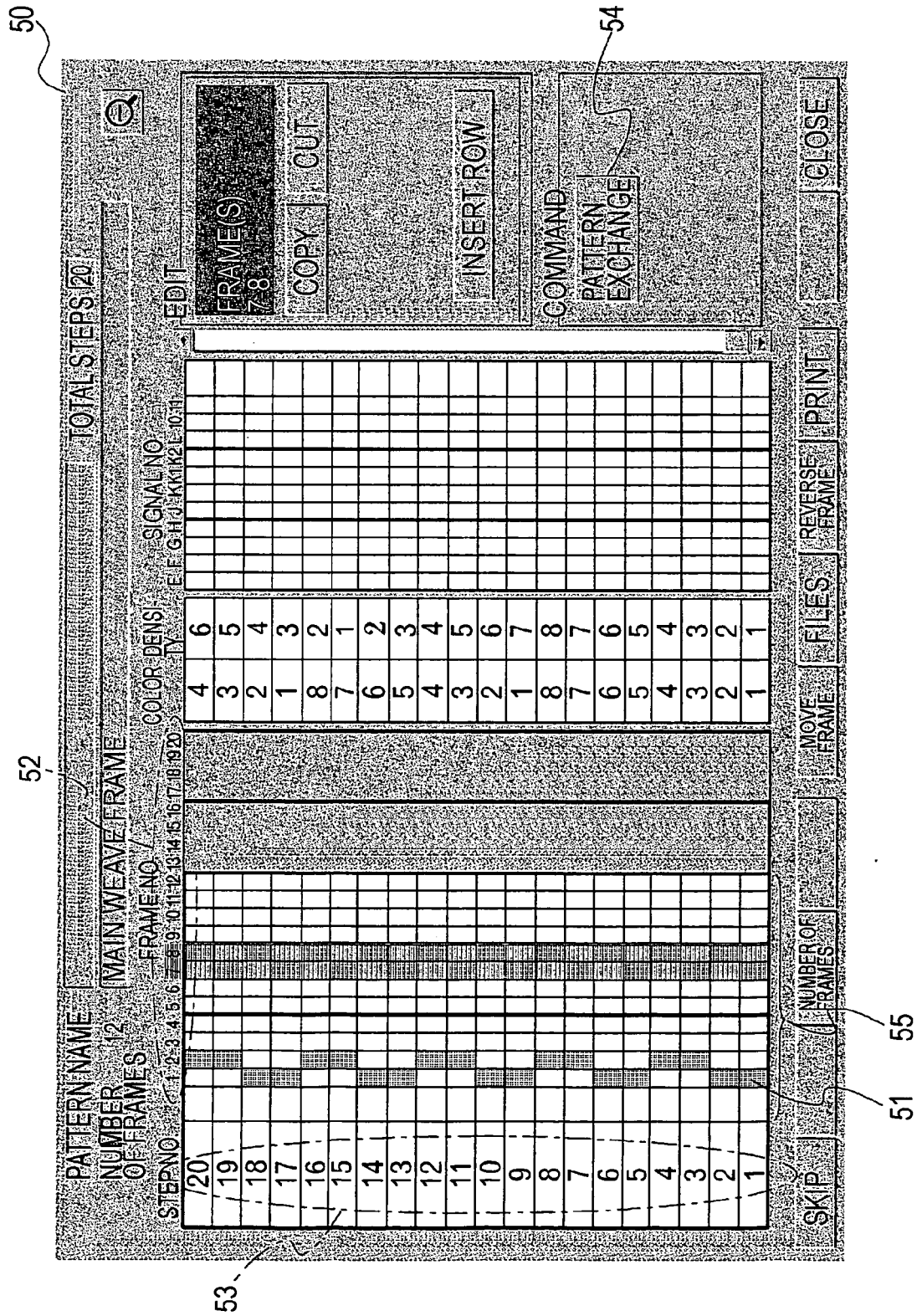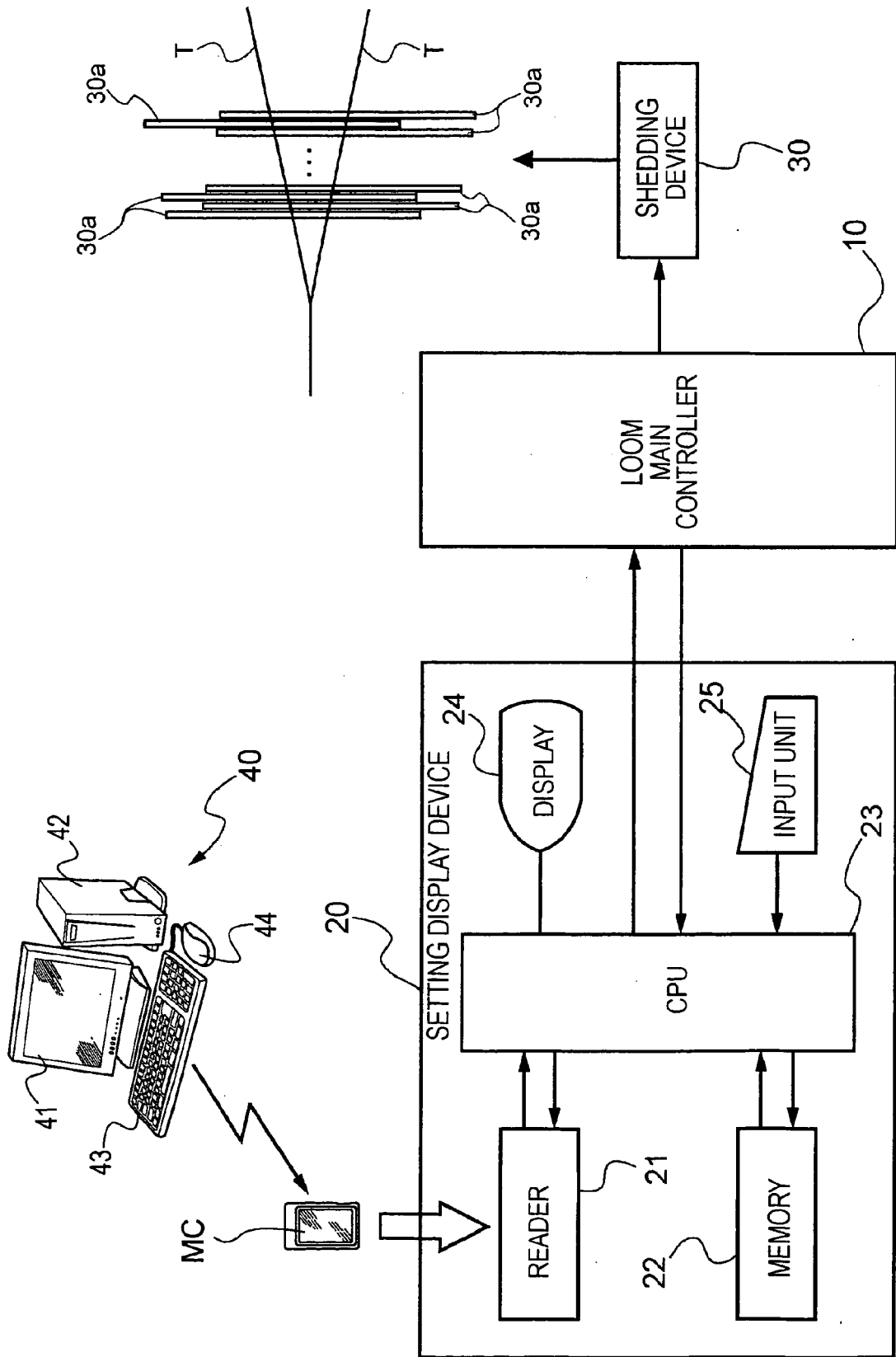*55*

FIG. 1

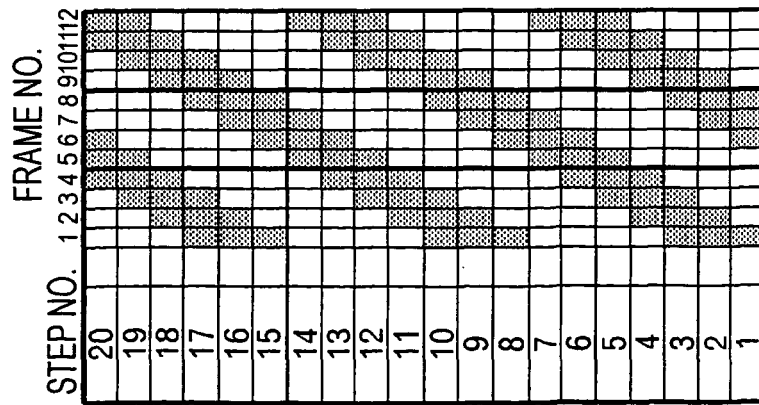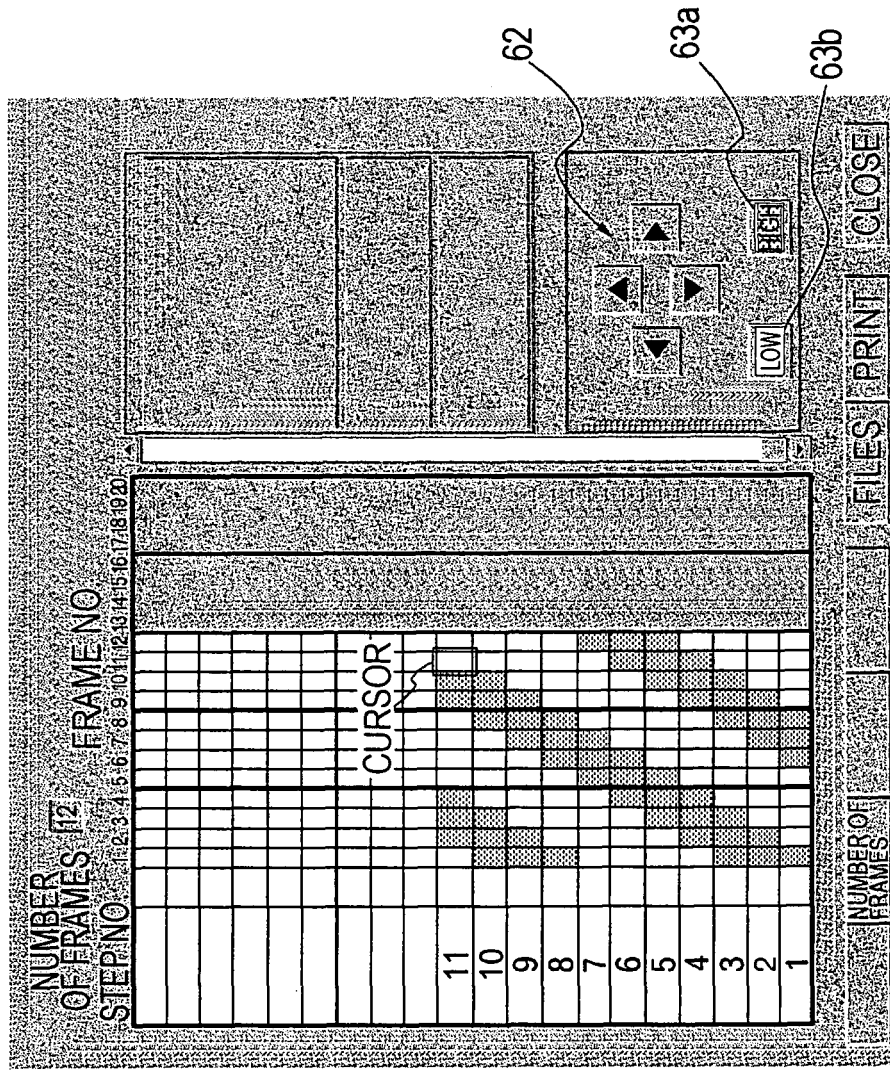## FIG. 2

FIG. 3

FIG. 4A

FIG. 4B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 07 00 3660

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 June 2007	Iamandi, Daniela

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 00 3660

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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