(19)

Europäisches
Patentamt
European
Patent Office
Office européen
des brevets

(11) **EP 1 811 067 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.07.2007 Bulletin 2007/30

(21) Application number: **06026202.9**

(22) Date of filing: **18.12.2006**

(51) Int Cl.:
D03C 13/00 (2006.01)   *D03C 19/00* (2006.01)
D03J 1/00 (2006.01)

(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: **19.01.2006 JP 2006010572
28.04.2006 JP 2006124554**

(71) Applicant: **TSUDAKOMA KOGYO KABUSHIKI
KAISHA
Kanazawa-shi,
Ishikawa-ken 921-8650 (JP)**

(72) Inventors:
• **Yamazaki, Koki
Kanazawa-shi
Ishikawa-ken, 921-8650 (JP)**
• **Hayashi, Kentaro
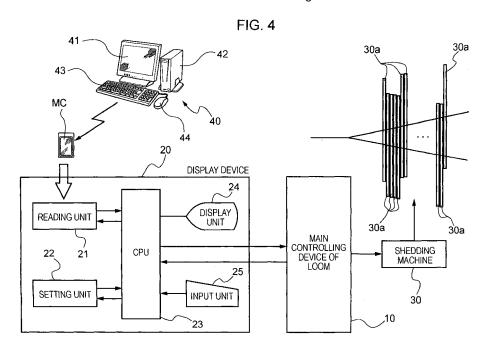Kanazawa-shi
Ishikawa-ken, 921-8650 (JP)**

(74) Representative: **Samson & Partner
Widenmayerstrasse 5
80538 München (DE)**

(54) **Shed pattern setting device in loom**

(57)   A shed pattern setting device (40) for a loom
which includes a shedding machine (30) capable of elec-
trically controlling individual movements of heald frames
(30a) and which operates the heald frames (30a) as a
result of driving the shedding machine (30) in accordance
with shed patterns in which vertical positions of the re-
spective heald frames (30a) for each loom cycle are in-
dicated over a plurality of weaving cycles. The shed pat-
tern setting device (40) comprises a display unit (41) ca-
pable of displaying on a display screen the shed patterns
that are set, and controlling means (42) capable of setting
the shed patterns on the display screen (41) and chang-
ing the set shed patterns. The controlling means (42) has
a function of specifying an arbitrary range in the shed
patterns that are displayed on the display screen and a
function of reversing the shed patterns within the speci-
fied range.

FIG. 4

EP 1 811 067 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a loom, and, more particularly, to a shed pattern setting device in a loom including a shedding machine that can electrically control individual movements of a plurality of heald frames. In the loom, the heald frames are operated as a result of driving the shedding machine in accordance with shed patterns in which vertical positions of the respective heald frames for every loom cycle are indicated over a weaving cycle.

2. Description of the Related Art

[0002] In a loom including a shedding machine (such as an electronic dobby shedding machine or an electric shedding machine) that can electrically control individual movements of a plurality of heald frames, the shedding machine is driven in accordance with previously set shed patterns. This causes each heald frame to be driven so as to move vertically, so that a shed is formed in a warp to perform weaving.

[0003] Examples of the aforementioned shed patterns are shown in Fig. 9A. The illustration shows set states of the shed patterns of a loom that performs weaving using 20 heald frames. More specifically, the set states of the illustrated shed patterns regarding positions (maximally raised position/maximally lowered position) of the respective heald frames (that is, the first heald frame to the twentieth heald frame) for each shed step (that is, a weaving cycle) are shown in matrix form over the plurality of shed steps. Therefore, the columns of the illustrated shed patterns represent driving patterns of the respective heald frames that advance every weaving cycle.

[0004] The above-described shed patterns are formed by an operator that forms (edits) the shed patterns, and are set by a setting unit that is attached to a display device of the loom. The operator forms the shed patterns with a shed pattern setting device. The operator sets the positions (maximally raised position/maximally lowered position) of the respective heald frames for every shed step at an editing screen that is provided at a display screen of the shed pattern setting device.

[0005] More specifically, the above-described setting operation is performed by changing a display mode (such as display color) of a box corresponding to its associated heald frame for each shed step. In the example shown in Fig. 9B, the setting is performed as follows. In each shed step, the display mode of the box corresponding to its associated heald frame set at its maximally raised position is changed to distinguish the display mode of the heald frame set at its maximally raised position from the display mode of the heald frame set at its maximally lowered position. Then, since, for the respective heald frames, the shed patterns set in this way are displayed differently when they are set at their maximally raised positions from when they are set their maximally lowered positions, it is possible to easily visually recognize the relationship between the driving patterns of the heald frames. The aforementioned changing of the display mode of each box is performed by, for example, putting a cursor at the box and operating a button.

[0006] For the above-described shed pattern setting device, for example, a personal computer may be used, instead of the display device (such as a display device including a touch-panel display unit) provided at the loom, to form the aforementioned shed patterns. The shed patterns are read into the setting device at the loom through a storage medium (such as a memory card) or LAN to set the shed patterns.

[0007] In the loom, all of the plurality of head frames (20 frames in the illustrated example) are not necessarily used to weave a non-selvage portion of a cloth. For example, some (such as the 18th to 20th heald frames) of the first to twentieth heald frames may be used for weaving a selvage portion of the cloth.

[0008] In the weaving performed by the loom, the heald frames used to weave selvage portions (hereunder referred to as the "selvage frames") may be driven in accordance with driving patterns that are the reverse of driving patterns set in accordance with the driving patterns of the heald frames used to weave the non-selvage portion of the cloth (such as driving patterns in which the upper and lower positions of the heald frames are reversed). The heald frames used to weave the non-selvage portion of the cloth are hereunder referred to as the "non-selvage frames." In this case, as shown in Fig. 8, the driving patterns that are set for the selvage frames are patterns in which the setting of the upper and lower positions are reversed as compared to those of the driving patterns set in accordance with the driving patterns of the non-selvage frames shown in Fig. 9A.

[0009] As mentioned above, when the driving patterns of some of the heald frames are set so as to be the reverse of the patterns that are set in accordance with the driving patterns of the other heald frames (such driving patterns of some of the heald frames are hereunder referred to as the "reversed patterns"), in a related method of setting shed patterns, it is necessary to set the patterns of the some of the heald frames irregularly with respect to those of the other heald frames while checking the columns of the some of the heald frames. However, the task of forming the shed patterns by this setting method has problems in that it is very complicated, is troublesome to carry out, and requires time. In particular, the problems become more noticeable as the shed patterns become sophisticated.

[0010] Japanese Unexamined Patent Application Publication No. 4-263644 discloses the process of reversing and outputting a set pattern (that is, a shed pattern) when driving an electronic dobby machine. However, in describing the related art, the document only dis-

closes the process of completely reversing and outputting the set shed pattern, that is, it does not disclose the process of partly reversing a temporarily formed shed pattern at an editing screen.

SUMMARY OF THE INVENTION

[0011] Accordingly, it is an object of the present invention to provide a shed pattern setting device which, when forming shed patterns partly including reversed patterns, can easily form the shed patterns, reduce the burden on an operator, and reduce working time.

[0012] To this end, according to the present invention, there is provided a claim 1*

[0013] "Reversing patterns" in the invention of the application covers a case in which patterns are reversed with respect to a central line in a column direction of the patterns disposed in a matrix form within a specified range, in addition to the case in which setting states regarding the positions (maximally raised position/maximally lowered position) of heald frames are reversed.

[0014] According to the above-described shed pattern setting device according to the present invention, when forming shed patterns partly including reversed patterns, the shed patterns are not formed by assuming the reversed state from the beginning. Rather, portions to be reversed are set in a regular state in correspondence with the other portions. After completing this setting operation, a range of the portions to be reversed is specified, so that the patterns can be changed (reversed) by one operation. Therefore, the shed patterns can be easily formed in a short time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a schematic view of an embodiment of the present invention;
Fig. 2 is another schematic view of the embodiment of the present invention;
Fig. 3 is still another schematic view of the embodiment of the present invention;
Fig. 4 is a block diagram of a loom according to an embodiment of the present invention;
Fig. 5 is a schematic view of exemplified shed patterns to which the present invention is applied;
Figs. 6A and 6B are schematic views of another embodiment of the present invention;
Figs. 7A to 7C are schematic views of still another embodiment of the present invention;
Fig. 8 is a schematic view of exemplified shed patterns to which the present invention is applied; and
Figs. 9A and 9B are schematic views of a related art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Embodiments of the present invention will hereunder be described with reference to the drawings.

[0017] Figs. 1 to 4 show an embodiment of the present invention. In the embodiment below, similarly to the above, a description will be given of forming shed patterns in which driving patterns of selvage frames are reversed patterns, in a loom that performs weaving using 20 heald frames and that uses the 18th to the 20th heald frames of the heald frames as the selvage frames. In the description below, the reversed patterns set as driving patterns of the selvage frames are patterns in which set states of vertical positions of the heald frames are the reverse of those of vertical positions of patterns set in correspondence with shed patterns of non-selvage frames.

[0018] In the embodiment, the shed patterns are formed with a personal computer, and the formed shed patterns are set on a display device at the loom through a storage medium (such as a memory card). Therefore, in the embodiment, a combination of, for example, a display 41 (corresponds to a display unit), a personal computer body 42 (to be more precise, includes a pattern formation program (software) that is executed at the personal computer body), a keyboard 43, and a mouse 44 corresponds to a shed pattern setting device 40. The personal computer body 42 corresponds to controlling means.

[0019] The shed patterns that are formed with the shed pattern setting device 40 and that are stored in a storage medium MC are inserted into and read by a reading unit 21 at the display device 20 of the loom through the storage medium MC, and is stored in a setting unit 22 through a CPU 23 (Fig. 4).

[0020] When an operator operates an input unit 25 and generates a display request command from the input unit 25 to the CPU 23, the shed patterns that are stored in the setting unit 22 are read out from the setting unit 22 by the CPU 23, and the read out shed patterns can be displayed on a display unit 24.

[0021] The shed patterns that are stored in the setting unit 22 are output to a main controlling device 10 through the CPU 23 in accordance with a request from the main controlling device 10 of the loom. In accordance with the shed patterns, the main controlling device 10 outputs a signal that is in accordance with a selection state (that is, a state in which either a maximally raised position or a maximally lowered position is selected) of each heald frame 30a, to a shedding machine 30 for each weaving cycle. Then, the shedding machine 30 moves each heald frame 30a vertically in a predetermined timing on the basis of the signal from the main controlling device 10.

[0022] The forming operation of the shed patterns will hereunder be described as being carried out on the display unit (display) 41 of the shed pattern setting device 40.

[0023] The operator uses the personal computer body 42 (serving as controlling means) to display a pattern editing screen 50 (shown in Fig. 1) on a display screen of the display unit 41. Although the pattern editing screen

50 shown in Fig. 1 is in a state in which the shed patterns are already set, in an initial state, each box 51 disposed in a matrix is in a colorless (white) display state.

[0024] The illustrated pattern editing screen 50 will be described in more detail. First, a section of the screen 50 where the boxes 51 are disposed in a matrix at the left side of the screen (this section will hereunder be referred to as the "box section 55") is where the shed patterns are formed. Each number in a numerical column 52 provided above the box section 55 indicates a frame number (frame no.) of its associated heald frame 30a corresponding to the column of its associated box 51. In other words, the boxes 51 under no. 1 represent driving patterns of the first heald frame 30a, and the boxes 51 under no. 20 represent driving patterns of the 20th heald frame 30a.

[0025] Each number in a numerical column 53 provided on the left of the box section 55 represents a step number of the shed patterns. Each step number of the shed patterns represents the order of shed states through which the shed patterns progress in one weaving cycle. Therefore, each row of the box section 55 represents the vertical position (selection state) of each heald frame 30a during warp shedding for each weaving cycle.

[0026] A display box 54, which is provided at the top portion in the pattern editing screen 50, indicates the number of heald frames that are used in weaving. A display frame 61 indicates information related to the heald frame 30a that is specified by a cursor 57. As illustrated, in the embodiment, the number of head frames used in weaving is 20. In addition, in the embodiment, of the 20 heald frames 30a, or the 1st to the 20th heald frames 30a, the 18th to the 20th heald frames 30a are used as the selvage frames. Therefore, when the cursor 57 is put at any one of the numbers 1 to 17 among the numbers in the numerical column 52, the display frame 61 displays "non-selvage frame" as in the illustrated example. In contrast, when the cursor 57 is put at any one of the numbers 18 to 20, the display frame 61 displays "selvage frame."

[0027] At such a pattern editing screen 50, the shed patterns are formed, that is, the driving pattern of each heald frame is set by confirming whether each heald frame is set at its maximally raised position or its maximally lowered position for every shed step during warp shedding, to change the display mode (such as display color) of each box 51 of the heald frame at its maximally raised position. The display mode is changed by using a cursor 56 at a predetermined box 51 and operating a button.

[0028] The positional operation of the cursor 56 is performed by operating the mouse 44 to operate a cursor movement button 62 (provided on the right side in the pattern editing screen 50) with a mouse pointer (not shown) or by operating a cursor key of the keyboard 43. The display mode is changed by operating an upper position specification button 63a or a lower position specification button 63b (both of which are provided on the right side in the pattern editing screen 50) or by operating a particular key of the keyboard 43 to which a position

specification operation is allotted. If possible, the display mode may be changed by putting the mouse pointer directly at a box 51 and clicking the box 51.

[0029] The driving pattern of each heald frame is set by the operations described above. The operator performs the above-described operations while confirming the vertical position where each heald frame is set for each shed step (each weaving cycle). If, as shown in Fig. 9A, the shed patterns are as a whole regular, such shed pattern setting operation can be easily carried out. However, as mentioned above, when some of the patterns are set as reversed patterns, the setting operation becomes complicated. Therefore, in the present invention, a program that reverses patterns of a specified range is set with respect to the controlling means (personal computer body) 42 to facilitate the forming of the shed patterns including the reversed patterns described above.

[0030] More specifically, when setting the shed patterns, first, in a first stage, as shown in Fig. 1, the vertical position of each heald frame 30a for every weaving cycle is set in accordance with a pattern having a predetermined regularity at the pattern editing screen 50, without the operator being conscious of the selvage frames and the reversed patterns.

[0031] After completing the formation of the shed patterns not including reversed patterns in this way, as shown in Fig. 2, shed patterns to be reversed, that is, the driving patterns of the 18th heald frame to 20th heald frame are specified. The specification of a range is carried out by, for example, operating a range specification button 64 (provided at a lower portion in the pattern editing screen 50) and causing the controlling means 42 to be set in a range setting mode. A program that performs such a range specification is also set at the controlling means 42.

[0032] As mentioned above, the pattern editing screen 50 is set in the range setting mode by the controlling means 42 as a result of operating the range specification button 64 or by operating a particular key of the keyboard 43 to which a range specification operation is allotted. In this state, the cursor 56 is moved by the aforementioned operation to specify a beginning point and an end point, so that the range is specified. The range can also be specified by operating the mouse 44 and dragging the range with the mouse pointer.

[0033] By the above-described operation, as shown in Fig. 2, the range of the driving patterns of the selvage frames is specified (that is, the range specified portion is in a state in which its display mode (such as color) is changed with respect to the other portions). In this state, a frame reversal button 65 (provided at the lower portion of the pattern editing screen) is operated or a particular key of the keyboard 43 to which the frame reversal operation is allotted is operated. This cancels the range specification mode and causes the controlling means 42 to execute a program for reversing the patterns in the specified range. In the embodiment, the reversal program for reversing the set state of the vertical position of each

pattern in the specified range is executed. As a result, the shed patterns of the selvage frames are changed from the state in which they are set in accordance with the shed patterns of the non-selvage frames to the state (shown in Fig. 3) in which the set states of the vertical positions are reversed, thereby ending the forming operation of the shed patterns.

[0034] In the embodiment, although the case in which the driving patterns of particular heald frames are reversed is described, the present invention is not limited thereto. In other words, the above-described range specification is not limited to that performed in heald frame units. It may also be performed in weaving cycles (shed steps).

[0035] More specifically, when design advantages are demanded, weaving may be performed on a cloth with reversed shed patterns as in the embodiment over a predetermined range in a warp direction. In that case, the shed patterns are reverse patterns like those in the embodiment over, for example, a predetermined weaving cycle (in the illustrated example, the weaving cycle extends from the shed step no. 5 to the shed step no. 15), as indicated by a portion that is enclosed by dotted lines in Fig. 5. Even when such shed patterns are formed, as in the embodiment, the range including all of the boxes from the row of the shed step no. 5 to the row of the shed step no. 15 in the illustrated shed patterns is specified to reverse the patterns in the specified range, so that the shed patterns partly including reversed patterns as in the illustrated example can be easily formed.

[0036] The range specification is not limited to that performed in heald frames or weaving cycles as mentioned above, so that any range may be specified in the set shed patterns.

[0037] "Reversing patterns" in the present invention is not limited to reversing the set states of the vertical positions of patterns within the specified range as mentioned above, so that it may mean reversing patterns with respect to a central line extending in a columnar direction of the patterns in a matrix and within a specified range. Here, "reversing patterns with respect to a central line extending in a columnar direction of patterns in a matrix" refers to symmetrically interchanging the patterns with respect to the central line, that is, to interchanging driving patterns of the heald frames that are symmetrically positioned with respect to the central line.

[0038] This will be explained in more detail with reference to, for example, a simple matrix pattern shown in Figs. 6A and 6B. Fig. 6A shows a case for shed patterns of shed frames A to D in a specified range of from a shed step a to a shed step d. In this case, a central line in a columnar direction in the shed patterns is a line that is positioned between a driving pattern of the heald frame B and a driving pattern of the heald frame C. The central line is represented by a reference character x. With respect to the central line x, a driving pattern of the heald frame A and a driving pattern of the heald frame D are symmetrically positioned. Similarly, with respect to the

central line x, the driving pattern of the heald frame B and the driving pattern of the head frame C are symmetrically positioned. In the shed patterns (reversed patterns) resulting from the change, the driving pattern of the heald frame A and the driving pattern of the heald frame D, which are symmetrically positioned with respect to the central line x, are interchanged, and the driving pattern of the heald frame B and the driving pattern of the heald frame C, which are symmetrically positioned with respect to the central line x, are interchanged. Accordingly, when the driving patterns are in an interchanged state, the shed patterns before the change and the shed patterns after the change are in mirror symmetry when they are placed side by side and viewed. Consequently, in the present invention, "reversing patterns" also means symmetrically interchanging the set driving patterns with respect to the central line in the columnar direction in the shed patterns. Incidentally, as shown in Fig. 6B, when the number of heald frames (heald frames A to E) in a specified range is odd, a central line in a columnar direction in shed patterns corresponds to a central line y passing through the center of a driving pattern of the heald frame C. In this case too, in the shed patterns after a change (reversed patterns), driving patterns of the heald frames (that is, those of the heald frames A and E and those of the heald frames B and D) which are symmetrically positioned with respect to the central line y are interchanged. However, since a driving pattern of the heald frame C is positioned in the center of the shed patterns within the specified range, it is in a set state that is the same as that before the reversal.

[0039] Examples of the above-described reversed shed patterns are shed patterns that are used when weaving (back weaving) is performed so that a portion of a pattern of a front side appears at a back or reverse side of a cloth that is weaved. This will be described in more detail with reference to Figs. 7A to 7C. First, it is assumed that shed patterns that are used when the whole pattern at the front side appears at the front side are as represented by (a). When weaving is performed so that the pattern at the front side appears at the back side in a range of from shed step no. 7 to shed step no. 15, shed patterns are as represented by (c).

[0040] When the shed patterns (c) are formed by the present invention, first, the regular shed patterns (a) are formed. Then, after the formation of the regular shed patterns (a) is completed, similarly to the above-described embodiment, a range of from the shed step no. 7 to the shed step no. 15 is specified. Then, the shed patterns in the range specified above are symmetrically reversed with respect to a central line of the shed patterns. As in the above-described embodiment, the reversing operation is also carried out by one operation by, for example, operating a button that is provided for the reversing operation. This causes the shed patterns to be in a set state that is indicated by (b). Thereafter, as in the above-described embodiment, a reversing operation is carried out to reverse set states regarding vertical positions in the

shed patterns in the specified range. This causes the shed patterns to be in a set state that is indicated by (c).

[0041] According to the above-described method of forming shed patterns, even the shed patterns shown in Fig. 7(c) can be easily formed by, first, forming regular patterns that can be easily formed and, then, performing the two types of reversing operations. Therefore, compared to the case in which such patterns are considered from the beginning and set, it is possible to quickly and easily form the shed patterns.

[0042] The aforementioned two types of reversing operations may be executed in the reverse order. In addition, although, in the foregoing description, the reversing operations are performed by operating buttons for the respective reversing operations, the method of executing the reversing operations is not limited thereto. The two types of reversing operations may be continuously carried out by operating a single operating button for forming a reversed pattern for back weaving.

[0043] Although, in the above-described embodiments, shed patterns are formed with the shed pattern setting device having, for example, the personal computer body 42 that is provided separately from the loom, the present invention is not limited thereto. For example, the shed patterns may be formed with a display device that is provided at the loom. The form of the shed pattern setting device is not particularly limited as along as it can form and edit shed patterns. Further, shed patterns partly including reversed patterns may be formed by forming regular shed patterns, serving as base patterns, with, for example, a separately provided personal computer and performing reversing operations with a separately provided device (such as a display device provided at the loom). In this case, the separately provided device corresponds to the shed pattern setting device in the present invention.

[0044] The present invention is not limited to the above-described embodiments, so that various modifications may be made without departing from the gist of the present invention.
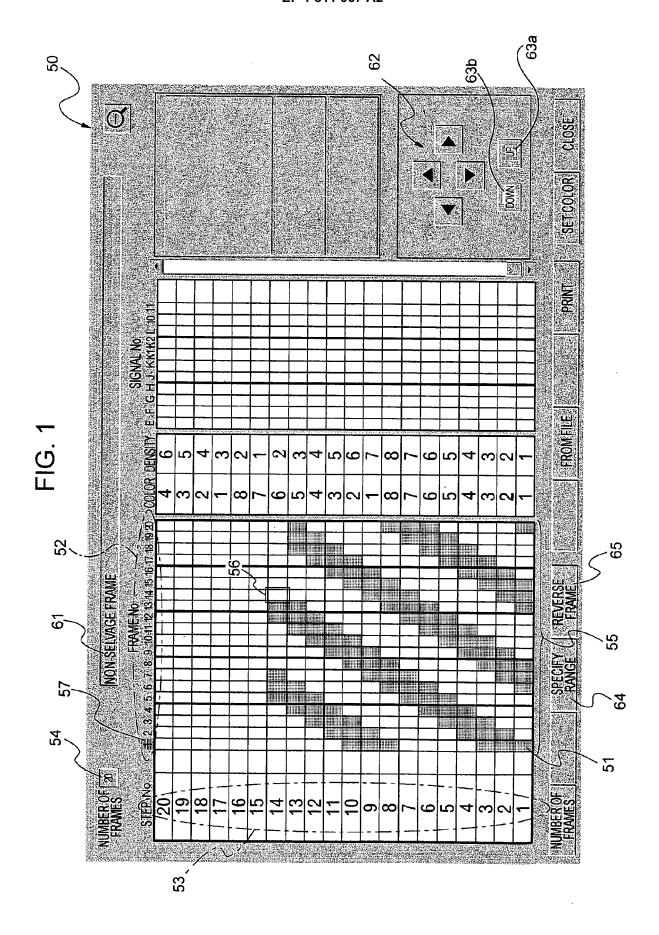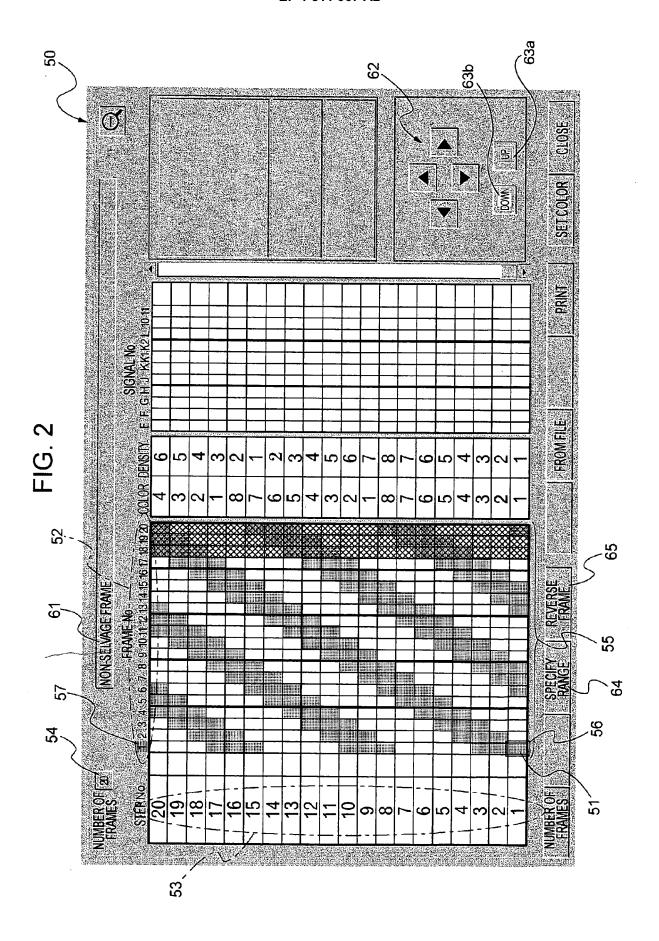
Claims

1. A shed pattern setting device (40) for a loom which includes a shedding machine (30) capable of electrically controlling individual movements of a plurality of heald frames (30a) and which operates the heald frames (30a) as a result of driving the shedding machine (30) in accordance with shed patterns in which vertical positions of the respective heald frames (30a) for each loom cycle are indicated over a plurality of weaving cycles, the shed pattern setting device (40) comprising:
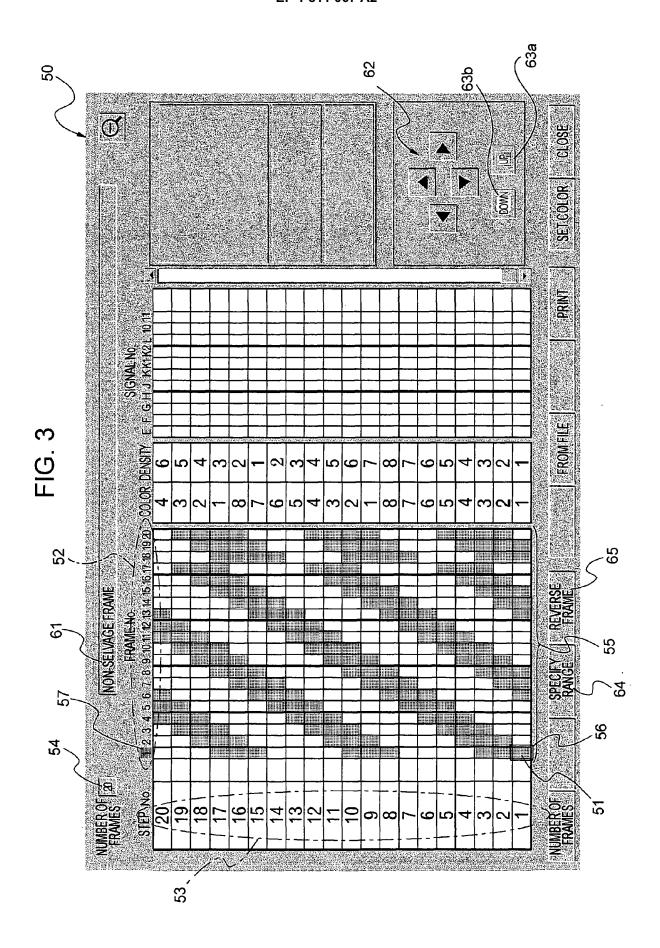
    a display unit (41) that is capable of displaying on a display screen the shed patterns that are set; and

    controlling means (42) capable of changing the shed patterns on the display screen of the display unit (41),
    wherein the controlling means (42) has a function of specifying an arbitrary range in the shed patterns that are displayed on the display screen and a function of reversing the shed patterns within the specified range.
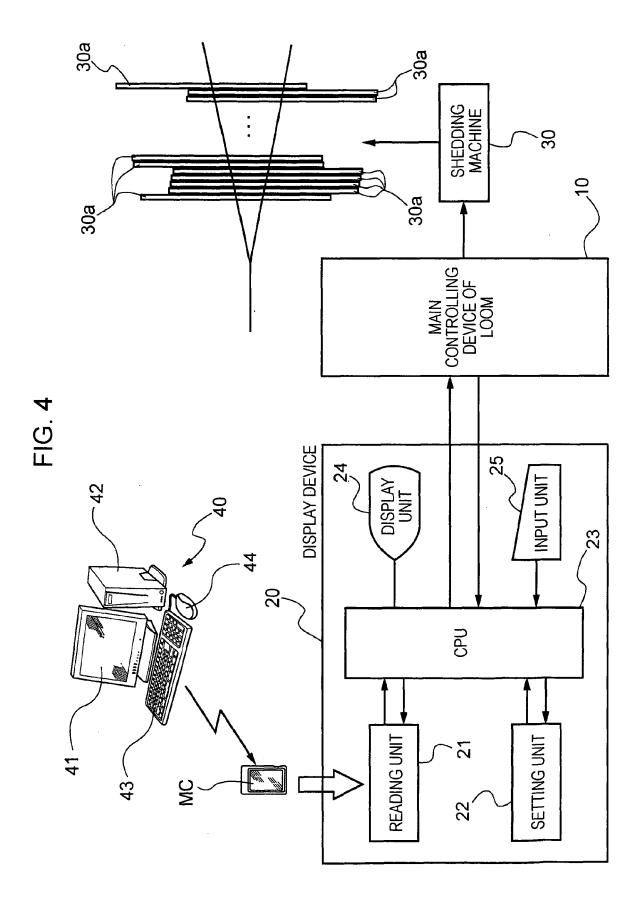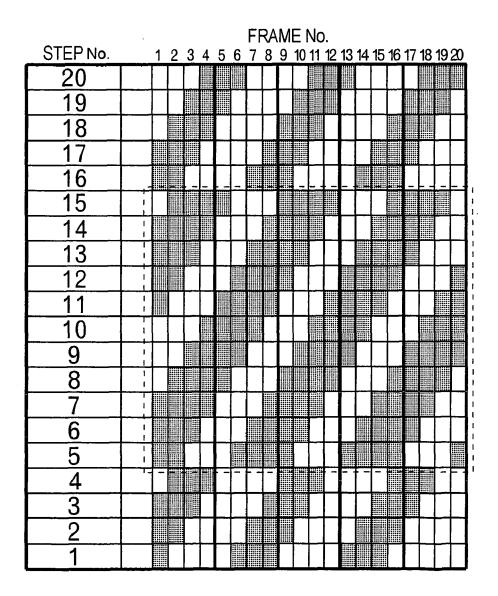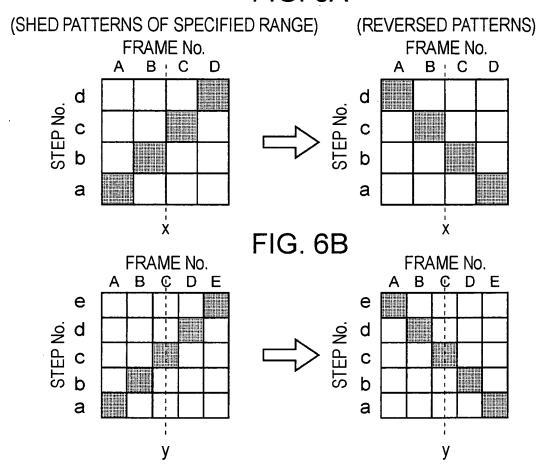
FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6A

(SHED PATTERNS OF SPECIFIED RANGE)

(REVERSED PATTERNS)

FIG. 6B

FIG. 7A

FIG. 7B

FIG. 7C

FIG. 8

FIG. 9A

FIG. 9B

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- JP 4263644 A **[0010]**