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(54) WEAVING METHOD IN LOOM

WEBVERFAHREN IN EINER WEBMASCHINE

PROCÉDÉ DE TISSAGE DANS UN MÉTIER À TISSER

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Description

TECHNICAL FIELD

[0001] The present invention relates to a weaving method in a loom including a shedding device configured to give a shedding motion to warps by driving a corresponding heddle frame with a dedicated drive motor provided for each heddle frame, and configured to perform control of each drive motor, based on an operation pattern set for each heddle frame so that the warps intersect at a predetermined cross point.

BACKGROUND ART

[0002] For example, PTL 1 discloses a loom including a shedding device as described above. The shedding device disclosed in PTL 1 includes drive motors each provided corresponding to each of a plurality of heddle frames. The shedding device is configured so that each heddle frame is driven by the corresponding drive motor and drive of the heddle frame is controlled based on an operation pattern set so that warps intersect at a predetermined cross point.

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: JP2007-009355A

SUMMARY

[0004] An object of the present invention is to provide a weaving method for weaving a woven fabric having a special texture, in a loom including the shedding device as described above.

[0005] A weaving method in a loom of the present invention includes: setting at least a part of the heddle frames as a target heddle frame; and setting the operation pattern set for the target heddle frame as a special operation pattern, where the special operation pattern is an operation pattern for one repeat of a weaving pattern set in a form of assigning height position information to each weaving cycle, and where the height position information is information about the cross point and having a cross timing of the warps. The special operation pattern includes a first pattern having a first setting weaving cycle and a second pattern set after the first pattern and having a second setting weaving cycle. The first pattern consists of predetermined three or more weaving cycles and the second pattern consists of one or more weaving cycles, and each pattern is set as follows.

[0006] The first pattern is set such that:

(A) the cross point of each weaving cycle in the first setting weaving cycle is on one side in an upper and lower direction with respect to the cross point of a preceding weaving cycle; or

(B) the cross point in a plurality of weaving cycles smaller than a total number in the first setting weaving cycle is on one side in an upper and lower direction with respect to the cross point of a preceding weaving cycle and the cross point in remaining weaving cycles is the same as the cross point of the preceding weaving cycle.

[0007] In addition, the second pattern is set to change the cross point toward a first cross point of the first setting weaving cycle.

[0008] Further, in the weaving method of the present invention, the cross timing may be set to a time point different from a beating time point by a reed.

[0009] In addition, the second setting weaving cycle may consist of three or more weaving cycles, and the second pattern may be set such that:

(C) the cross point of each weaving cycle in the second setting weaving cycle is on an opposite side to the one side with respect to the cross point of the preceding weaving cycle; or

(D) the cross point in a plurality of weaving cycles smaller than a total number in the second setting weaving cycle is on an opposite side to the one side with respect to the cross point of the preceding weaving cycle and the cross point in remaining weaving cycles is the same as the cross point of the preceding weaving cycle.

[0010] According to the weaving method in the loom of the present invention, the target heddle frame is driven according to the first pattern, so that in the first setting weaving cycle, the weaving is performed in such a form that the cross point in the upper and lower direction changes from the cross point in the first weaving cycle of the first setting weaving cycle toward one side.

[0011] Note that, when the cross point changes, a position where a weft collides with the reed also changes at a beating time at which the weft inserted by the reed swingably driven is driven into a cloth fell. As a result, a driving amount of the weft made by the reed also changes. However, regarding a change in driving amount, the driving amount is larger as the weft is driven at a further upper position of the reed, and the driving amount is smaller as the weft is driven at a further lower position.

[0012] Therefore, in the first setting weaving cycle, the weaving is performed so as for the cross point to change as described above, so that the weaving in the first set weaving cycle is performed with accompanying a change in driving amount. Furthermore, since the first pattern is set to generate such a change in driving amount multiple times, a change in texture associated with the multiple changes in driving amount appears on portions woven according to the first pattern (portions woven with the first setting weaving cycle).

[0013] Note that, an operation pattern for controlling

drive of the drive motor is set for one repeat of a weaving pattern, and the operation pattern is repeated, so that a woven fabric is woven. The special operation pattern set for the target heddle frame is set to include, after such a first pattern, the second pattern for returning the cross point to the cross point in the first weaving cycle of the first setting weaving cycle. Thereby, in the first setting weaving cycle of each special operation pattern, the change of the cross point in the same state is repeated. Then, in the woven fabric woven in such a way, at least at portions woven with the first setting weaving cycle, a change in texture as if an appearance of the weft on a surface of the portions is shaded appears. Therefore, according to the weaving method of the present invention, it is possible to obtain a woven fabric having a special texture, as compared to a woven fabric woven by a usual weaving method.

[0014] Further, in the weaving method of the present invention, the weaving is performed with the cross timing set to a time point different from the beating time point, so that it is possible to obtain a woven fabric on which the above-described special texture (shading of the appearance of the weft) is more prominent.

[0015] Specifically, when the cross timing is a time point different from the beating time point, the beating is performed in a state where the warp is set to a shed open state. Therefore, in this case, the tension at the beating time point of the upper and lower warps forming a shed is higher, as compared to a case where the beating is performed in a state where a warp is set to a shed closed state. The tension of both warps corresponds to a displacement amount of the warp from an intermediate position (reference position) as a reference between the uppermost position and the lowermost position of the heddle frame in the upper and lower direction.

[0016] In addition, when the cross point is set on one side in the upper and lower direction with respect to the reference position, the tension of the upper warp and the lower warp at the beating time point is higher on one warp of the upper warp and the lower warp than on the other warp. That is, in this case, both the warps have a tension difference at the beating time point. Furthermore, the tension difference increases as a distance of the cross point from the reference position increases. Therefore, when performing weaving while changing the cross point toward one side, as described above, the cross timing is set to a time point different from the beating time point, so that weaving is performed in such a form that the tension difference between the upper warp and the lower warp at the beating time point changes each time the cross point changes.

[0017] The weaving is performed in this way, so that the warp shedding on one side is beaten in a state of being gradually and strongly pulled. Therefore, a woven fabric, in which the above-described change in texture is more prominent in combination with the above-described change in driving amount, is obtained.

[0018] Further, regarding the above-described second pattern, when the second setting weaving cycle is set to three or more weaving cycles and the second pattern is set as described in (C) or (D), the change of the cross point in the second setting weaving cycle for returning the cross point to the cross point of the first weaving cycle in the first setting weaving cycle is performed multiple times. Thereby, the drive of the drive motor for changing the cross point in the second setting weaving cycle can be performed without applying an excessive load to each drive motor.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

FIG. 1 is a block diagram showing an example of a shedding device of a loom according to the present invention.

FIG. 2 shows an example of a setting screen on which drive information is set.

FIG. 3 shows an example of a setting display screen of height position information.

FIG. 4 is a shedding curve of a first pattern in an embodiment.

FIG. 5 is a shedding curve of a second pattern in the embodiment.

FIG. 6 shows an example of the setting screen on which drive information different from the embodiment is set.

FIG. 7 shows another example of shedding curves of the first pattern and the second pattern.

DESCRIPTION OF EMBODIMENTS

[0020] Hereinafter, one embodiment of a weaving method in a loom of the present invention will be described with reference to FIGS. 1 to 5.

[0021] FIG. 1 shows an example of a shedding device 1 of a loom according to the present invention. The shedding device 1 includes a plurality of heddle frames 2, dedicated drive motors 21 each provided for each heddle frame 2, and motion conversion mechanisms 22 each configured to connect the heddle frame 2 and the drive motor 21 each other. The shedding device 1 is configured such that rotation of an output shaft of each drive motor 21 is converted by the motion conversion mechanism 22, which reciprocally drives the corresponding heddle frame 2 in an upper and lower direction to give a shedding motion to warps. That is, the shedding device 1 is configured to independently drive each heddle frame 2 by the dedicated drive motor 21. For reference, the present embodiment is an example where weaving is performed using the heddle frames 2 of 12 frames.

[0022] Note that, the motion conversion mechanism 22 is configured to include, for example, a crank mechanism, and the shedding device 1 is configured so that the heddle frame 2 is located at the uppermost position or lowermost position at a top dead center or a bottom

dead center of the motion conversion mechanism 2 while the drive motor 21 rotates one revolution. In addition, in such a shedding device 1, between a rotation phase with respect to the top dead center and a rotation phase with respect to the bottom dead center, the drive motor is reversely driven at a rotation angle smaller than an angle range (180°), so that an upper shedding position of the heddle frame 2 (a position corresponding to a position of an upper warp in a warp shed) and a lower shedding position (a position corresponding to a position of a lower warp in the warp shed) can be set to any positions without being limited to the mechanical configuration of the motion conversion mechanism 22. Also in the shedding device 1 of the present invention, the drive motor 21 is reversely driven in such a manner when giving a shedding motion to the warps.

[0023] In addition, the shedding device 1 includes a shedding control unit 3 configured to control drive of each drive motor 21. The shedding control unit 3 has a storage unit 31 and a drive controller 32 connected to the storage unit 31. In the storage unit 31, drive information including a shedding pattern corresponding to a weave structure of a woven fabric to be woven and an operation pattern set for each heddle frame so that warps intersect at a predetermined cross point is stored in a form of corresponding to each heddle frame 2. As for the shedding pattern of the drive information, positions (upper shedding position and lower shedding position) of the heddle frame 2 are set per each weaving cycle, and are set for each heddle frame 2. In the present embodiment, a shedding pattern of a plain weave is set as shown in FIG. 2.

[0024] Further, the loom includes an input setting unit 5 configured to input and set a weaving condition and the like, and the input setting unit 5 is also connected to the storage unit 31 of the shedding control unit 3. The drive information including the shedding pattern and the like is input and set by the input setting unit 5 and stored (set) in the storage unit 31. For reference, as the input setting unit 5, for example, a touch panel type unit having a display unit and capable of inputting the above-described shedding pattern and the like by operating a setting screen on the display unit is used.

[0025] In addition, the drive controller 32 is configured to control drive of each drive motor 21, based on the drive information set in the storage unit 31. Further, the drive controller 32 is connected to a main shaft-side encoder 41 provided for a main shaft 4 of the loom and configured to detect a crank angle. The drive controller 32 is configured, as a crank angle signal corresponding to a detected crank angle is input from the main shaft-side encoder 41, to control drive of the drive motor 21, based on the crank angle signal.

[0026] Further, the drive controller 32 is connected to a shed-side encoder 23 provided for each drive motor 21 and configured to detect a rotation angle of the output shaft of the corresponding drive motor 21. The drive controller 32 is also configured, as a rotation angle signal corresponding to the rotation angle of each drive motor 21 is input from the shed-side encoder 23, to perform feedback control, based on the rotation angle signal.

[0027] As described above, the shedding device 1 is configured such that the shedding control unit 3 controls drive of each drive motor 21, based on the above-described drive information (shedding pattern, operation pattern), thereby reciprocally driving each heddle frame 2. The present invention has a feature of: setting at least a part of the heddle frames as a target heddle frame; and setting an operation pattern set for the target heddle frame, as a special operation pattern, which is an operation pattern for one repeat of a weaving pattern set in a form of assigning, to each weaving cycle, height position information that is height position information including a cross timing of warps and is information about a cross point. In addition, the special operation pattern is set to include a first pattern consisting of a first setting weaving cycle and a second pattern set after the first pattern and consisting of a second setting weaving cycle.

[0028] Further, in the present embodiment, all the heddle frames 2 (12 frames) that are used for weaving are set as the target heddle frame, and the above-described special operation pattern is set for all the 12 frames. Further, it is assumed that the number of weaving cycles of the first setting weaving cycle and the second setting weaving cycle is set to 10 weaving cycles, respectively. Further, the first pattern is set as such a pattern ((A) pattern described above) that a cross point of each weaving cycle in the first setting weaving cycle is located above with respect to a cross point of a preceding weaving cycle. Further, the second pattern is set such a pattern ((C) pattern described above) that a cross point of each weaving cycle in the second setting weaving cycle is located below with respect to a cross point of the preceding weaving cycle and a cross point is changed toward a cross point of a first weaving cycle in the first setting weaving cycle.

[0029] FIG. 3 shows a display screen that is displayed on the input setting unit 5, and is a setting display screen 60 for displaying setting values for each of a plurality of setting items regarding the height position information described above. The setting display screen 60 of the shown example is provided with a display field of a setting value for each of a plurality of setting items of the height position information. In this way, in the present embodiment, the height position information is configured by the plurality of setting items. The setting items are a cross timing, a shedding position (upper shedding position, lower shedding position), and a dwell (upper dwell, lower dwell). The setting items are described in detail, as follows.

[0030] The cross timing is a timing at which warps intersect at a time when the heddle frame 2 (drive motor 21) is driven based on the height position information. In the display field "cross timing" on the setting display screen 60, a setting value of the cross timing set by a crank angle is displayed.

[0031] The shedding position (upper shedding posi-

tion, lower shedding position) is a position of the heddle frame 2 corresponding to positions of the warps at a time when the warps are in a maximum shed state when the heddle frame 2 (drive motor 21) is driven based on the height position information. More specifically, for each heddle frame 2, a position of the heddle frame 2 (upper shedding position) when the warp of the heddle frame 2 becomes an upper warp of the warp shed, and a position of the heddle frame 2 (lower shedding position) when the warp of the heddle frame becomes a lower warp are set as the shedding position, respectively.

[0032] Note that, in the present embodiment, as for the setting, distances (mm) from the uppermost position and the lowermost position are set. That is, as for the upper shedding position, the setting value is set as the distance from the uppermost position, and as for the lower shedding position, the setting value is set as the distance from the lowermost position. For example, in a case where the setting value is 5mm, the setting value indicates that the upper shedding position is set to a position 5mm lower from the uppermost position and the lower shedding position is set to a position 5mm higher from the lowermost position. Such setting values are displayed in the display fields "upper shedding position" and "lower shedding position" on the setting display screen 60.

[0033] The dwell (upper dwell, lower dwell) is a period for which the heddle frame 2 is caused to stay at the maximum shedding position (upper shedding position, lower shedding position). In the present embodiment, as for the setting value of the dwell, the staying period is set by a crank angle range. For example, when the setting value of the upper dwell is n°, it indicates that a period (crank angle range) after the heddle frame 2 reaches the upper shedding position until the heddle frame starts to descend is n°. For example, when the setting value of the lower dwell is n°, it indicates that a period (crank angle range) after the heddle frame 2 reaches the lower shedding position until the heddle frame starts to ascend is n°. Such setting values are displayed in the display fields "upper dwell" and "lower dwell" on the setting display screen 60.

[0034] Note that, the drive of the heddle frame 2 based on the setting values is performed with a time point before the crank angle 180° with respect to the above-described cross timing, as a reference. Specifically, when the setting value of the cross timing is 310° and the setting value of the dwell is 80°, the drive of the heddle frame 2 is performed in a form of causing, with 130° as a reference, which is before 180° from the cross timing, the heddle frame 2 to reach the upper shedding position at 90° before 40° from the reference and starting to descend the heddle frame 2 at 170° after 40 ° from the reference, and the heddle frame 2 to reach the lower shedding position at 90° before 40° from the reference and starting to ascend the heddle frame 2 at 170° after 40 ° from the reference.

[0035] Further, in the present embodiment, each height position information can be identified by a color, and a display portion indicating a color assigned to the height position information is provided next to a display (number) indicating a setting No. on the display screen 60. In the shown example, the color has a different degree of shading, according to the setting of the height position information.

[0036] Further, FIG. 2 shows a setting screen that is displayed on the input setting unit 5, and is a pattern setting screen 50 for setting drive information for driving the heddle frame 2. Note that, the drive information includes the above-described shedding pattern and an operation pattern (special operation pattern) for one repeat of a weaving pattern set in a form of assigning the height position information to each weaving cycle. In addition, the pattern setting screen 50 includes a setting display field 51 for displaying the drive information, as shown on a left side of the screen. As in the well-known shedding pattern setting screen, the setting display field 51 has square frames 52 arranged in a matrix shape, and display fields of rows of the square frames 52 corresponding to weaving steps (weaving cycles) and columns corresponding to the heddle frames 2. Therefore, in the setting display field 51, numbers indicating "step No." are displayed on the left side of the square frames 52, and numbers indicating "frame No." of the heddle frames 2 are displayed on the top.

[0037] Note that, in the shown example, the setting display field 51 has the square frames 52 of step Nos. 1 to 20. However, this is because the display range of the setting display field 51 in the shown example is for 20 weaving steps, and the number of rows of the square frames 52 is provided more than that for 20 weaving steps. The square frames 52 after step No.21 are displayed by scrolling the display in the setting display field 51.

[0038] Further, on the shedding pattern setting screen, generally, the display color of each square frame 52 indicates whether the frame position in each weaving step is set to the upper shedding position or the lower shedding position. However, in the shown example, since the height position information is identified by the display color, as described above, the display of the frame position is identified by the display in the square frame 52. Specifically, the square frame 52 set to the upper shedding position is indicated by a usual single-line frame, and the square frame 52 set to the lower shedding position is indicated by a double-line frame. In the shown example, for the frame Nos.1 to 12, the shedding patterns thereof are set, and the weaving is performed using the heddle frames 2 of 12 frames. Further, in the present embodiment, since the shedding pattern of the plain weave is set as described above, the setting state is as shown.

[0039] In addition, the input setting unit 5 is configured so that an arbitrary range including a plurality of square frames 52 can be specified by a touch operation or the like on the setting display field 51 on the pattern setting screen 50. Further, the pattern setting screen 50 includes

a setting button 53 arranged on the right side of the screen, separately from the setting display field 51 as described above. Note that, the setting button 53 is a button for displaying, on the screen, a separate window (not shown) for creating height position information to be assigned to each weaving step in a range of the designated square frames 52. The input setting unit 5 is configured to automatically create height position information to be assigned, based on information input in the separate window.

[0040] The creation and assignment of the height position information are described in detail, as follows. Note that, in the present embodiment, it is assumed that all the heddle frames 2 of 12 frames are set as the target heddle frame and the above-described special operation pattern is set for all the 12 frames. In addition, as for the first pattern and the second pattern included in the operation pattern, it is assumed that the setting weaving cycle of both the patterns is 10 weaving cycles (10 weaving steps), the first pattern is set for the first 10 weaving steps (step Nos.1 to 10) and the second pattern is set for the successive 10 weaving steps (step Nos. 11 to 20). That is, the operation pattern in the present embodiment consists of only the first pattern and the second pattern, and consists of 20 weaving steps as a whole (one repeat of a weaving pattern). When setting the operation pattern, first, the first pattern is set, and then the second pattern is set.

[0041] In the setting of the first pattern, first, for the frame Nos.1 to 12 corresponding to the heddle frames 2 of the setting targets, the square frames 52 in the range of step Nos.1 to 10 corresponding to 10 weaving cycles are specified by a touch operation or the like on the setting display field 51. When the setting button 53 is touched in this state, the separate window as described above is displayed on the pattern setting screen 50.

[0042] Note that, in the separate window, it is assumed that the shedding amount and the cross point are set for the first weaving step and the last weaving step in the specified range, for example. In addition, in this case, a maximum shedding amount, which is a shedding amount at a time when each heddle frame 2 is located at the uppermost position or the lowermost position, is used as a reference (100%), and the shedding amount is set by a percentage (%) to the maximum shedding amount. Further, as for the cross point, for example, an intermediate position (reference position) between the uppermost position and the lowermost position in the upper and lower direction is used as a reference, and a distance from the reference position is set by $\pm$N mm (plus indicates a side above the reference position, and minus indicates a side below the reference position).

[0043] When the information (shedding amount, cross point) is set in the separate window, the height position information for 10 weaving steps (setting Nos.1 to 10) is automatically created in the input setting unit 5, based on the setting values of the shedding amount and the cross point for the 1st step and the 10th step, and the number of weaving steps of the first pattern (the number of the first setting weaving cycles).

[0044] Note that, the present embodiment is an example where the change of the cross point is realized by changing the upper shedding position and the lower shedding position per each weaving step. Therefore, in the input setting unit 5, the setting values of the upper shedding position and the lower shedding position in each weaving step are obtained based on the information set as described above. Further, as for the cross timing and the dwell, which are the setting items of the height position information described above, setting values thereof are input on a separate setting screen of the input setting unit 5, and the setting values are used. For reference, in the present example, the setting value of the cross timing is 310° and the setting value of the dwell is 80°.

[0045] From the setting values of the upper shedding position and the lower shedding position obtained as described above and the preset setting values of the cross timing and the dwell, the height position information for 10 weaving steps of the first pattern is created. The height position information created in this way is displayed on the setting display screen 60 as shown in FIG. 3, in the input setting unit 5. Note that, in the shown example, each height position information is displayed as the setting Nos.1 to 10. However, the setting Nos.1 to 10 correspond to the weaving steps (step Nos.) in corresponding order. In addition, the height position information of the setting Nos.1 to 10 created in this way is automatically assigned to each weaving step in the input setting unit 6, along with the creation.

[0046] For reference, the first pattern of the present embodiment is such a pattern that a cross point of each weaving cycle in the first setting weaving cycle is located above with respect to a cross point of a preceding weaving cycle, as described above. Therefore, as shown in the setting display screen 60, the setting values of the "upper shedding position" and the "lower shedding position" of each weaving step in the height position information are set such that the upper shedding position gradually decreases by a same value and the lower shedding position gradually increases by a same value.

[0047] As for calculation of the setting values of the "upper shedding position" and the "lower shedding position" in the present example, specifically, based on the setting values of the shedding amount and the cross point in the first weaving step and the last weaving step in the specified range, the setting values of the upper shedding position and the lower shedding position in the first weaving step and the last weaving step are first calculated. Then, the setting values in the weaving steps (step Nos.2 to 9) between the first weaving step and the last weaving step are calculated so as to be values equally changed from the setting value of the first weaving step to the setting value of the last weaving step, according to the number of weaving steps. In the shown example, the setting value of the upper shedding position decreases

by 1mm per each weaving step, and the setting value of the lower shedding position increases by 1mm per each weaving step.

[0048] In this way, when the first pattern is set by the creation and assignment of the height position information, the setting of the second pattern is performed subsequently. However, the setting is basically the same as the setting of the first pattern, and the illustration thereof is omitted.

[0049] In the setting of the second pattern, as in the setting of the first pattern, the square frames 52 in a range of step Nos. 11 to 20 corresponding to the second setting weaving cycle (10 weaving steps) successive to the first setting weaving cycle (10 weaving steps) are first specified by a touch operation or the like on the setting display field 51. Then, the setting button 53 is touched to display the separate window, and the shedding amounts and cross points for the 1st step (that is, step No.11) and the 10th step (that is, step No.20) in the second weaving cycle are set.

[0050] Note that, as described above, the second pattern is a pattern set to change the cross point toward a cross point in the first weaving cycle of the first setting weaving cycle. Therefore, the setting value of the cross point set in the separate window is such that the cross point for the 1st step of the second setting weaving cycle is the same as the cross point for the 10th step of the first setting weaving cycle, and the cross point for the 10th step of the second setting weaving cycle is the same as the cross point for the 1st step of the first setting weaving cycle. In addition, the shedding amount is the same as the shedding amount of the first pattern.

[0051] Further, the second pattern of the present embodiment is such a pattern that a cross point of each weaving cycle in the second setting weaving cycle is located below with respect to a cross point of a preceding weaving cycle. Therefore, in the input setting unit 5, the height position information for 10 weaving steps of the second pattern is automatically created based on the conditions, the setting values in the separate window, and the number of the second setting weaving cycles. Then, in the present example, the height position information obtained in this way is one where the height position information for 10 weaving steps of the first pattern is inverted (setting Nos.1 to 10 are reversed in order). That is, the height position information of the second pattern is such that the setting value of the upper shedding position increases by 1mm per each weaving step and the setting value of the lower shedding position decreases by 1mm per each weaving step. In addition, the height position information created in this way is automatically assigned to each weaving step (step Nos. 11 to 20) in the input setting unit 6, along with the creation.

[0052] The first pattern and the second pattern are set in this way, so that the operation pattern (special operation pattern) of the 20 weaving steps consisting of the first pattern and the second pattern is set, and the operation pattern consisting of the 20 weaving steps becomes an operation pattern for one repeat of a weaving pattern. Further, as a result of setting the operation pattern for one repeat of a weaving pattern in this way, since the display color assigned to each height position information is different (that is, a degree of shading is different) as described above, the setting display field 51 on the pattern setting screen 50 is displayed as shown in FIG. 2 in the range of step Nos. 1 to 20. Thereby, an operator can easily perceive the setting state of the operation pattern.

[0053] The drive of each drive motor 21 is controlled based on the operation pattern set in this way, so that the corresponding heddle frame 2 is driven, respectively. Note that, in the present embodiment, it is assumed that a displacement speed in a period excluding an acceleration period in which the heddle frame 2 starts to be displaced toward the shedding position on the opposite side and a deceleration period before reaching the shedding position is a constant speed. In addition, in the present embodiment, it is assumed that the displacement speed (ascending speed) when displacing the heddle frame 2 toward the upper shedding position is the same speed in each weaving step. Similarly, it is assumed that the displacement speed (descending speed) when displacing the heddle frame 2 toward the lower shedding position is also the same speed in each weaving step. However, as described above, since the setting values of the upper dwell and the lower dwell are the same, the timings at which the heddle frame 2 reaches the upper shedding position and the lower shedding position in each weaving cycle are the same, and the amount of displacement from the upper shedding position to the lower shedding position and the amount of displacement from the lower shedding position to the upper shedding position over the successive weaving cycle are different, the ascending speed and the descending speed are different (in the first pattern, the ascending speed is larger, and in the second pattern, the descending speed is larger).

[0054] Thereby, each heddle frame 2 is driven to operate as shown in shedding curves of FIGS. 4 and 5. Note that, FIG. 4 shows the shedding curve of the heddle frame 2 when each drive motor 21 is driven based on the first pattern, and FIG. 5 shows the shedding curve of the heddle frame 2 when each drive motor 21 is driven based on the second pattern. The operation of the heddle frame 2 is more specifically described, as follows.

[0055] First, in the 1st step of the operation pattern, since the upper shedding position is 13mm and the lower shedding position is 3mm in the height position information set in step No.1 of the first pattern, the heddle frame 2 for which the position of the heddle frame 2 in the 1st step is set to the upper shedding position in the shedding pattern is driven to reach a position 13mm lower with respect to the uppermost position at the crank angle 90°. Similarly, the heddle frame 2 for which the position of the heddle frame 2 in the 1st step is set to the lower shedding position is driven to reach a position 3mm higher with respect to the lowermost position at the crank angle 90°.

[0056] Then, after reaching the upper shedding posi-

tion or the lower shedding position described above, each heddle frame 2 stays at the shedding position by the crank angle range 80° set as the dwell, and is then driven to be displaced toward the shedding position on an opposite side (shedding position based on the shedding pattern and the height position information) at the crank angle 170°, which is an ending time point of the dwell.

[0057] Note that, the heddle frame 2 located at the upper shedding position in the 1st step is displaced toward the lower shedding position set in the 2nd step, and passes through an intermediate position between the upper shedding position in the 1st step and the lower shedding position in the 2nd step at the cross timing 310°, which is an intermediate crank angle between the crank angle 170° and the crank angle 90° in a next weaving step. Similarly, the heddle frame 2 located at the lower shedding position in the 1st step passes through an intermediate position between the lower shedding position in the 1st step and the upper shedding position in the 2nd step at the cross timing 310°. Then, at the intermediate position, the upper warp and the lower warp intersect (all warps are aligned). Further, in both the 1st step and the 2nd step, since the distance from the reference position to the shedding position is larger in the lower shedding position than in the upper shedding position, the position (cross point) where the warps intersect is below the reference position.

[0058] Then, also in the 2nd and subsequent steps, as in the 1st step, each heddle frame 2 is driven based on the shedding pattern and the height position information set in each weaving step. Note that, in the first pattern, as described above, the setting value of the upper shedding position in the height position information set in step Nos.1 to 10 decreases by 1mm per each weaving step and the setting value of the lower shedding position increases by 1mm per each weaving step. Thereby, the cross point in the first setting weaving cycle is displaced upward by 1 mm per each weaving cycle. For reference, in the present example, the setting values of the upper shedding position and the lower shedding position in the height position information of the 6th step are the same, and the cross point in the upper and lower direction substantially coincides with the reference position in the 6th step. Therefore, the cross point is displaced below the reference position up to the 5th step, and is displaced above the reference position in the 7th to 10th steps.

[0059] Further, also in the second setting weaving cycle in which the second pattern is set, the heddle frame 2 is driven in the same manner as described above in each weaving step. However, as for the setting values of the upper shedding position and the lower shedding position in step Nos. 11 to 20 in which the second pattern is set, as described above, the setting value of the upper shedding position increases by 1mm per each weaving step, and the setting value of the lower shedding position decreases by 1mm per each weaving step. Thereby, the cross point in the second setting weaving cycle is displaced downward by 1 mm per each weaving cycle.

[0060] Since the setting values of the upper shedding position and the lower shedding position in the height position information set in the 20th step, which is the last weaving step of the operation pattern for one repeat of a weaving pattern, are the same as the setting values of the upper shedding position and the lower shedding position in the 1st step, which is the first weaving step, the cross point of the 20th step is the same position as the cross point of the 1st step. That is, the cross point displaced upward from the position in the 1st step of the first setting weaving cycle (first pattern) is returned to the initial position in the last 20th step of the second setting weaving cycle (second pattern). For reference, in the second setting weaving cycle, the cross point is displaced above the reference position up to the 14th step, and is displaced below the reference position in the 15th to 20th steps.

[0061] Then, in the weaving, the drive of each heddle frame 2 according to the operation pattern (special operation pattern) for one repeat of a weaving pattern consisting of the first pattern and the second pattern is repeated every 20 weaving steps consisting of the first setting weaving cycle and the second setting weaving cycle.

[0062] According to the weaving method as described above, the weaving is performed by controlling drive of each drive motor 21 according to the special operation pattern consisting of the first pattern and the second pattern set as described above. As a result, in the weaving, a woven fabric having a special texture is obtained. More specifically, when the cross point changes, a position where the weft collides with a reed at the beating time also changes. Furthermore, when the position changes, a driving amount of weft by the reed also changes. However, the driving amount is larger as the position where the weft collides at the beating time is higher with respect to the reed, and is smaller as the position is lower with respect to the reed.

[0063] In addition, according to the weaving method of the present embodiment as described above, in the 1st step to the 10th step in which weaving is performed with the first pattern, the weaving is performed so that the cross point gradually changes upward per each weaving step. Therefore, the driving amount of weft also gradually increases per each weaving step. Thereby, at portions woven according to the first pattern, a change in texture as if an appearance of the weft on a surface of a woven fabric woven is gradually darkened appears with a change in driving amount.

[0064] Further, the second pattern is a pattern for returning the cross point changed in the first pattern to the position in the first weaving step. However, in the present embodiment, the number of the second setting weaving cycles constituting the second pattern is 10 weaving steps, and the cross point is changed toward the position in the first weaving step per each weaving step over the 10 weaving steps. Therefore, also at portions in the 11th to 20th steps woven with the second pattern, weaving is performed so that the driving amount of weft changes

per each weaving step over the 10 weaving steps. Since the driving amount changes so that the amount of driving gradually decreases, a change in texture as if an appearance of weft becomes gradually lighter appears on the surface of the woven fabric at the portions woven according to the second pattern.

[0065] Therefore, according to the weaving method based on the special operation pattern including the first pattern and the second pattern, it is possible to obtain a woven fabric having a special texture on a surface thereof, as compared to a woven fabric woven by a usual weaving method. Further, since the second pattern for returning the cross point to the position in the first weaving step is set to gradually change the cross point over 10 weaving steps, as described above, the drive of the drive motor 21 for changing the cross point in the second pattern can be performed without applying an excessive load to each drive motor 21.

[0066] Note that, the weaving method of the present invention is not limited to the above-described embodiment (the above embodiment), and can also be implemented in following other embodiments (modified embodiments).

[0067] (1) As for the special operation pattern, the special operation pattern of the above embodiment includes the first pattern for changing the cross point upward and the second pattern for changing the cross point downward and returning the cross point to the position in the first weaving step. That is, the special operation pattern of the above embodiment is set as a pattern of changing the cross point upward and then returning the cross point to the original position. However, the special operation pattern in the present invention may also be such a pattern that the first pattern is set as a pattern of displacing the cross point downward and the second pattern is set as a pattern of displacing the cross point upward and returning the cross point to the position in the first weaving step. In other words, the special operation pattern may also be set as a pattern of changing the cross point downward and then returning the cross point to the original position.

[0068] (2) As for the first pattern, the first pattern of the above embodiment is set as such a pattern ((A) pattern described above) that the cross point of each weaving cycle in the first setting weaving cycle is located on one side with respect to the cross point of the preceding weaving cycle. That is, the first pattern of the above embodiment is a pattern of (consecutively) changing the cross point per each weaving cycle (weaving step). However, in the present invention, the first pattern is not limited to the (A) pattern as described above, and may also be set as the (B) pattern as described above.

[0069] Specifically, the first pattern may also set as a pattern ((B) pattern described above) in which the cross point in a plurality of weaving cycles smaller than a total number in the first setting weaving cycle is on one side in the upper and lower direction with respect to the cross point of the preceding weaving cycle and the cross point in the remaining weaving cycles is the same as the cross point of the preceding weaving cycle. That is, the first pattern may also be set as a pattern in which the cross point is changed only in some (two or more) weaving steps of the first setting weaving cycle and the cross point is not changed in the other weaving steps.

[0070] Further, the first pattern of the above embodiment consists of 10 weaving cycles. However, the first pattern in the present invention may consist of three or more weaving cycles. Specifically, the first pattern in the present invention is a pattern ((A) or (B) pattern described above) of changing the cross point multiple times toward one side in the upper and lower direction in the first setting weaving cycle. Therefore, the first pattern is made to include at least three weaving cycles so as to change the cross point multiple times.

[0071] (3) As for the second pattern for returning the cross point to the position in the first weaving step, the second pattern of the above embodiment is a pattern of changing the cross point over a plurality of times. In addition, the second pattern is set as such a pattern ((C) pattern described above) that the cross point of each weaving cycle in the second setting weaving cycle is located below with respect to the cross point of the preceding weaving cycle and the cross point is changed toward the cross point of the first weaving cycle of the first setting weaving cycle. That is, the second pattern is also a pattern of changing the cross point per each weaving step, as in the first pattern of the above embodiment. However, in the present invention, the second pattern is not limited to the (C) pattern as described above, and may also be set as the (D) pattern as described above.

[0072] Specifically, the second pattern may also be set as a pattern ((D) pattern described above) in which the cross point in a plurality of weaving cycles smaller than a total number in the second setting weaving cycle is on an opposite side to one side with respect to the cross point of the preceding weaving cycle and the cross point in the remaining weaving cycles is the same as the cross point of the preceding weaving cycle. That is, the second pattern may also be set as a pattern in which the cross point is changed only in some (two or more) weaving steps of the second setting weaving cycle and the cross point is not changed in the other weaving steps.

[0073] Further, the second pattern of the above embodiment consists of 10 weaving cycles, which are the same as the number of the first setting weaving cycles of the first pattern. However, the present invention is not limited to thereto. For example, the second pattern may consist of different numbers of weaving cycles from the number of the first setting weaving cycles. However, the second pattern is preferably set to change the cross point over a plurality of weaving steps, as in the above embodiment, considering the load that is applied to each drive motor 21 in the second setting weaving cycle. However, when the shedding device is configured so that the load applied to each drive motor 21 can be tolerated (for example, when a drive motor having a large capacity is

adopted), the second pattern may be set as a pattern of returning the cross point to the first cross point in one weaving step.

[0074] (4) As for the special operation pattern set for the target heddle frame, in the above embodiment, all the heddle frames 2 that are used for weaving are set as the target heddle frame, and one (one type) special operation pattern is set for all the target heddle frames, as a common pattern. However, the present invention is not limited thereto. For example, a plurality of types of special operation patterns in which the settings of the first pattern and/or the second pattern are different may be set for any one of the target heddle frames. For example, as shown in FIG. 6, a special operation pattern of changing the cross point upward and then returning the same to the original position may be set for frame Nos.1 to 8, and a special operation pattern of changing the cross point downward and then returning the same to the original position may be set for frame Nos.9 to 16.

[0075] Further, in the present invention, the target heddle frame for which the special operation pattern is set is not limited to all the heddle frames 2 that are used for weaving, as in the above embodiment. That is, only a part of the heddle frames may be set as the target heddle frame, and the other heddle frames may be set as the heddle frames that are driven by a usual operation pattern (a pattern that does not change the cross point).

[0076] (5) As for the change of the cross point in the special operation pattern, in the above embodiment, the ascending speed and the descending speed of the target heddle frame are set as the same speed in each weaving step. In addition, in order to realize the change from the cross point of the first weaving step to the cross point of the last weaving step set in the separate window, the upper shedding position and the lower shedding position are changed per each weaving step. However, in the present invention, in order to realize the change of the cross point, the upper shedding position and the lower shedding position are not limited to being changed in such a way, and the upper shedding position and the lower shedding position in each weaving step may be set to be the same, and the displacement speed of the heddle frame in each weaving step may be changed.

[0077] Specifically, in a case where it is presumed that the upper shedding position and the lower shedding position are the same in each weaving step and the dwell and the cross timing are the same in each weaving step as in the above embodiment, as for the displacement speed from the crank angle at which displacement of the heddle frame is started (the ending time point of the dwell) to the cross timing, for example, when the displacement speed of the heddle frame from the lower shedding position is gradually increased per each weaving step and the displacement speed of the heddle frame from the upper shedding position is gradually decreased per each weaving step, the cross point gradually rises per each weaving step. Note that, when the upper shedding position and the lower shedding position are the same and the cross point at the same cross timing gradually rises, the displacement speed from the cross timing to a time point at which the heddle frame reaches the upper shedding position becomes naturally slower, and the displacement speed up to a time point at which the heddle frame reaches the lower shedding position becomes naturally faster.

[0078] Therefore, in the case of the above premise, the height position information assigned to each weaving step includes the setting value of the changed cross point (for example, the distance from the reference position is set by $\pm$ N mm). In addition, the shedding control unit 3 may calculate the displacement speed to the cross timing and the displacement speed from the cross timing when displacing the heddle frame in the above-described form according to the cross point in each weaving step set in the height position information, and control the drive motor 21, based on the displacement speeds. In this case, the heddle frame is displaced in a form as exemplified in FIG. 7, and therefore, the cross point is changed as shown.

[0079] (6) As for the cross timing, the cross timing of the above embodiment is set to a time point (crank angle 310°) different from the beating time point. However, in the weaving method of the present invention, the cross timing may be any timing as long as it is appropriate for weaving, and for example, may be set to the same time point (crank angle 360°) as the beating time point, similar to the cross timing in the weaving of the related art. Even when the cross timing is any timing, a change in texture appears on the surface of the woven fabric by changing the cross point to change the driving amount in the above-described manner.

[0080] However, in the present invention, as in the above embodiment, when the cross timing is set to a time point different from the beating time point, the effect of weaving a woven fabric having a special texture according to the present invention can be made more prominent. More specifically, when the cross timing is set to a time point different from the beating time point, the beating is performed in a state where the warp is set to a shed open state. Therefore, the tension of the upper warp and the lower warp, which form the shed, at the beating time point is increased, as compared to a case where the beating is performed in a state where the warp is set to a shed closed state. Further, the tension corresponds to the amount of displacement of the warp from the reference position. Moreover, when the cross point is above the reference position, for example, the tension of the upper warp at the beating time point is higher than the tension of the lower warp. When weaving is performed while the cross point is gradually changed upward, a tension difference between the upper warp and the lower warp also gradually increases.

[0081] Therefore, when the cross timing is set to a time point different from the beating time point in this way, the upper warp is beaten in a state of being gradually and strongly pulled. Therefore, a woven fabric, in which the

above-described change in texture is more prominent in combination with the above-described change in driving amount of the weft, is obtained. That is, in the weaving method of the present invention, in order to achieve the object of weaving a woven fabric having a special texture, it is more preferable that the cross timing is set to a time point different from the beating time point.

[0082] (7) As for the height position information, the height position information of the above embodiment includes the cross timing, the shedding position (upper shedding position, lower shedding position), and the dwell (upper dwell, lower dwell). In addition, as for the setting value of the shedding position, the setting value of the upper shedding position is set as the distance (mm) from the uppermost position, and the setting value of the lower shedding position is set as the distance (mm) from the lowermost position. However, in the present invention, the setting value of the shedding position is not limited to such a setting, and may be set as a distance (mm) from the reference position with respect to the reference position. Further, in the present invention, the length itself of the distance from the reference as described above is not limited to being used as the setting value. For example, a distance from the reference position to the uppermost position (the lowermost position) may be set as a reference (100%), and a percentage (%) to the reference may be used as a setting value.

[0083] In addition, the height position information is not limited to including the cross timing, the shedding position, and the dwell, and may also include the cross point as described above. In addition, the setting value of the cross point is not limited to being set as the distance ± N mm from the reference position as described above, and may also be set as a distance N mm from the uppermost position (or the lowermost position) or the set shedding position. Further, the setting value of the cross point is not limited to the length itself of the distance as such, and for example, may be set as a percentage (%) to a reference (100%), which is a distance from the set shedding position to the reference position. For reference, even when the cross point is set in a separate window as in the above embodiment, the setting value of the cross point may be set as the percentage (%) as described above.

[0084] Further, in the above embodiment, the height position information for a weaving step selected on the setting display field 51 is automatically created in the input setting unit 5 by setting the shedding amount and the cross point in the separate window. However, in the present invention, the height position information is not automatically created as such, but the height position information (shedding position, cross point, and the like) per each weaving step may be separately obtained and may be input and set by the operator.

[0085] (8) As for the shedding amount per each weaving step, in the above embodiment, the shedding amount is the same for all weaving steps, but may not be the same for all weaving steps as long as it is appropriate for weaving. In addition, in a case where the shedding amount is set in a separate window as in the above embodiment, the setting value of the shedding amount is not limited to being set to the percentage (%) to the maximum shedding amount as a reference (100%), and may be set as a dimension (N mm) in the upper and lower direction about the reference position.

[0086] (9) As for the shedding pattern, in the above embodiment, the shedding pattern of a plain weave as shown in FIG. 2 is set. However, in the weaving method of the present invention, the shedding pattern is not limited thereto, and may also be a shedding pattern of a separate weave structure (twill structure, satin weave structure, and the like).

[0087] Note that, the present invention is not limited to the above embodiment, and can be appropriately changed within the scope of the appended claims.

REFERENCE SIGNS LIST

[0088]

1: shedding device
2: heddle frame
21: drive motor
22: motion conversion mechanism
23: shedding-side encoder
3: shedding control unit
31: storage unit
32: drive control unit
4: main shaft
41: main shaft-side encoder
50: pattern setting screen
51: setting display field
52: square frame
53: setting button
60: setting display screen

Claims

1. A weaving method in a loom including a shedding device (1) configured to give a shedding motion to warps by driving a corresponding heddle frame (2) with a dedicated drive motor (21) provided for each heddle frame, and configured to perform control of each drive motor based on an operation pattern set for each heddle frame so that the warps intersect at a predetermined cross point,
the weaving method being **characterized in that** it comprises:

setting at least a part of the heddle frames (2) as a target heddle frame; and
setting the operation pattern set for the target heddle frame as a special operation pattern, where the special operation pattern is an operation pattern for one repeat of a weaving pattern

set in a form of assigning height position information to each weaving cycle, and where the height position information is information about the cross point and having a cross timing of the warps, wherein
the special operation pattern includes:

a first pattern having a first setting weaving cycle; and
a second pattern set after the first pattern and having a second setting weaving cycle,

the first pattern consisting of predetermined three or more weaving cycles and the second pattern consisting of one or more weaving cycles,
the first pattern is set such that:

(A) the cross point of each weaving cycle in the first setting weaving cycle is on one side in an upper and lower direction with respect to the cross point of a preceding weaving cycle; or
(B) the cross point in a plurality of weaving cycles smaller than a total number in the first setting weaving cycle is on one side in an upper and lower direction with respect to the cross point of a preceding weaving cycle, and the cross point in remaining weaving cycles is the same as the cross point of the preceding weaving cycle, and

the second pattern is set to change the cross point toward a first cross point of the first setting weaving cycle.

2. The weaving method according to Claim 1, wherein the cross timing is set to a time point different from a beating time point by a reed.

3. The weaving method according to Claim 1 or 2, wherein

the second setting weaving cycle consists of three or more weaving cycles, and
the second pattern is set such that:

(C) the cross point of each weaving cycle in the second setting weaving cycle is on an opposite side to the one side with respect to the cross point of the preceding weaving cycle, or
(D) the cross point in a plurality of weaving cycles smaller than a total number in the second setting weaving cycle is on an opposite side to the one side with respect to the cross point of the preceding weaving cycle and the cross point in remaining weaving cycles is the same as the cross point of the preceding weaving cycle.

Patentansprüche

1. Webverfahren in einer Webmaschine, die eine Fachbildevorrichtung (1) beinhaltet, die so konfiguriert ist, dass sie den Kettfäden eine Fachbildebewegung ermöglicht, indem sie einen entsprechenden Litzenrahmen (2) mit einem dedizierten Antriebsmotor (21) antreibt, der für jeden Litzenrahmen bereitgestellt ist, und die so konfiguriert ist, dass sie die Steuerung jedes Antriebsmotors anhand eines Betriebsmusters durchführt, das für jeden Litzenrahmen eingestellt ist, so dass sich die Kettfäden an einem vorbestimmten Kreuzungspunkt schneiden,
wobei das Webverfahren **dadurch gekennzeichnet ist, dass** es Folgendes umfasst:

Einstellen mindestens eines Teils der Litzenrahmen (2) als Ziel-Litzenrahmen; und
Einstellen des Betriebsmusters, das für den Ziel-Litzenrahmen eingestellt ist, als ein spezifisches Betriebsmuster, wobei das spezifische Betriebsmuster ein Betriebsmuster für eine Wiederholung eines Webmusters ist, das in Form eines Zuweisens von Höhenpositionsinformationen zu jedem Webzyklus eingestellt ist, und wobei die Höhenpositionsinformationen Informationen über den Kreuzungspunkt sind und einen Kreuzungszeitpunkt der Kettfäden aufweisen, wobei
das spezifische Betriebsmuster Folgendes beinhaltet:

ein erstes Muster mit einem ersten Einstellungs-Webzyklus; und
ein zweites Muster, das nach dem ersten Muster eingestellt wird und einen zweiten Einstellungs-Webzyklus aufweist,
wobei das erste Muster aus drei oder mehr vorgegebenen Webzyklen und das zweite Muster aus einem oder mehreren Webzyklen besteht,
wobei das erste Muster so eingestellt ist, dass:

(A) der Kreuzungspunkt jedes Webzyklus im ersten Einstellungs-Webzyklus auf einer Seite in einer oberen und unteren Richtung in Bezug auf den Kreuzungspunkt eines vorhergehenden Webzyklus liegt; oder
(B) der Kreuzungspunkt in einer Vielzahl von Webzyklen, die kleiner sind als die Gesamtzahl in dem ersten Einstellungs-Webzyklus, auf einer Seite in ei-

ner oberen und unteren Richtung in Bezug auf den Kreuzungspunkt eines vorhergehenden Webzyklus liegt, und der Kreuzungspunkt in den verbleibenden Webzyklen der gleiche ist wie der Kreuzungspunkt des vorhergehenden Webzyklus, und

das zweite Muster so eingestellt ist, dass sich der Kreuzungspunkt in Richtung eines ersten Kreuzungspunktes des ersten Einstellungs-Webzyklus ändert.

2. Webverfahren nach Anspruch 1, wobei der Kreuzungszeitpunkt durch ein Blatt auf einen von einem Schlagzeitpunkt abweichenden Zeitpunkt eingestellt wird.

3. Webverfahren nach Anspruch 1 oder 2, wobei:

der zweite Einstellungs-Webzyklus aus drei oder mehr Webzyklen besteht und
das zweite Muster so eingestellt ist, dass:

(C) der Kreuzungspunkt jedes Webzyklus im zweiten Einstellungs-Webzyklus auf einer Seite liegt, die der einen Seite in Bezug auf den Kreuzungspunkt des vorhergehenden Webzyklus gegenüberliegt, oder
(D) der Kreuzungspunkt in einer Vielzahl von Webzyklen, die kleiner ist als die Gesamtzahl im zweiten Einstellungs-Webzyklus, auf einer Seite liegt, die der einen Seite in Bezug auf den Kreuzungspunkt des vorhergehenden Webzyklus gegenüberliegt, und der Kreuzungspunkt in den verbleibenden Webzyklen der gleiche ist wie der Kreuzungspunkt des vorhergehenden Webzyklus.

Revendications

1. Procédé de tissage dans un métier à tisser comportant un dispositif de formation de la foule (1) configuré pour donner un mouvement de formation de la foule à des chaînes par l'entraînement d'un cadre de lisses (2) correspondant avec un moteur d'entraînement dédié (21) prévu pour chaque cadre de lisses, et configuré pour réaliser une commande de chaque moteur d'entraînement sur la base d'un motif de fonctionnement défini pour chaque cadre de lisses de sorte que les chaînes soient en intersection à un point de croisement prédéterminé,
le procédé de tissage étant **caractérisé en ce qu'**il comprend :

la définition d'au moins une partie des cadres de lisses (2) en tant qu'un cadre de lisses cible ; et
la définition du motif de fonctionnement défini pour le cadre de lisses cible en tant qu'un motif de fonctionnement spécial, dans lequel le motif de fonctionnement spécial est un motif de fonctionnement pour une répétition d'un motif de tissage défini sous forme d'attribution d'informations de position de hauteur à chaque cycle de tissage, et dans lequel les informations de position de hauteur sont des informations relatives au point de croisement et présentant une synchronisation de croisement des chaînes, dans lequel
le motif de fonctionnement spécial comporte :

un premier motif présentant un premier cycle de tissage de définition ; et
un deuxième motif défini après le premier motif et présentant un deuxième cycle de tissage de définition,
le premier motif est constitué de trois cycles de tissage prédéterminés ou plus et le deuxième motif est constitué d'un cycle de tissage ou plus,
le premier motif est défini de sorte que :

(A) le point de croisement de chaque cycle de tissage dans le premier cycle de tissage de définition est sur un côté et dans une direction vers le haut et vers le bas par rapport au point de croisement d'un cycle de tissage précédent ; ou
(B) le point de croisement dans une pluralité de cycles de tissage inférieurs à un nombre total dans le premier cycle de tissage de définition est sur un côté dans une direction vers le haut et vers le bas par rapport au point de croisement d'un cycle de tissage précédent, et le point de croisement dans des cycles de tissage restants est le même que le point de croisement du cycle de tissage précédent, et

le deuxième motif est défini pour changer le point de croisement vers un premier point de croisement du premier cycle de tissage de définition.

2. Procédé de tissage selon la revendication 1, dans lequel la synchronisation de croisement est définie à un point temporel différent d'un point temporel de battage par un peigne.

3. Procédé de tissage selon la revendication 1 ou 2, dans lequel

le deuxième cycle de tissage de définition est constitué de trois cycles de tissage ou plus, et le deuxième motif est défini de sorte que :

(C) le point de croisement de chaque cycle de tissage dans le deuxième cycle de tissage de définition est sur un côté opposé au côté par rapport au point de croisement du cycle de tissage précédent, ou

(D) le point de croisement dans une pluralité de cycles de tissage inférieurs à un nombre total dans le deuxième cycle de tissage de définition est sur un côté opposé au côté par rapport au point de croisement du cycle de tissage précédent et le point de croisement dans des cycles de tissage restants est le même que le point de croisement du cycle de tissage précédent.

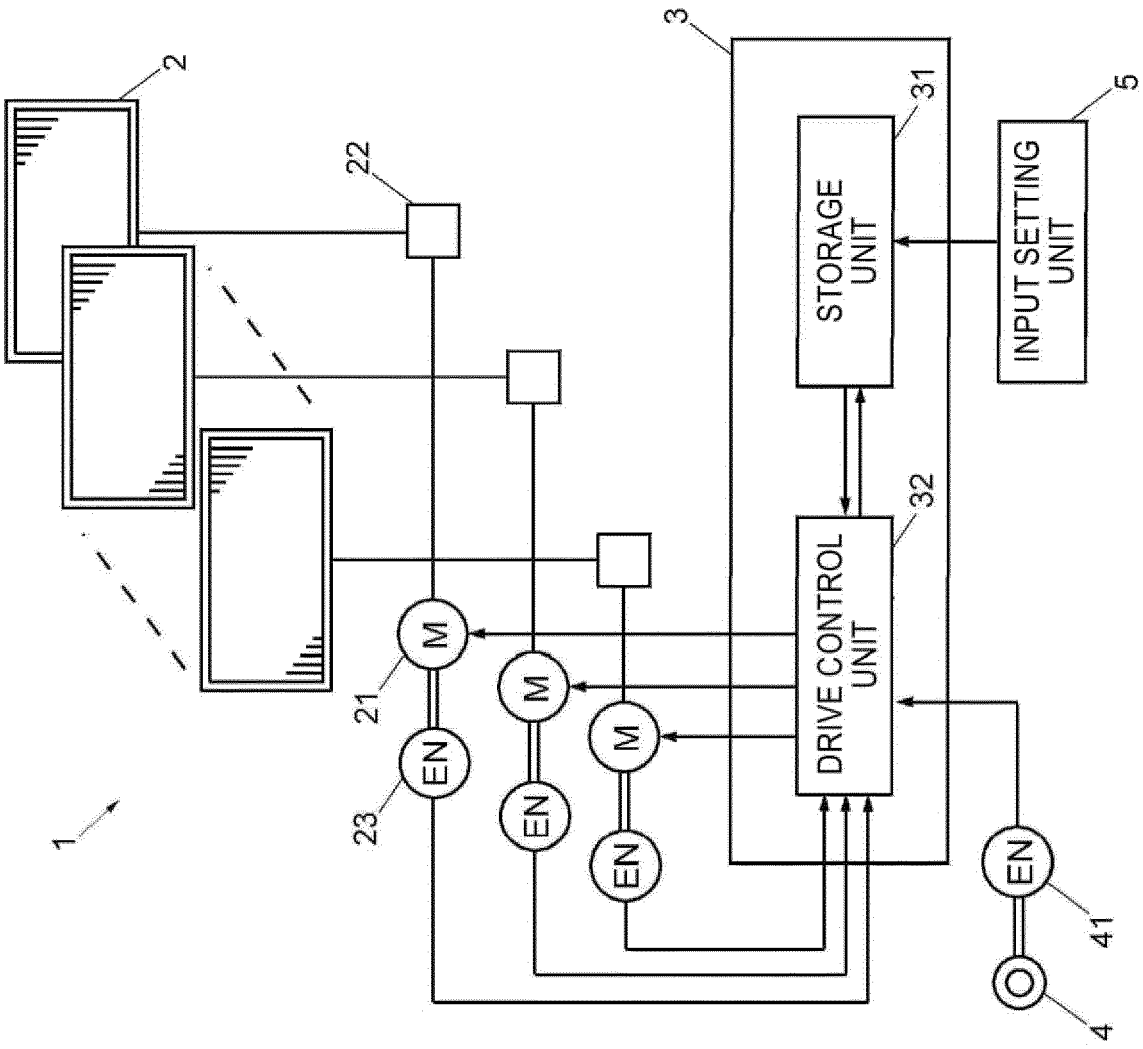

1
2
22
3
31
STORAGE UNIT
5
INPUT SETTING UNIT
32
DRIVE CONTROL UNIT
M
21
EN
23
M
EN
M
EN
EN
41
4

FIG.1

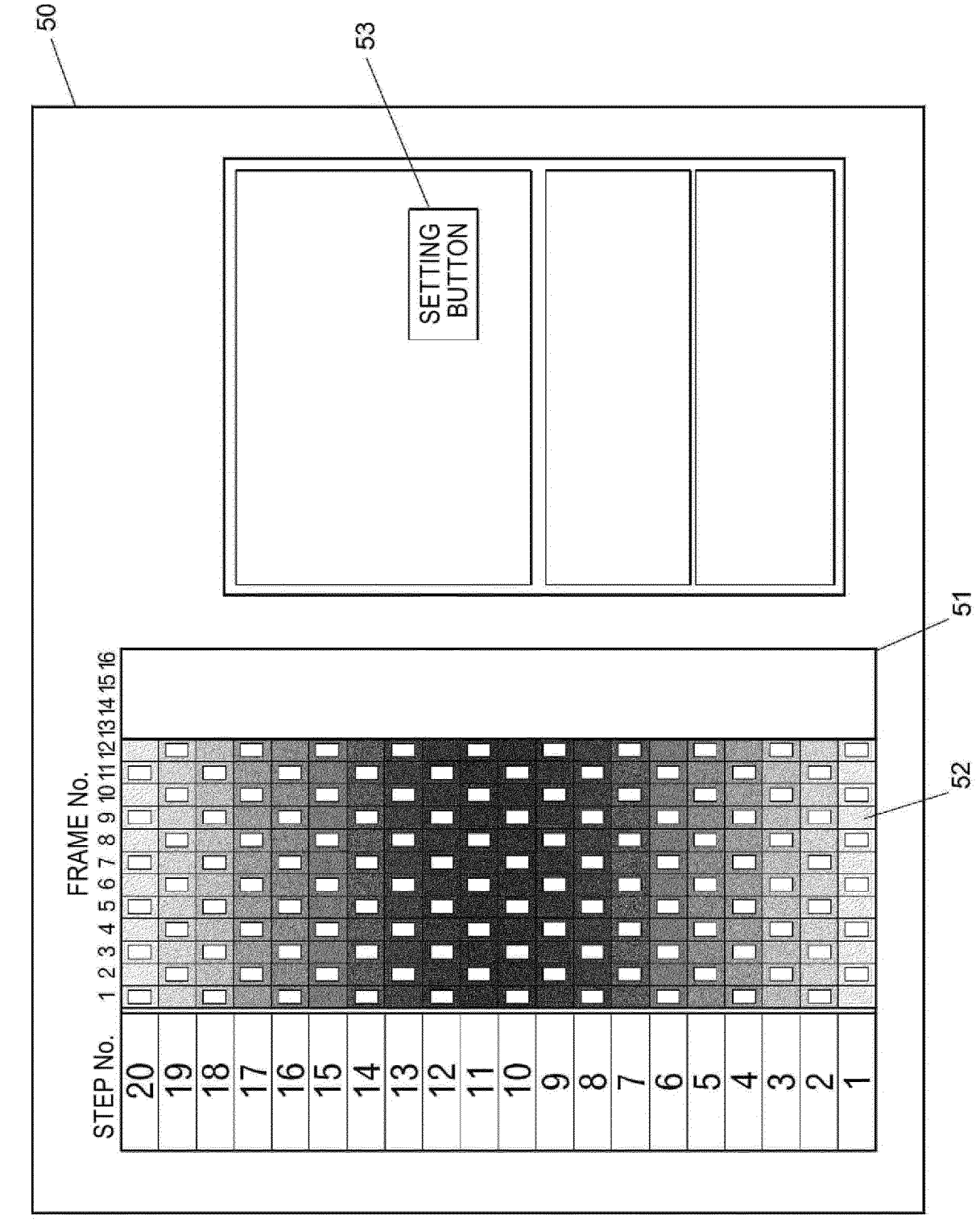
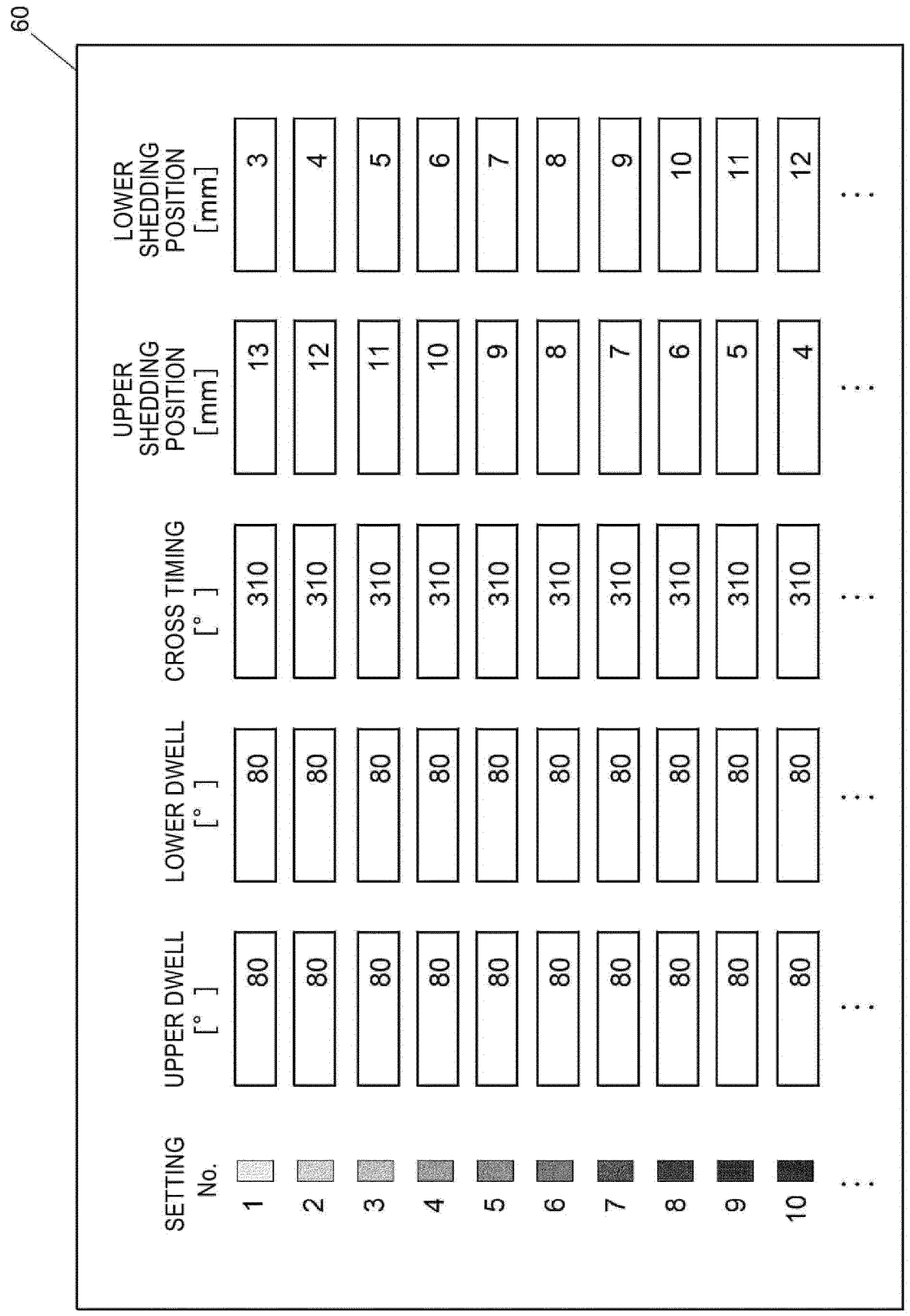

50
53
SETTING BUTTON
51
52
FRAME No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
STEP No.
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

FIG.2

FIG.3


60
SETTING No.
UPPER DWELL [°]
LOWER DWELL [°]
CROSS TIMING [°]
UPPER SHEDDING POSITION [mm]
LOWER SHEDDING POSITION [mm]
1 80 80 310 13 3
2 80 80 310 12 4
3 80 80 310 11 5
4 80 80 310 10 6
5 80 80 310 9 7
6 80 80 310 8 8
7 80 80 310 7 9
8 80 80 310 6 10
9 80 80 310 5 11
10 80 80 310 4 12

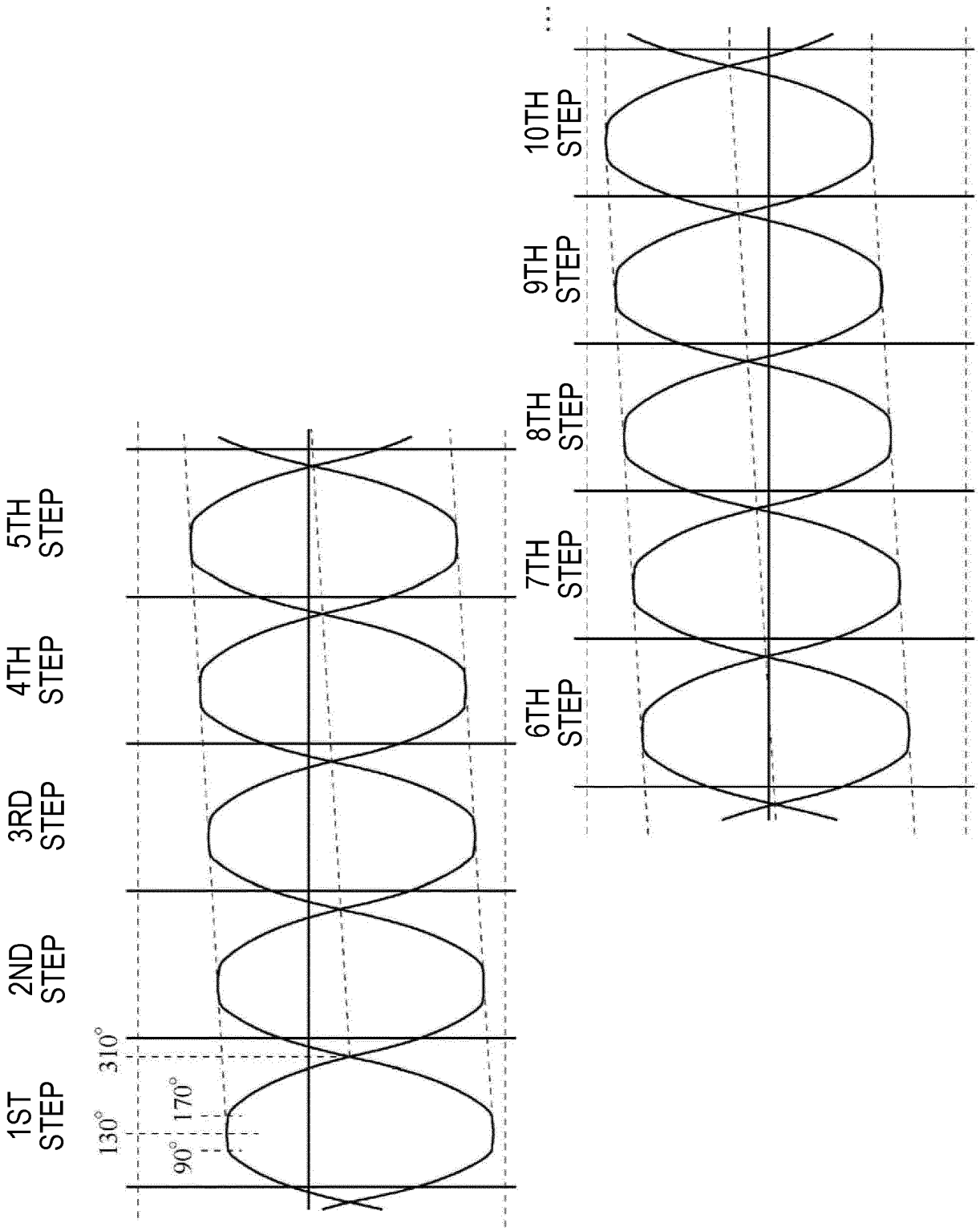

1ST STEP
2ND STEP
3RD STEP
4TH STEP
5TH STEP
6TH STEP
7TH STEP
8TH STEP
9TH STEP
10TH STEP
130°
310°
90°
170°

FIG.4

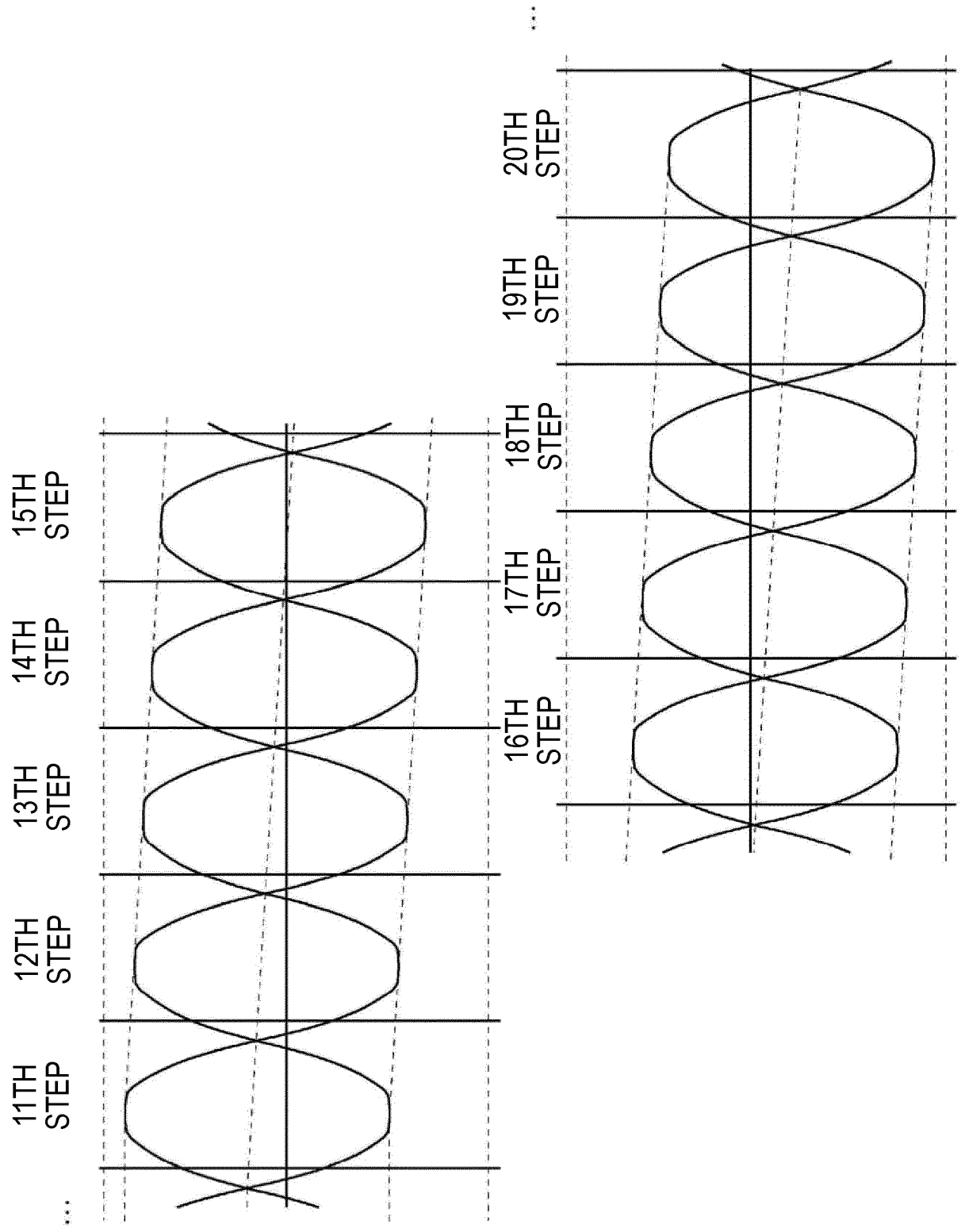

...
11TH STEP
12TH STEP
13TH STEP
14TH STEP
15TH STEP
16TH STEP
17TH STEP
18TH STEP
19TH STEP
20TH STEP
...

FIG.5

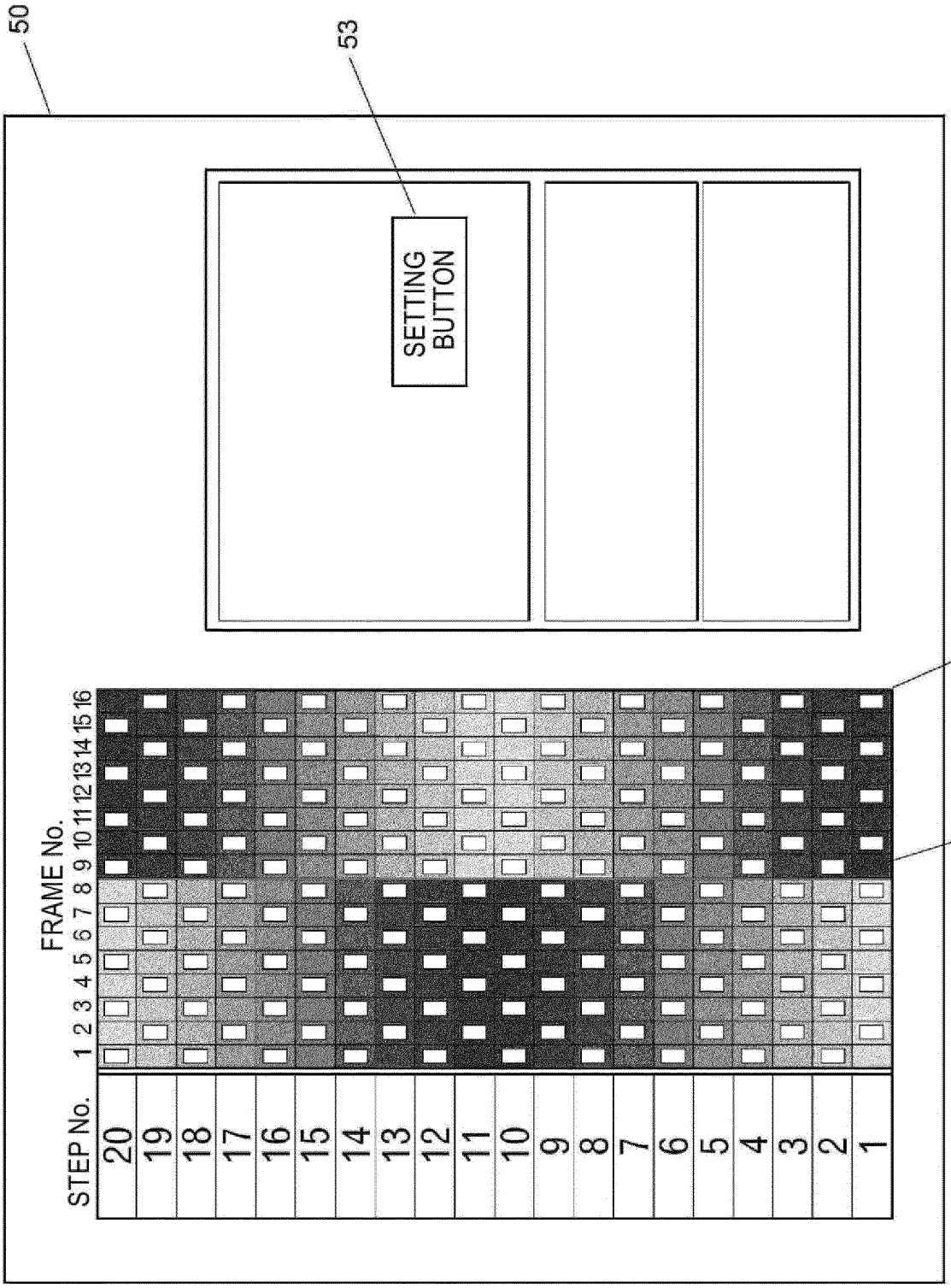
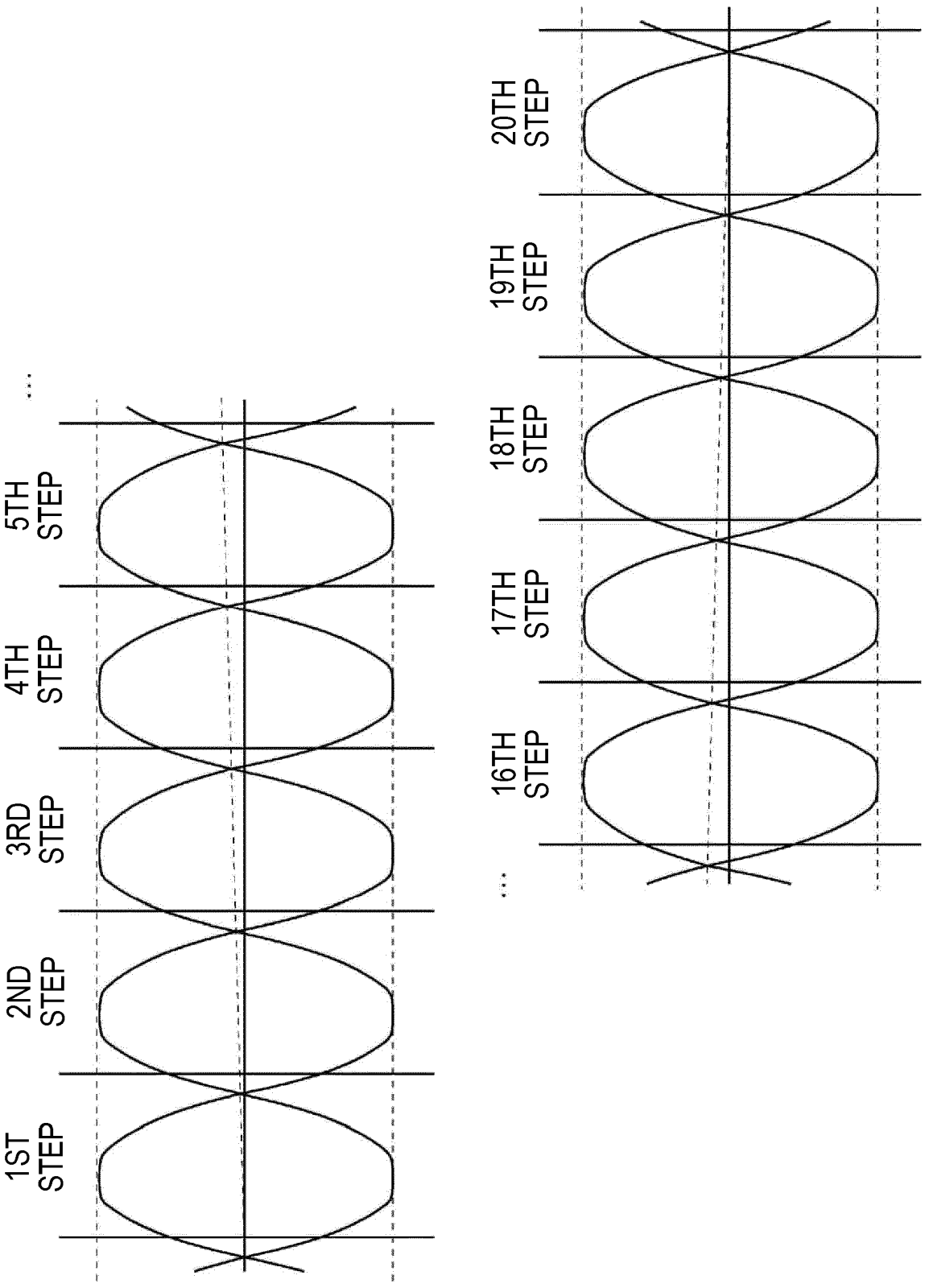

50
53
SETTING BUTTON
51
52
FRAME No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
STEP No.
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

FIG.6

FIG.7


1ST STEP
2ND STEP
3RD STEP
4TH STEP
5TH STEP
...
16TH STEP
17TH STEP
18TH STEP
19TH STEP
20TH STEP
...

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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