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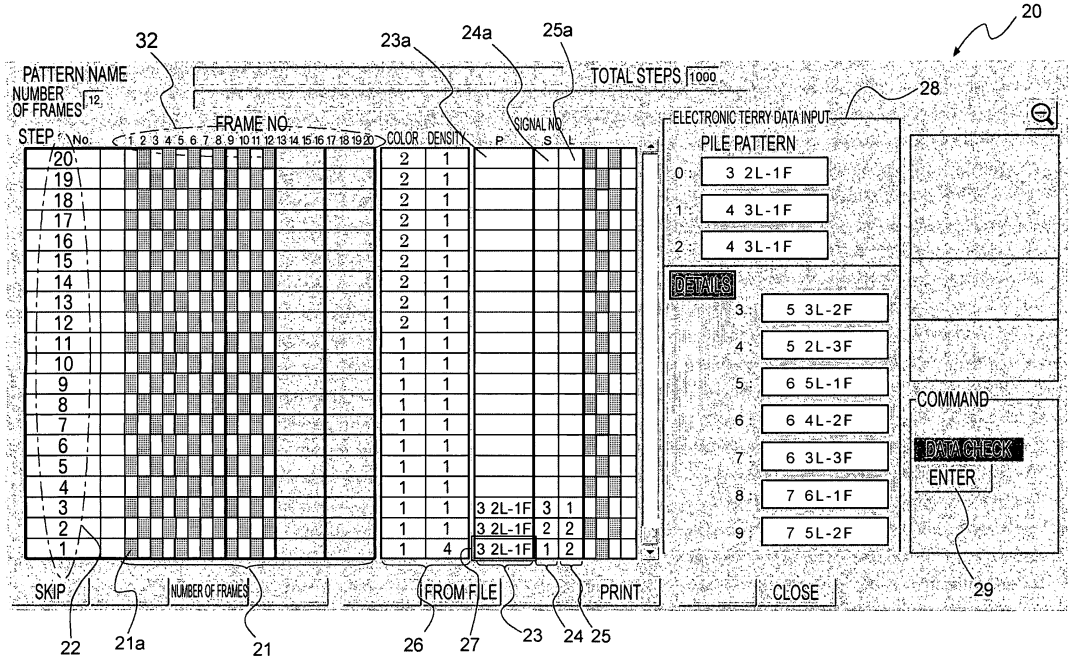
(54) Pile-weaving-pattern editing device

(57) A pile-weaving-pattern editing device (30) is provided for a pile loom (1), which forms piles by driving pile forming elements (15, 16) through driving means (M) that is independent of a main driving motor of the loom so as to change a relative position between a cloth fell (CF) of a woven cloth (W) and a beating position, the pile forming elements being driven on the basis of set pile forming information. The pile-weaving-pattern editing device (30) includes controlling means (31) having an automatic setting function. Based on the pile forming information input for an arbitrary one of the weaving steps, the controlling means (31) automatically sets pile forming information corresponding to the input pile forming information for a plurality of the weaving steps that follows the starting step in accordance with the number of weaving cycles included in the input pile forming information.

FIG. 1



EP 1 876 272 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a pile loom that forms piles by driving pile forming elements through driving means that is independent of a main driving motor of the loom so as to change a relative position between a cloth fell of a woven cloth and a beating position, the pile forming elements being driven on the basis of a pile weaving pattern containing pile forming information set in correspondence with weaving steps, the pile forming information including the number of weaving cycles to be performed in one pile forming cycle. In particular, the present invention relates to a device for writing and editing the pile weaving pattern to be used in the pile loom.

[0002] The term "one pile forming cycle" in the present invention refers to one unit of weaving cycles for forming piles. More specifically, one pile forming cycle consists of a plurality of weaving cycles for forming one pile. For example, if one pile is to be formed by inserting three weft threads and performing three beating operations, then one pile forming cycle consists of three weaving cycles. On the other hand, the term "weaving steps" in the present invention refers to steps that proceed in units of weaving cycles in one repeat of a weave structure, and a step number indicates what number of step (what number of weaving cycle) in one repeat. Accordingly, one step equals one weaving cycle.

[0003] The term "pile weaving pattern" in the present invention refers to a pattern in which pile forming information including the number of weaving cycles (which will be referred to as "the number of pile picks" hereinafter) in at least one pile forming cycle is set in correspondence with the weaving steps for one repeat of a weave structure. Furthermore, the term "pile forming information" refers to information that includes at least the number of pile picks. For example, if the number of pile picks is three picks (i.e. three weaving cycles), the pile forming information will include the numerical value "3". Furthermore, in addition to the number of pile picks, there are cases where the pile forming information includes the number of loose picks (namely, the number of weft insertion processes in which each inserted weft thread is beaten to a position that is distant from the cloth fell of the woven cloth), the number of fast picks (namely, the number of weft insertion processes in which each inserted weft thread is beaten against the cloth fell together with a loose-pick weft thread), and the relative position between the cloth fell of the woven cloth and the beating position of the reed.

2. Description of the Related Art

[0004] Japanese Unexamined Patent Application Publication No. 11-350303 (which will simply be referred to as Patent Document 1 hereinafter) discloses an example of this type of a pile loom, which is a cloth-shifting type that forms piles by shifting the cloth fell relative to a fixed beating position. Specifically, a pile loom 1 of this cloth-shifting type is shown in Fig. 7 and includes a pile-warp beam 2 (at the upper side of Fig. 7) around which a plurality of pile warp threads PT are wound in a sheet-like manner and a ground-warp beam 3 (at the lower side) around which a plurality of ground warp threads GT are wound in a sheet-like manner.

[0005] The pile warp threads PT are let off from the pile-warp beam 2 and are wound around guide rollers 6, 6 and a pile-warp tension roller 7 disposed downstream of the guide rollers 6, 6. The pile warp threads PT then pass through a heald 8 and a reed 5 so as to be guided to a cloth fell CF of a woven cloth W. On the other hand, the ground warp threads GT are let off from the ground-warp beam 3 and are wound around a ground-warp tension roller 15 serving as a let-off-side terry motion member, which is a pile forming element. Similar to the pile warp threads PT, the ground warp threads GT then pass through the heald 8 and the reed 5 so as to be guided to the cloth fell CF. The woven cloth W formed as a result of inserted weft threads (not shown) interwoven with the pile warp threads PT and the ground warp threads GT is guided to a cloth guide roller 16 serving as a take-up-side terry motion member, which is another pile-forming element. The woven cloth W then passes through a take-up roller 11 and guide rollers 12, 13 so as to be finally taken up by a cloth roller 4.

[0006] Each weft thread inserted into a shed formed between the pile warp threads PT and the ground warp threads GT is beaten against the cloth fell CF by the reed 5. Regarding this beating process, the let-off-side and take-up-side terry motion members 15 and 16 are driven such that, for loose-pick beating, the cloth fell CF is positioned distant from the beating position (i.e. frontmost position of the reed 5), whereas, for fast-pick beating, the cloth fell CF is aligned with the beating position.

[0007] In the pile loom 1 shown in Fig. 7, the let-off-side terry motion member 15 has its opposite ends supported by support levers 15a, which are rotatably supported by a pile frame (not shown) through a rotary shaft 15b. Likewise, the take-up-side terry motion member 16 has its opposite ends supported by support levers 16a, which are rotatably supported by the pile frame through a rotary shaft 16b. Accordingly, the let-off-side and take-up-side terry motion members 15, 16 are rotatable about the rotary shafts 15b, 16b with respect to the pile frame.

[0008] The support levers 15a, 16a are linked with a rocking lever 18 respectively through linking rods 17, 19. Thus, when the rocking lever 18 is driven in a rocking motion, the let-off-side and take-up-side terry motion members 15, 16 are rocked in the same direction, thereby shifting the cloth fell CF.

[0009] Similar to the pile loom described in Patent Document 1, in the pile loom 1 shown in Fig. 7, the rocking lever 18 is connected with an output shaft Ms of a driving

motor M, which is independent of a main driving motor of the loom. The rocking lever 18 is driven by the driving motor M in a rocking motion. Accordingly, by controlling the driving of the driving motor M using a pile controller 48, the timing for shifting the cloth fell CF can be set arbitrarily and can also be changed in the course of a weaving operation. Specifically, for example, it is possible to switch from a three-pile-pick weaving mode to a four-pile-pick weaving mode, or from a four-pile-pick weaving mode consisting of three loose picks and one fast pick to a four-pile-pick weaving mode consisting of two loose picks and two fast picks in the course of a continuous operation (weaving operation) without having to stop the loom.

[0010] In the aforementioned pile loom, if a shedding device (not shown) for moving the pile warp threads PT and the ground warp threads GT in a shedding motion is a type that can electrically control a plurality of heald frames in an individual fashion, such as an electronic dobby shedding device or an electric dobby device that drives the heald frames individually with designated motors, the shedding device will be driven on the basis of preliminarily set shedding patterns.

[0011] Furthermore, as described in Patent Document 1, in a pile loom equipped with the shedding device of the aforementioned type, there are cases where other weaving pattern information is set for the shedding device in addition to the shedding patterns mentioned above. In this case, the term "weaving pattern information" refers to information related to operation (control) modes for devices that are involved in weaving in addition to the shedding patterns for the shedding device. In the case of a pile loom, this weaving pattern information includes a pile weaving pattern containing pile forming information, such as the number of pile picks and the number of fast picks and loose picks to be performed in one pile forming cycle, and the shifting amount of the cloth fell. In a pile loom, the aforementioned pile controller 48 controls the driving of the driving motor M on the basis of the pile forming information included in the pile weaving pattern so as to drive the pile forming elements in accordance with the pile weaving pattern.

[0012] Fig. 6 illustrates an example of the setting of the weaving pattern information. Specifically, Fig. 6 shows the setting conditions of the weaving pattern information displayed on a display window of a display unit included in a pattern editing device. The pattern editing device may be a built-in display device provided on the loom, of which display contents are editable, such as a display device having a touch-panel type display portion, or an external personal computer that is separate from the loom.

[0013] In the left portion of a display window 20 in Fig. 6 are shown shedding patterns for the shedding device, the shedding patterns being one of the items included in the weaving pattern information. The example of the setting of the shedding patterns shown in Fig. 6 corresponds to a case where a weaving operation is to be performed using 12 heald frames (first to twelfth heald frames in that order from the cloth fell). Each shedding pattern includes drive modes of the heald frames for a corresponding one of weaving cycles. The shedding patterns are set for one repeat of a weave structure and are set in correspondence to total steps starting from Step No. 1 (i.e. the first weaving cycle in one repeat of the weave structure). Specifically, each shedding pattern corresponds to one step, i.e. one weaving cycle, and includes information related to the positions (uppermost/lowermost positions) of the heald frames at the time of warp shedding in that weaving cycle. The term "total steps" refers to the number of weaving cycles (i.e. the number of picks) in one repeat of a weave structure, and in the example shown in Fig. 6, the total steps correspond to 1000 picks.

[0014] In Fig. 6, the left portion of the display window 20 has a setting display section 21 which includes a plurality of cells 21a arranged in a matrix and shows shedding patterns. To the left of the setting display section 21 is provided a display section 22 having numerical values that indicate weaving step numbers. Each of the weaving step numbers in the display section 22 not only corresponds to a shedding pattern but also to weaving pattern information. Furthermore, numerical values 32 above the setting display section 21 indicate heald frames (first to twentieth heald frames) that correspond to the cells 21a. Since the set shedding patterns in the example shown in Fig. 6 are for weaving using the first to twelfth heald frames, the cells 21a that correspond to the thirteenth to twentieth heald frames in the setting display section 21 are in a non-display mode. For each weaving step, the corresponding shedding pattern is set such that the cells 21a corresponding to the designated heald frames are displayed in different display modes depending on whether the heald frames are to be positioned at an uppermost position or a lowermost position at the time of warp shedding in that weaving step.

[0015] In addition to the shedding patterns, the display window 20 displays other weaving pattern information to the right of the setting display section 21. The weaving pattern information includes the type (color) of weft thread to be inserted in each weaving step, the weft density, and pile forming information that constitutes a pile weaving pattern.

[0016] In Fig. 6, pile pattern information (P), which is a piece of pile forming information, is set in a setting display section 23 given a reference character "P" thereabove. For example, the pile pattern information (P) is shown in the following manner: "3 2L-1F" or "4 2L-2F". The first value "3" in "3 2L-1F" indicates the number of pile picks. The second value "2L" indicates the number of loose picks, meaning that the number of loose picks is 2 picks. The third value "1F" indicates the number of fast picks, meaning that the number of fast picks is 1 pick. In other words, "3 2L-1F" represents one pile forming cycle consisting of a total of three picks, i.e. two loose picks and one fast pick. Likewise, "4 2L-2F" indicates that there are 4 pile picks, two of which being loose picks and

the other two being fast picks. In other words, "4 2L-2F" represents one pile forming cycle consisting of a total of four picks, i.e. two loose picks and two fast picks.

[0017] With regard to the setting process of the weaving pattern information, the display window 20 shown in Fig. 6 can also be used as, for example, an editing/setting window. In other words, in addition to simply displaying the display window 20 on the display unit of the pattern editing device, the display window 20 may be configured such that information can be input to the cells in the setting display sections. Thus, the setting process of the weaving pattern information can be implemented by inputting information to the cells in correspondence to the weaving steps. Generally, this input process is implemented manually by an operator through the pattern editing device.

[0018] Conventionally, the setting process of the weaving pattern information involves inputting information to the cells in a one-by-one fashion in correspondence to the weaving steps. With regard to the pile weaving pattern, pile forming information, such as "3 2L-1F" and "4 2L-2F", is input to the cells in a one-by-one fashion.

[0019] This setting process, however, is problematic in that the input process requires a significant amount of time and effort and is also apt to cause input errors. This will be described below in detail.

[0020] The pile forming information contains information related to the number of pile picks. If the pile forming information indicates that the number of pile picks is "3", the same information will always be set for three weaving steps. Regardless of the fact that the same information is simply required to be input for consecutive weaving steps, the same information has to be input one by one to the cells that correspond to these consecutive weaving steps in the conventional art. This input process is extremely troublesome. In addition, since this process needs to be performed for all the pile weave portions in one repeat of the weave structure, the process requires a large number of inputs, thus requiring too much time and effort.

[0021] The possibility of an input error is considered to be low if there is only one kind of pile forming information to be set for the pile weave portions in one repeat of the weave structure. However, in a case where a mixture of different kinds of pile forming information needs to be set, that is, if the pile weaving is to be performed with different numbers of pile picks in one repeat of the weave structure, there is a high possibility of an input error in the setting process. For example, if the pile forming information indicates that the number of pile picks is four picks, the same information should be input for four weaving steps. However, there is a possibility that the same information is erroneously input for only three weaving steps, and the next pile forming information is subsequently input. In the case where such an input error occurs, the process for correcting the error will require even more time and effort.

SUMMARY OF THE INVENTION

[0022] Accordingly, it is an object of the present invention to facilitate an input process of pile forming information in a pile loom, which includes a pile weaving pattern as weaving pattern information containing pile forming information set for one repeat of a weave structure, and to ensure that the input process of the pile forming information is properly implemented for the number of pile picks included in the pile forming information so that input errors can be prevented and that the time and effort required for the input process can be reduced.

[0023] The present invention is directed to a pile loom that forms piles by driving pile forming elements through driving means that is independent of a main driving motor of the loom so as to change a relative position between a cloth fell of a woven cloth and a beating position, the pile forming elements being driven on the basis of a pile weaving pattern containing pile forming information set in correspondence with weaving steps, the pile forming information including the number of weaving cycles to be performed in one pile forming cycle. The present invention provides a pile-weaving-pattern editing device, which is provided for writing and editing the pile weaving pattern to be used in such a pile loom and includes controlling means having an automatic setting function. Based on the pile forming information input for an arbitrary one of the weaving steps designated as a starting step, the controlling means automatically sets pile forming information corresponding to the input pile forming information for a plurality of the weaving steps that follows the starting step in accordance with the number of weaving cycles included in the input pile forming information.

[0024] The term "input" is not limited to a case where information is directly input to a corresponding setting section, but may include a case where the setting section is set in a selected state and a desired piece of information is selected from a plurality of pieces of preliminarily set information so that the selected piece of information is set in the setting section. Furthermore, the setting sections may be selectable through another input window and information may be input to a selected one of the setting sections through that window so that the information can be set in that setting section.

[0025] According to the pile-weaving-pattern editing device of the present invention, based on the pile forming information input for an arbitrary one of the weaving steps designated as a starting step, the controlling means automatically sets pile forming information corresponding to the input pile forming information for a plurality of the weaving steps that follow the starting step in accordance with the number of weaving cycles included in the pile forming information. Accordingly, when inputting pile forming information that indicates the number of pile picks is n picks, an operator only needs to input the pile forming information for the first weaving step of one pile forming cycle consisting of n picks. For the remaining weaving steps corresponding to (n - 1) picks, the control-

ling means automatically sets pile forming information corresponding to the pile forming information input by the operator. Thus, the number of inputs to be performed by the operator is reduced to 1/n or less, and the input process of the pile forming information for the n-pick weaving steps is properly implemented. Accordingly, this significantly reduces the time and effort required for the input process of the pile forming information performed by the operator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 schematically illustrates an embodiment of the present invention;
Fig. 2 is a block diagram of this embodiment;
Fig. 3 illustrates a database table used in this embodiment;
Figs. 4A and 4B schematically illustrate other embodiments of the present invention;
Figs. 5A and 5B schematically illustrate other embodiments of the present invention;
Fig. 6 schematically illustrates a conventional example; and
Fig. 7 schematically illustrates an example of a pile loom to which the present invention is applied.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] Embodiments of the present invention will now be described with reference to the drawings.

[0028] Figs. 1 to 3 illustrate an embodiment of the invention. Fig. 1 shows a setting display window 20 to which weaving pattern information can be input. Sections in Fig. 1 that are equivalent to those in the above description are given the same reference numerals, and descriptions of those sections will not be repeated. Furthermore, the pile loom to which the present invention is applied is of a cloth-shifting type. However, the pile loom is not limited to a cloth-shifting-type pile loom, and may include a pile loom of a type in which the beating position is shiftable with respect to a fixed cloth fell.

[0029] In the setting display window 20 shown in Fig. 1, setting display sections 23, 24, 25, 26 are provided to the right of the setting display section 21 in which shedding patterns are set. In the setting display sections 23, 24, 25, 26, weaving pattern information other than the shedding patterns can be input. In the setting display section 26, information related to the type (color) of weft thread to be inserted in each weaving step and information related to the weft density (density) are set as weaving pattern information.

[0030] The pile weaving pattern being one of the items included in the weaving pattern information in the present invention is constituted by pile forming information set in the setting display sections 23, 24, 25. In the example shown in Fig. 1, the pile pattern information (P), being one of the items included in the pile forming information, is set in the setting display section 23 given a reference character "P" thereabove. Examples of the pile pattern information (P) are [3 2L-1F], [4 3L-1F], [4 2L-2F], and [5 3L-2F].

[0031] In this embodiment, the pile forming information includes cloth-fell position information (L) which is information related to the relative position between the cloth fell CF and the beating position. In the setting display window 20, this cloth-fell position information (L) is input to the setting display section 25 given a reference character "L" thereabove. Furthermore, pile step information (S) for one pile forming cycle is displayed in Fig. 1. This pile step information (S) is set in the setting display section 24 given a reference character "S" thereabove.

[0032] The setting display sections 23, 24, 25 respectively have cells 23a, 24a, 25a, which correspond to the weaving step numbers shown in the leftmost display section 22 on the setting display window 20. The cells 23a, 24a, 25a have information set therein in correspondence to the weaving steps.

[0033] Fig. 2 illustrates an external personal computer 30 serving as a pattern editing device that is separate from the pile loom. In this example of Fig. 2, the weaving pattern information is set using the personal computer 30 and is set in a setting device 40 of the loom by means of a memory card MC.

[0034] The personal computer 30 includes a main computer unit 31, a display 33 serving as a display unit, and a keyboard 35 serving as an input unit. The main computer unit 31 has a program installed therein for writing and editing the weaving pattern information. Accordingly, in this embodiment, the main computer unit 31 corresponds to controlling means according to the present invention.

[0035] The setting device 40 in the loom includes a central processing unit (which will be referred to as a "CPU" hereinafter) 41, an input/output port (which will be referred to as an "I/O port" hereinafter) 42 connected to the CPU 41, and a storage unit 43. The I/O port 42 in the setting device 40 is connected to a display unit 45, an input unit 46, and a card interface (which will be referred to as a "card I/F" hereinafter) 47, which are provided in the loom.

[0036] The weaving pattern information written in the personal computer 30 and stored in the memory card MC is read into the CPU 41 via the card I/F 47 and the I/O port 42 and is stored into the storage unit 43. The weaving pattern information stored in the storage unit 43 can be displayed on the display unit 45 by operating the input unit 46 to send a display command from the input unit 46 to the CPU 41 via the I/O port 42.

[0037] Based on the weaving pattern information stored in the storage unit 43, the CPU 41 outputs setting information of the weaving pattern information to controllers of the devices in the loom that are involved with weaving. For example, based on the set pile weaving pattern, the pile forming information can be output to the pile con-

troller 48. Furthermore, based on the set shedding pattern, the set color, and the set density, the setting information can be output to a shed controller for driving the shedding device, a weft-insertion controller for controlling the weft insertion, and a take-up controller for controlling the density, although none of these controllers are shown in the drawings.

[0038] The setting process of the pile weaving pattern using the pile-weaving-pattern editing device according to the present invention will now be described.

[0039] First, an operator operates the personal computer 30 to display a new setting display window 20 on the display 33. It is assumed that the setting display section 21 and the setting display sections 23 to 26 in the setting display window 20 are in a blank state. The operator then begins the setting process of the weaving pattern information including information related to the shedding patterns, the types of weft threads to be inserted in the weaving steps, the densities, and the pile weaving pattern. However, the description of the setting process of the information related to the shedding patterns, the weft types, and the densities will be omitted below.

[0040] To set the pile weaving pattern, the operator first operates the personal computer 30 so that the main computer unit 31 serving as controlling means executes the program for editing the pile weaving pattern. Thus, the cells 23a, 24a, 25a in the setting display sections 23, 24, 25 are set in a state such that pile forming information can be input thereto. In addition, a cursor 27 for selecting the cells 23a, 24a, 25a is displayed. The operator then puts the cursor 27 on one of the cells 23a in the setting display section 23 that corresponds to Step No. 1, which is the starting step, so that pile forming information for Step No. 1 can be input to that cell 23a. In other words, the operator confirms that the cell 23a corresponding to the starting step is selected and inputs pile pattern information (P) to that cell 23a. The cursor 27 can be moved arbitrarily to a desired position using, for example, cursor keys on the keyboard 35.

[0041] In the example shown in Fig. 1, a plurality of pieces of usable pile pattern information (P) is preliminarily set, and the pile pattern information pieces (P) are given the numbers 0 to 9, which are displayed in a display section 28. This is intended to facilitate the input process of the pile pattern information (P). In detail, instead of inputting characters in a one-by-one fashion to the cells 23a in the setting display section 23 using the keyboard 35, the pile pattern information (P) can be input to a corresponding cell 23a by operating a numeric key on the keyboard 35 so that the pile pattern information piece (P) corresponding to the input numerical value is input to that cell 23a.

[0042] According to the pile-weaving-pattern editing device of this embodiment, when the operator inputs the pile pattern information (P) for the starting step, the controlling means 31 performs an automatic setting process of pile pattern information (P) for the number of pile picks (for example, n picks) included in the input pile pattern information (P). In detail, in order for the pile pattern information (P) input to the cell 23a for the starting step (which will be referred to as an "input cell" hereinafter) by the operator to be input to n cells 23a (n being equal to the number of pile picks) including the cell 23a for the starting step, the controlling means 31 automatically sets the same pile pattern information (P) in the (n - 1) cells 23a that follow the input cell 23a.

[0043] If the pile pattern information (P) set in the input cell 23a is [3 2L-1F] as shown in Fig. 1, the controlling means 31 determines that the number of pile picks is three picks from that pile pattern information (P) and executes a program for automatically setting the same [3 2L-1F] pile pattern information (P) in the cells 23a for the two picks following the input cell 23a. Thus, the [3 2L-1F] pile pattern information (P) input by the operator is set in the three cells 23a for three consecutive picks including the input cell 23a, which is the state shown in Fig. 1. On the other hand, if the pile pattern information (P) input to the input cell 23a is of a four pick type, such as [4 3L-1F] or [4 2L-2F], the controlling means 31 executes a program for automatically setting the same pile pattern information (P) in the cells 23a for the three consecutive picks following the input cell 23a.

[0044] According to the pile-weaving-pattern editing device of this embodiment, for an input process of n-pile-pick pile pattern information (P), the operator only needs to input the pile pattern information (P) to the first cell 23a of the n consecutive cells 23a to which the same pile pattern information (P) is to be input. The controlling means 31 then automatically sets the same pile pattern information (P) for the remaining (n - 1) cells 23a. Consequently, this reduces the number of input operations to be performed by the operator and ensures that the input process is performed properly for the number of pile picks included in the pile pattern information (P).

[0045] When the automatic setting process of the pile pattern information (P) is completed, the controlling means 31 moves the cursor 27 to a cell 23a that follows the automatically set cells 23a, and waits in a standby state. In detail, in the case of Fig. 1, when the operator inputs 3-pile-pick pile pattern information (P) to the cell 23a corresponding to Step No. 1 (i.e. the first weaving step) in the setting display section 23 in a state where the cursor 27 is located on that cell 23a, the controlling means 31 automatically sets the same pile pattern information (P) in the cells 23a corresponding to Step No. 2 and Step No. 3. When this automatic setting process is completed, the controlling means 31 moves the cursor 27 to the cell 23a corresponding to Step No. 4 and waits in a standby state. Accordingly, the cursor 27 is moved automatically to the next cell that is subject to the next input process. Thus, the input process of the pile pattern information (P) can be performed continuously without having to perform an operation for moving the cursor 27.

[0046] Furthermore, according to this embodiment, the pile forming information also includes the cloth-fell position information (L) and the pile step information (S) in

addition to the pile pattern information (P), which are also set automatically. Specifically, simultaneously with the automatic setting process of the pile pattern information (P), the controlling means 31 also automatically sets the cloth-fell position information (L) in the corresponding cells in the setting display section 25 for the corresponding weaving steps, and step numbers for the number of pile picks starting from 1 as the pile step information (S) in the corresponding cells in the setting display section 24.

[0047] In detail, the cloth-fell position information (L) is information related to the position of the cloth fell CF relative to the beating position in a cloth-shifting-type pile loom and indicates a cloth-fell position at a beating point at each weaving step in one pile forming cycle, the beating point being a time point at which the inserted weft thread is beaten against the cloth fell in that weaving step. This implies that the cloth-fell position information for a fast-pick weaving step indicates 0 mm. In Fig. 1, a plurality of pieces of cloth-fell position information (L) is set as distance values from the beating position to the cloth fell CF in a separate database (not shown). These cloth-fell position information pieces (L) are given numbers starting from 1 (for example, 1: 0 mm, 2: 10 mm, 3: 12 mm, and so on). Each of the cells 25a in the setting display section 25 is given one of the numbers that represents the cloth-fell position (i.e. the distance from the beating position). In the aforementioned separate database, [1: 0 mm] is a fixed cloth-fell position information piece (L) that corresponds to fast-pick weaving.

[0048] The controlling means 31 has a database shown in Fig. 3 set and stored therein. The controlling means 31 executes a program for automatically setting the pile forming information in accordance with this database.

[0049] In detail, when the operator inputs [3 2L-1F], the controlling means 31, in a first step (Step), sets "1" in section S (setting display section 24) of the same step number and "2" in section L (setting display section 25) of the same step number based on the fact that [3 2L-1F] is input in section P (setting display section 23). In the subsequent step (Step + 1), the controlling means 31 sets the same [3 2L-1F] pile pattern information (P) in the cell of section P of the subsequent step number, and sets "2" in section S of the same step number and "2" in section L of the same step number. In the subsequent step (Step + 2), the controlling means 31 sets the same [3 2L-1F] pile pattern information (P) in section P of the subsequent step number, and sets "3" in section S of the same step number and "1" in section L of the same step number. This completes the program (No. 0 in the database shown in Fig. 3).

[0050] Likewise, if the pile pattern information (P) input by the operator is [4 3L-1F], [4 2L-2F], or [5 3L-2F], the program is similarly executed on the basis of the database shown in Fig. 3, whereby the pile forming information is set automatically. Each numerical value to be set in section L in the database is appropriately selected in accordance with the weaving conditions from another database having the cloth-fell position information (L) set therein. The numerical value to be set in section L for a fast-pick weaving step will always be "1" (= 0 mm).

[0051] Furthermore, in this embodiment, the controlling means 31 has a data checking function for checking whether the pile pattern information (P) set in the above-described manner is set properly. This data checking function for the set pile pattern information (P) is executed by operating an data-check enter button 29 provided on the right side of the setting display window 20 or by operating a designated data-check enter key provided on the keyboard 35.

[0052] If the program for the automatic setting of the pile weaving pattern is executed properly, information setting errors should not occur. However, there are cases where the running program is terminated before its completion due to a certain reason. In that case, if the operator inputs the next pile pattern information (P) without noticing that the program has been terminated, the set pile weaving pattern will become improper as a whole. When a weaving operation is performed based on such a pile weaving pattern having erroneous setting information, the pile-woven cloth will be problematic in view of its quality. In contrast, with the data checking function provided in the controlling means 31, the setting information can be checked for errors at the point when the setting process of the pile weaving pattern is completed, thereby preventing quality defects in the woven cloth.

[0053] Regarding the data checking function of the controlling means 31 for checking the setting of the pile pattern information (P), the same pile pattern information (P) should always be consecutively set for the number of pile picks included in the information (P). Consequently, the checking process of the pile pattern information (P) involves checking whether the same pile pattern information (P) is set consecutively for the number of pile picks for each pile forming cycle so as to determine whether the setting is proper or improper. The checking process of the pile pattern information (P) can be implemented by, for example, allowing the controlling means 31 to execute the following program.

1. When the data-check enter button 29 is operated, the number of pile picks (n) is determined from the pile pattern information (P) set in the cell 23a corresponding to Step No. 1 and is stored.
2. Based on the stored information related to the number of pile picks (n), a checking process is sequentially performed on the cells 23a corresponding to Step No. 2 to Step No. n to determine whether these cells 23a have set therein the same pile pattern information (P) as the cell 23a corresponding to Step No. 1.
3. If there are no errors found in the setting as a result of the checking process, the information related to the number of pile picks (n) stored for the checking of the previous pile forming cycle is deleted. Subse-

quently, the number of pile picks is determined from the pile pattern information (P) set in the cell corresponding to Step No. (n + 1) and is stored.

4. The processes 2 and 3 described above are similarly repeated to sequentially perform the checking process. When the checking process of the cells 23a for the total number of steps is completed, the program ends.

[0054] If no error is found as a result of the checking process by the above-described program, the program is successfully completed, and a message indicating the successful completion of the program is displayed. On the other hand, if an error is found in the setting during the checking process, the checking program is stopped at that point. With the cursor 27 stopped at that position, an error message may be displayed.

[0055] Although the above description of the present embodiment is directed to a case where a new pile weaving pattern is being set, the present invention is not limited to the above-described case. The present invention can be employed for editing an already existing pile weaving pattern or for correcting a written pile weaving pattern.

[0056] Fig. 4A illustrates another embodiment of the present invention, in which a stored pile weaving pattern that has been previously set and used is read out and edited so that the edited pile weaving pattern can be used again. In this embodiment, additional weaving steps are added to an already existing pile weaving pattern for the number of pile picks included in additionally inserted pile forming information. For the additional weaving steps, the same automatic setting process as in the previous embodiment can be implemented. The present embodiment is not limited to the above case where the pile forming information is set after the operator has added the additional weaving steps. Alternatively, for example, the operator may send a command to "add [pile pattern information (P)] to Step No. X" so that the controlling means 31 automatically adds additional weaving steps and sets the pile forming information.

[0057] The automatic setting function can be similarly applied to another embodiment shown in Fig. 4B where an already existing pile weaving pattern is subject to a partial change. This embodiment shown in Fig. 4B is not limited to a case where already set pile forming information as shown is deleted once and is then replaced with new pile forming information. For example, the already set pile forming information can be changed by writing new information over the already set information.

[0058] In the above case where the pile forming information is to be changed, if a section having 3-pile-pick pile forming information set therein is to be changed to 4-pile-pick pile forming information, the pile forming information cannot be set properly in this state since there is not enough number of weaving steps.

[0059] Consequently, the controlling means 31 may be equipped with an automatic weaving-step adding function to compensate for an imbalance between the number of pile picks included in the input pile forming information and the number of weaving steps that can be input. This function can be implemented by, for example, allowing the controlling means 31 to execute the following program.

1. The number of pile picks (for example, n) included in the pile pattern information (P) input by the operator is determined.
2. Based on the determined number of pile picks (n), it is determined whether information (pile step information (S)) is set in section S (setting display section 24) corresponding to a weaving step that is n steps following the weaving step for which the pile pattern information (P) has been input. If it is determined that the information is not set, the program proceeds directly to an automatic setting process of the pile forming information. When the setting process is completed, the program ends.
3. If information is set in section S, it is determined whether a set value of the information is "1". If it is determined that the set value is "1", the program proceeds directly to the automatic setting process of the pile forming information. When the setting process is completed, the program ends.
4. If it is determined that the set value in section S is not "1", it is determined that there is an imbalance between the number of pile picks included in the input pile forming information and the number of weaving steps that can be input. Then, a confirmation message notifying that additional weaving steps will be added is displayed on the display window.
5. When the message is confirmed by the operator, the additional weaving steps are added, and the automatic setting process of the pile forming information is subsequently implemented. When the setting process is completed, the program ends.

[0060] The automatic weaving-step adding function described above is also effective for error correction in a case where an error is found in the setting during the data checking process of the pile pattern information (P). Specifically, with regard to pile forming information with the number of pile picks being n picks, n pieces of the same information should be set. However, if there are only (n - 1) pieces of pile forming information set, the aforementioned automatic weaving-step adding function can be used for the correcting process, thereby facilitating the correcting process.

[0061] Although the input process of the pile pattern information (P) is implemented by using the cursor 27 to designate a starting step in the above embodiment, the present invention is not limited to this technique. For example, referring to Fig. 5A, the starting step can be designated through a setting window 50 that is provided separate from the setting display window 20 of the above embodiment. Moreover, pile pattern information (P) to be input can also be set through this setting window 50. In

this case, the controlling means 31 may input the pile pattern information (P) in the setting display window 20 for the designated starting step.

[0062] Specifically, in Fig. 5A, a step number to be designated as a starting step can be input to a starting-step setting section 51 on the setting window 50, and pile pattern information (P) for the starting step can be input to a setting section 53. When an enter button 55 is operated, the controlling means 31 sets the pile pattern information (P) input to the setting section 53 in one of the cells 23a in the setting display section 23 that corresponds to the designated starting step. Subsequently, the automatic setting process of the pile pattern information (P) described in the above embodiment is implemented.

[0063] Furthermore, although the input process of the pile pattern information (P) for a starting step is performed for every starting step in the above embodiment, the present invention is not limited to this technique. Alternatively, the input process of the pile pattern information (P) for a starting step may be performed only a designated number of times by the controlling means 31.

[0064] Specifically, similar to Fig. 5A, Fig. 5B shows a setting window 60 that is provided separate from the setting display window 20. The setting window 60 has setting sections 61 and 63 to which the first starting step and pile pattern information (P) are respectively input. In addition, the setting window 60 also has a setting section 67 to which the number of piles, i.e. the number of repeats, is input. When an enter button 65 on the setting window 60 is operated, the controlling means 31 inputs the pile pattern information (P) input in the setting section 63 into one of the cells 23a of the setting display section 23 that corresponds to the designated first starting step input in the setting section 61, and then performs the automatic setting process of the pile pattern information (P) described in the above embodiment. Furthermore, as a second repeat, the controlling means 31 similarly inputs the pile pattern information (P) in the cell 23a that corresponds to the subsequent starting step, which is a cell 23a that follows the cells 23a that have underwent the automatic setting process described above. The controlling means 31 repeats the automatic setting process of the pile pattern information (P) described in the above embodiment and the input process of the pile pattern information (P) for the starting steps for the designated number of repeats input in the setting section 67. Accordingly, in addition to the automatic setting function described in the above embodiment, the controlling means 31 is given a function for repeating the input process of the pile pattern information (P) for the starting steps for a designated number of times, whereby the setting process of the pile pattern information (P) for a plurality of pile forming cycles can be performed automatically in one operation.

[0065] In the above embodiment, the cloth-fell position information pieces (L) are preliminarily set in correspondence with the number of steps from the starting step. Alternatively, if the input pile pattern information (P) is the same as that set for the weaving steps of the previous pile forming cycle, the cloth-fell position information pieces (L) set for these weaving steps may similarly be set for weaving steps of the subsequent pile forming cycle by the controlling means 31. In detail, in the setting display window 20 shown in Fig. 1, if [3 2L-1F] is input to the cell 23a in the setting display section 23 that corresponds to Step No. 4, the controlling means 31 may refer to the cloth-fell position information pieces (L) set for the weaving steps (Step Nos. 1 to 3) of the previous pile forming cycle having the same pile pattern information (P) ([3 2L-1F]) set therefor so as to set the same information pieces (L) in the cells 25a that correspond to Step Nos. 4 to 6.

[0066] The technical scope of the present invention is not limited to the above embodiments, and modifications are permissible to an extent that they do not depart from the scope of the claimed invention.

Claims

1. A pile-weaving-pattern editing device (30) for a pile loom (1), the pile loom (1) forming piles by driving pile forming elements (15, 16) through driving means (M) that is independent of a main driving motor of the loom so as to change a relative position between a cloth fell (CF) of a woven cloth (W) and a beating position, the pile forming elements (15, 16) being driven on the basis of a pile weaving pattern containing pile forming information set in correspondence with weaving steps, the pile forming information including the number of weaving cycles to be performed in one pile forming cycle, the pile-weaving-pattern editing device (30) being **characterized by** comprising:

   controlling means (31) having an automatic setting function, wherein based on the pile forming information input for an arbitrary one of the weaving steps designated as a starting step, the controlling means (31) automatically sets pile forming information corresponding to the input pile forming information for a plurality of the weaving steps that follows the starting step in accordance with the number of weaving cycles included in the input pile forming information.

2. The pile-weaving-pattern editing device (30) according to Claim 1, wherein the pile forming information includes pile pattern information (P) that contains said number of weaving cycles to be performed in said one pile forming cycle and the number of loose picks and fast picks to be performed in said one pile forming cycle,
   wherein the controlling means (31) automatically sets the pile pattern information (P) for said plurality of the weaving steps that follows the starting step

included in said one pile forming cycle, the automatically set pile pattern information being the same as the pile pattern information input for the starting step.

3. The pile-weaving-pattern editing device (30) according to Claim 2, wherein the pile forming information includes cloth-fell position information (L) in addition to the pile pattern information (P), the cloth-fell position information (L) indicating the relative position between the cloth fell (CF) of the woven cloth (W) and the beating position, and
wherein, in addition to automatically setting the pile pattern information (P), the controlling means (31) automatically sets the cloth-fell position information (L) for each of the weaving steps based on the number of loose picks and fast picks included in the pile pattern information (P).

4. The pile-weaving-pattern editing device (30) according to Claim 2, wherein the pile forming information includes pile step information (S) indicating pile forming steps in said one pile forming cycle, and
wherein, in addition to automatically setting the pile pattern information (P), the controlling means (31) automatically sets the pile step information (S).

5. The pile-weaving-pattern editing device (30) according to Claim 2, wherein the controlling means (31) has a data checking function for checking whether the set pile pattern information (P) is set properly or improperly.

FIG. 1

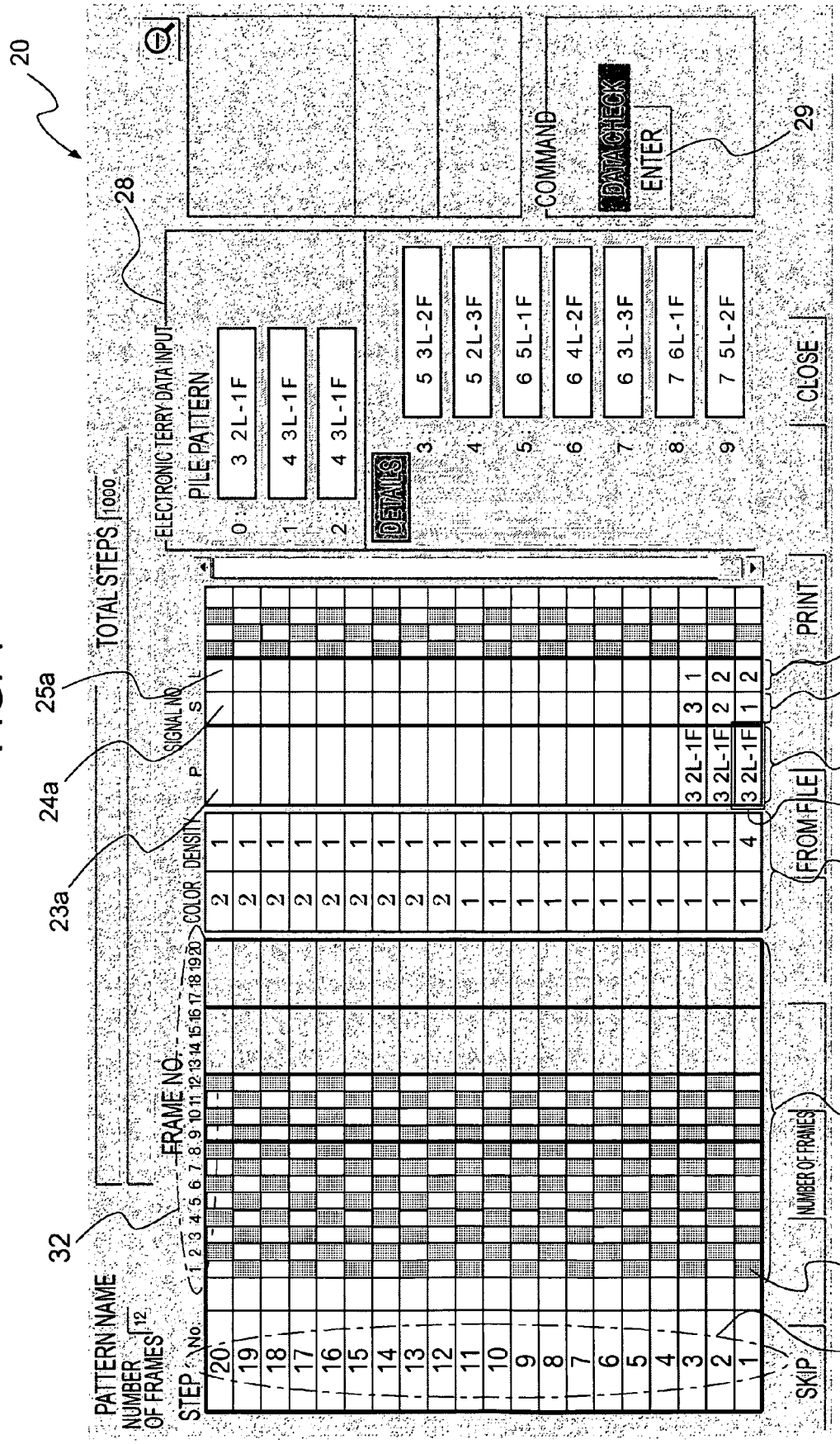

20
28
TOTAL STEPS 1000
ELECTRONIC TERRY DATA INPUT
PILE PATTERN
3 2L-1F
4 3L-1F
4 3L-1F
DETAILS
5 3L-2F
5 2L-3F
6 5L-1F
6 4L-2F
6 3L-3F
7 6L-1F
7 5L-2F
COMMAND
DATA CHECK
ENTER
29
CLOSE
25a
24a
23a
SIGNAL NO.
S
L
P
COLOR
DENSITY
PRINT
25
24
23
FROM FILE
27
26
PATTERN NAME
NUMBER OF FRAMES 12
STEP No.
FRAME NO.
32
NUMBER OF FRAMES
21
21a
SKIP
22

FIG. 2

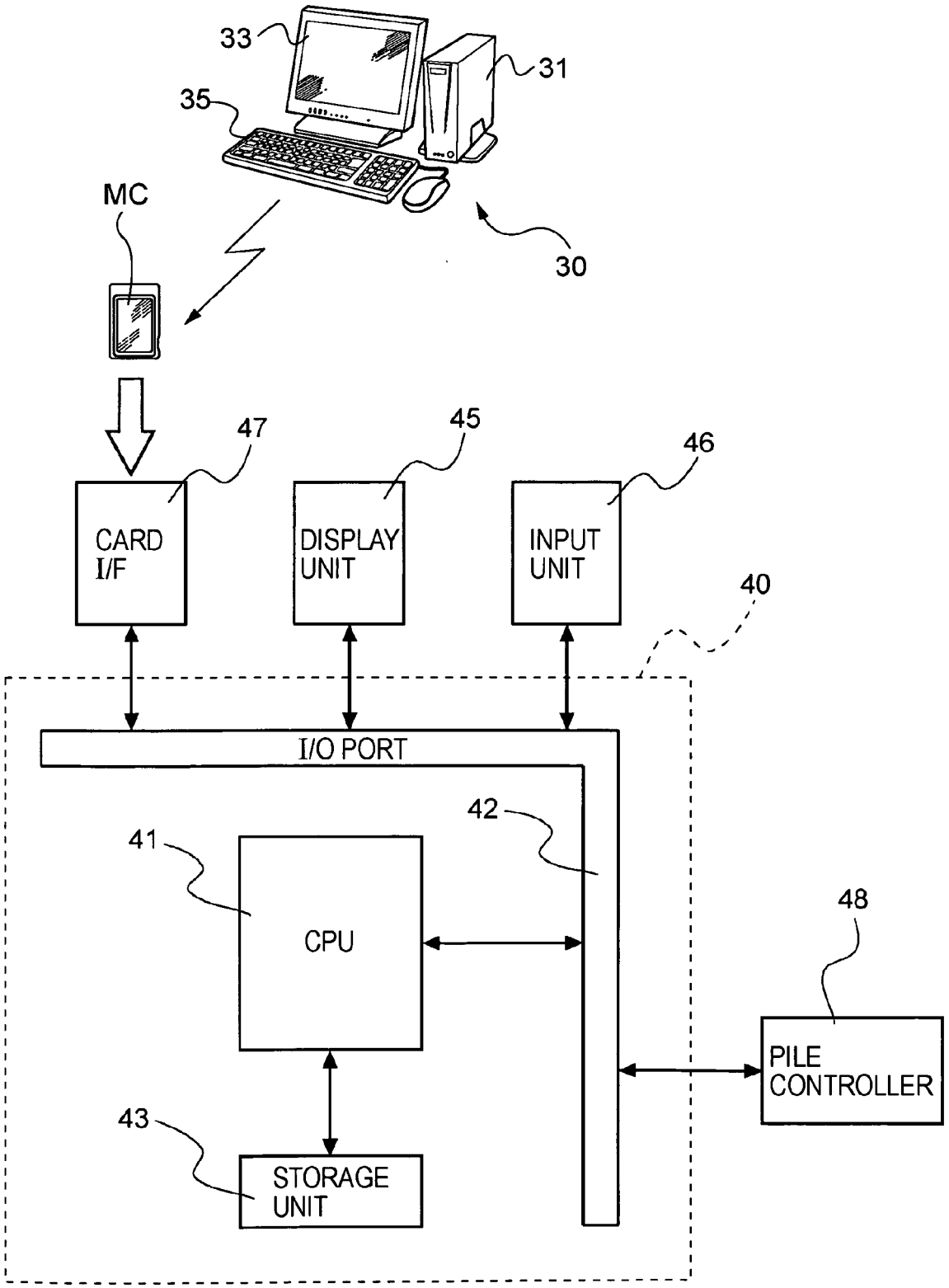
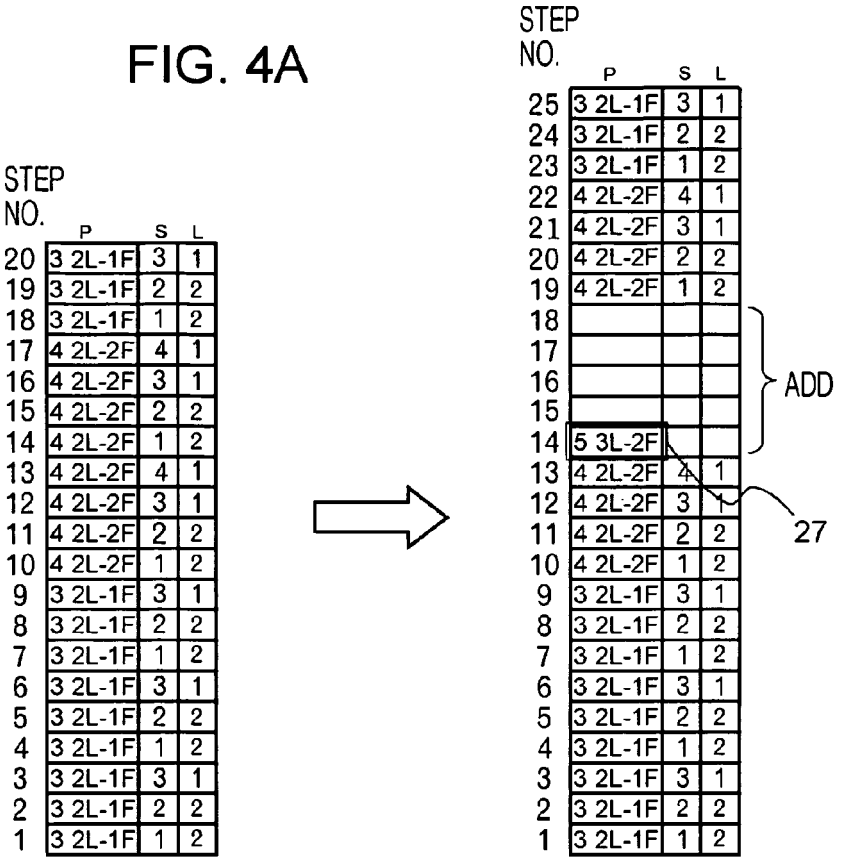

33
31
35
MC
30
47
45
46
CARD I/F
DISPLAY UNIT
INPUT UNIT
40
I/O PORT
42
41
CPU
48
PILE CONTROLLER
43
STORAGE UNIT

FIG. 3

No.	INPUT VALUE	Step	Step+1	Step+2	Step+3	Step+4	Step+5	Step+6
0	3 2L−1F	P:3 2L−1F S:1 L:2	P:3 2L−1F S:2 L:2	P:3 2L−1F S:3 L:1	−	−	−	−
1	4 3L−1F	P:4 3L−1F S:1 L:2	P:4 3L−1F S:2 L:2	P:4 3L−1F S:3 L:2	P:4 3L−1F S:4 L:1	−	−	−
2	4 2L−2F	P:4 2L−2F S:1 L:2	P:4 2L−2F S:2 L:2	P:4 2L−2F S:3 L:1	P:4 2L−2F S:4 L:1	−	−	−
3	5 3L−2F	P:5 3L−2F S:1 L:2	P:5 3L−2F S:2 L:2	P:5 3L−2F S:3 L:2	P:5 3L−2F S:4 L:1	P:5 3L−2F S:5 L:1	−	−
4	5 2L−3F	P:5 2L−3F S:1 L:2	P:5 2L−3F S:2 L:2	P:5 2L−3F S:3 L:1	P:5 2L−3F S:4 L:1	P:5 2L−3F S:5 L:1	−	−
5	6 5L−1F	P:6 5L−1F S:1 L:2	P:6 5L−1F S:2 L:2	P:6 5L−1F S:3 L:2	P:6 5L−1F S:4 L:2	P:6 5L−1F S:5 L:2	P:6 5L−1F S:6 L:1	−
6	6 4L−2F	P:6 4L−2F S:1 L:2	P:6 4L−2F S:2 L:2	P:6 4L−2F S:3 L:2	P:6 4L−2F S:4 L:2	P:6 4L−2F S:5 L:1	P:6 4L−2F S:6 L:1	−
7	6 3L−3F	P:6 3L−3F S:1 L:2	P:6 3L−3F S:2 L:2	P:6 3L−3F S:3 L:2	P:6 3L−3F S:4 L:1	P:6 3L−3F S:5 L:1	P:6 3L−3F S:6 L:1	
8	7 6L−1F	P:7 6L−1F S:1 L:2	P:7 6L−1F S:2 L:2	P:7 6L−1F S:3 L:2	P:7 6L−1F S:4 L:2	P:7 6L−1F S:5 L:2	P:7 6L−1F S:6 L:2	P:7 6L−1F S:7 L:1
9	7 5L−2F	P:7 5L−2F S:1 L:2	P:7 5L−2F S:2 L:2	P:7 5L−2F S:3 L:2	P:7 5L−2F S:4 L:2	P:7 5L−2F S:5 L:2	P:7 5L−2F S:6 L:1	P:7 5L−2F S:7 L:1

FIG. 4A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L
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16 4 2L-2F 3 1
15 4 2L-2F 2 2
14 4 2L-2F 1 2
13 4 2L-2F 4 1
12 4 2L-2F 3 1
11 4 2L-2F 2 2
10 4 2L-2F 1 2
9 3 2L-1F 3 1
8 3 2L-1F 2 2
7 3 2L-1F 1 2
6 3 2L-1F 3 1
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3 3 2L-1F 3 1
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1 3 2L-1F 1 2
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L
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19 4 2L-2F 1 2
18
17
16
15
14 5 3L-2F
13 4 2L-2F 4 1
12 4 2L-2F 3 1
11 4 2L-2F 2 2
10 4 2L-2F 1 2
9 3 2L-1F 3 1
8 3 2L-1F 2 2
7 3 2L-1F 1 2
6 3 2L-1F 3 1
5 3 2L-1F 2 2
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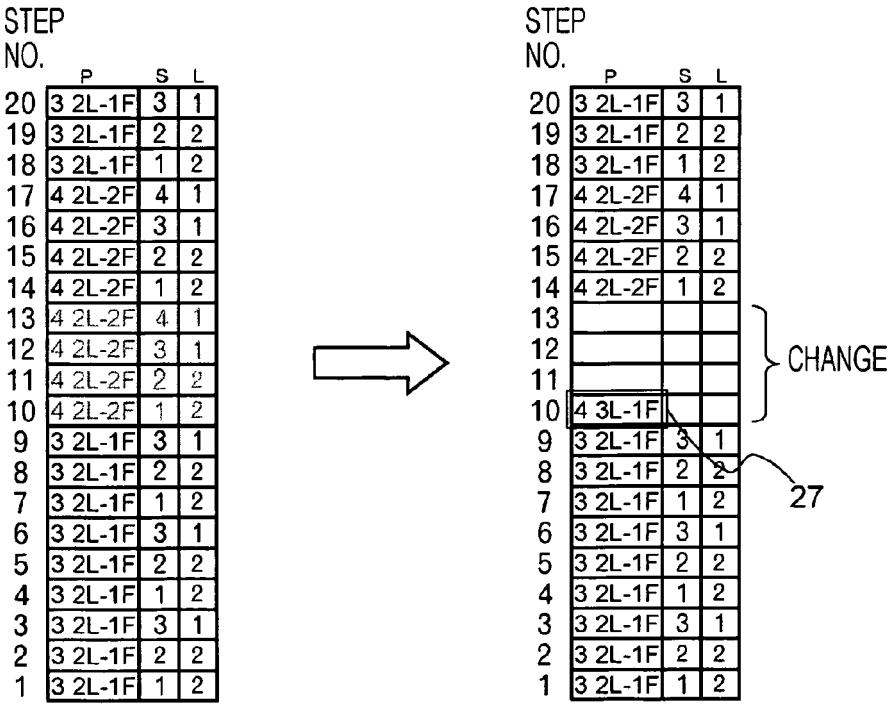
2 3 2L-1F 2 2
1 3 2L-1F 1 2
ADD
27

FIG. 4B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15 4 2L-2F 2 2
14 4 2L-2F 1 2
13 4 2L-2F 4 1
12 4 2L-2F 3 1
11 4 2L-2F 2 2
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9 3 2L-1F 3 1
8 3 2L-1F 2 2
7 3 2L-1F 1 2
6 3 2L-1F 3 1
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3 3 2L-1F 3 1
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1 3 2L-1F 1 2
STEP NO.
P
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L
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19 3 2L-1F 2 2
18 3 2L-1F 1 2
17 4 2L-2F 4 1
16 4 2L-2F 3 1
15 4 2L-2F 2 2
14 4 2L-2F 1 2
13
12
11
10 4 3L-1F
9 3 2L-1F 3 1
8 3 2L-1F 2 2
7 3 2L-1F 1 2
6 3 2L-1F 3 1
5 3 2L-1F 2 2
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2 3 2L-1F 2 2
1 3 2L-1F 1 2
CHANGE
27

FIG. 5A

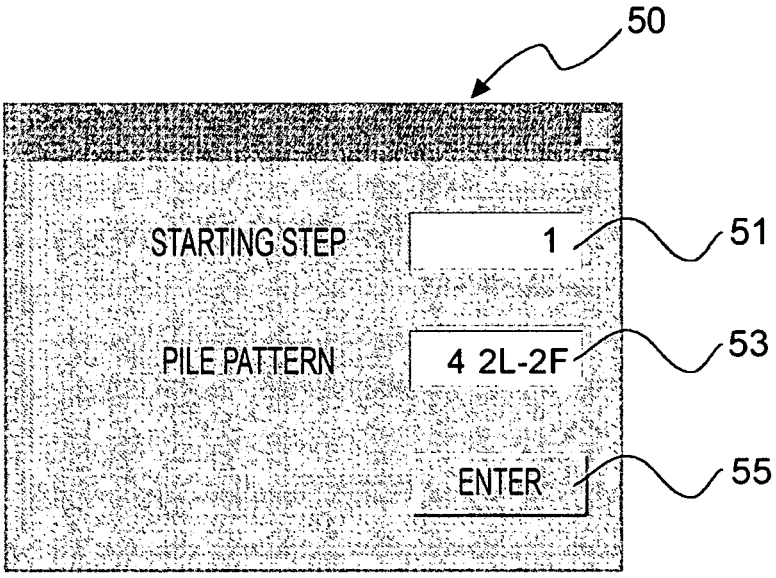
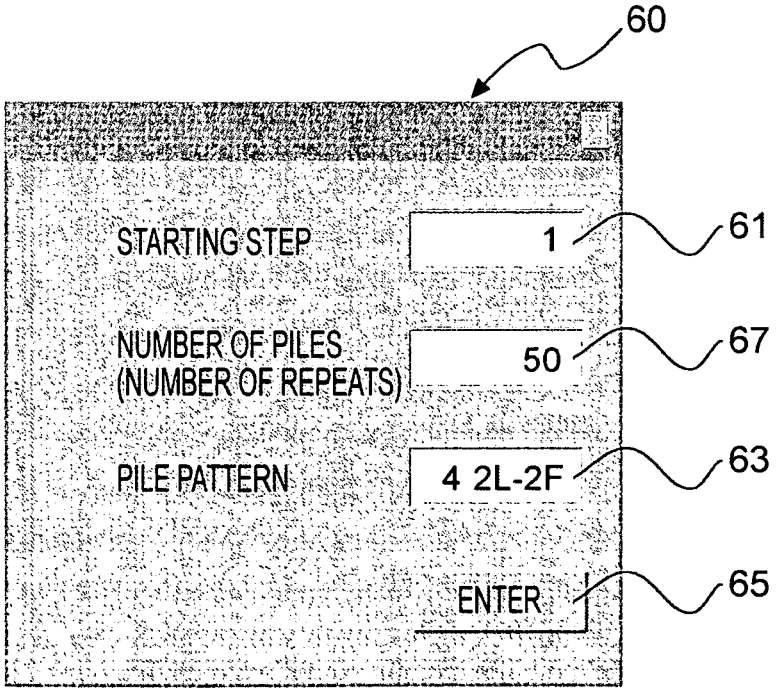

50
STARTING STEP
1
51
PILE PATTERN
4 2L-2F
53
ENTER
55

FIG. 5B


60
STARTING STEP
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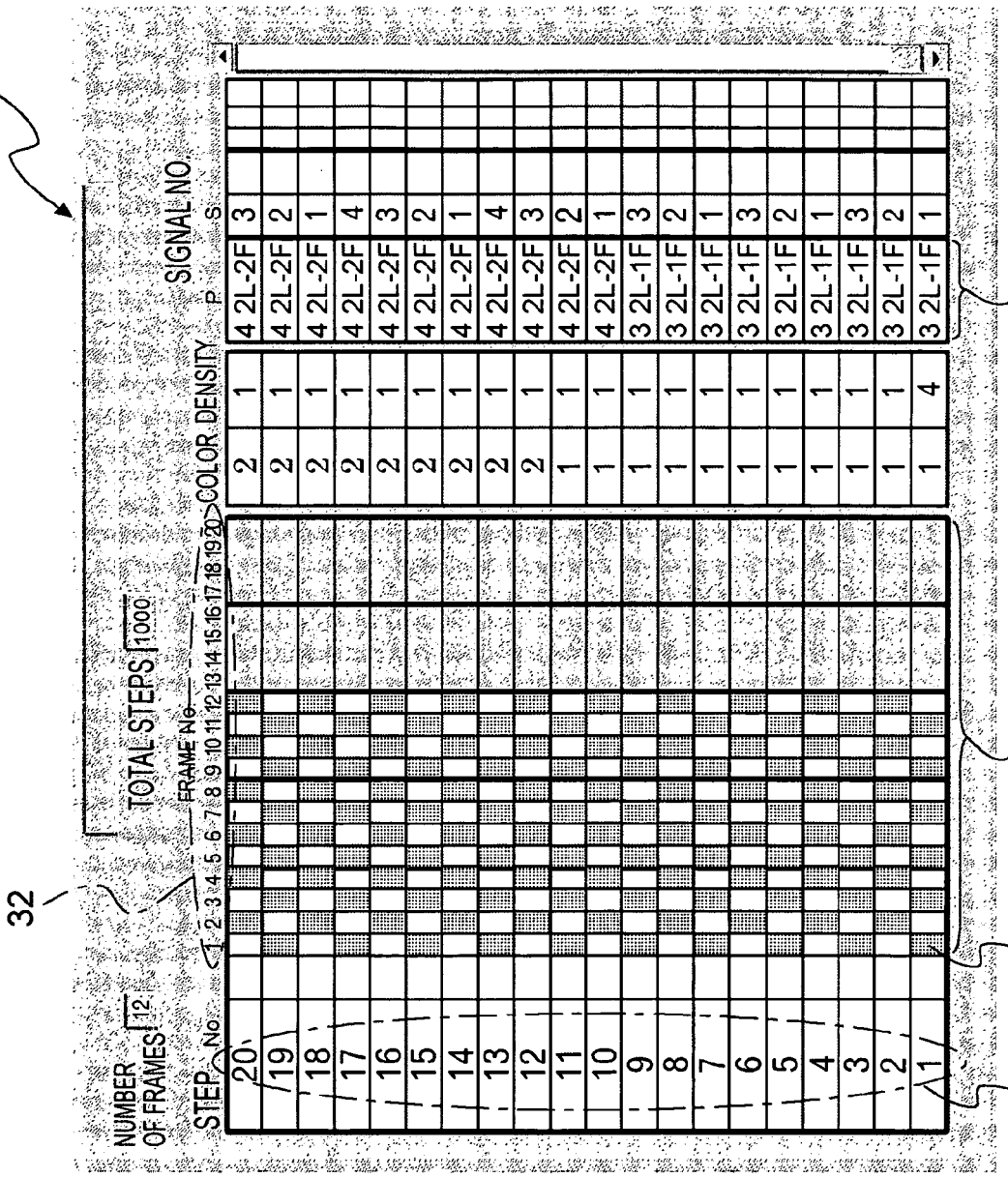
61
NUMBER OF PILES
(NUMBER OF REPEATS)
50
67
PILE PATTERN
4 2L-2F
63
ENTER
65

FIG. 6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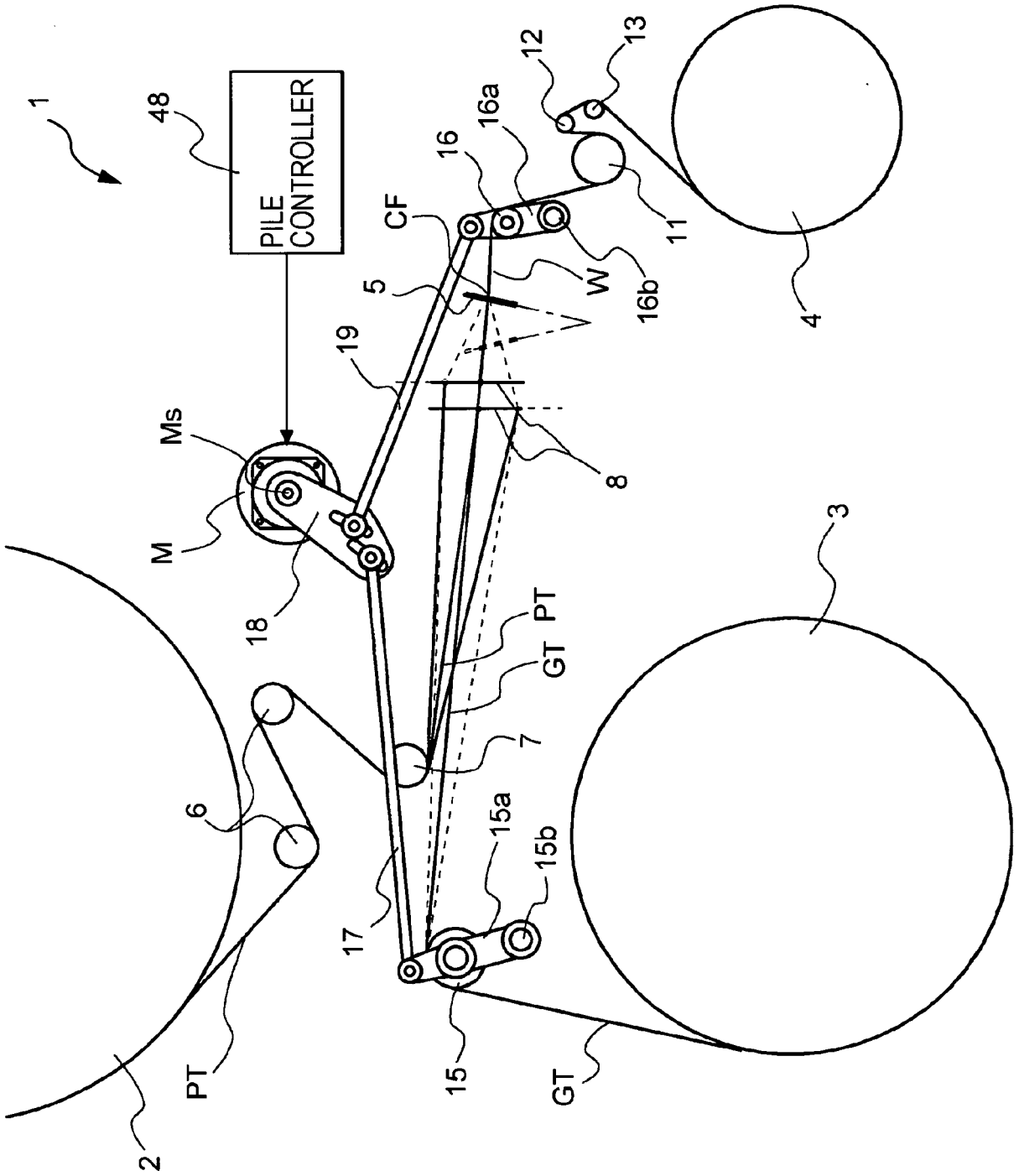
SIGNAL NO.
P
S
21
21a
22
23


1
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CF
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W
16b
4
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Ms
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M
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PT
GT
7
6
15a
15b
17
PT
15
GT
2

FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 00 8872

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 0 878 571 A1 (TOYODA AUTOMATIC LOOM WORKS [JP] TOYOTA JIDOSHOKKI KK [JP]) 18 November 1998 (1998-11-18) * figure 1 * * pages 4-7 * -----	1-5	
A	US 5 016 183 A (SHYONG EMORY [US]) 14 May 1991 (1991-05-14) * columns 2,3 * * column 7, lines 29-68 * * columns 8-12 * -----	1-5	TECHNICAL FIELDS SEARCHED (IPC) D03C D03D D03J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 June 2007	Iamandi, Daniela

CATEGORY OF CITED DOCUMENTS

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26-06-2007

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Patent documents cited in the description

- JP 11350303 A **[0004]**