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(54) **Information display method and information display device for loom**

Informationsanzeigeverfahren und Informationsanzeigevorrichtung für eine Webmaschine

Dispositif et procédé d'affichage d'informations pour métier à tisser

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an information display method and an information display device for a loom. The information display method and the information display device are used for displaying, as a graph, changes of a weaving-related member, provided at the loom, occurring as weaving is performed on a display screen of a display unit by associating the changes with a rotation angle (what is called a "crank angle") of a main shaft.

2. Description of the Related Art

[0002] Various related arts in which changes (displacements) of a weaving-related member, provided at a loom, occurring as weaving is performed (in particular, changes in warp tension and changes of a weaving-related member that influences the tension of a warp, such as an easing roller in a warp let-off device and a heald frame at a shedding device) are displayed as a graph on a display screen of a display unit by associating the changes with a crank angle are known. For example, Japanese Unexamined Patent Application Publication No. 10-130987 (Patent Literature (PTL) 1) discloses a technology of displaying on a display screen (display unit) a graph (waveform curve) in which the displacement amount of a heald frame, serving as a weaving-related member, and the crank angle are associated with each other. Japanese Unexamined Patent Application Publication No. 2005-336643 discloses a technology of displaying, as a graph (waveform curve), changes in the tension of a warp, serving as a weaving-related member, during weaving in a graph region in which the horizontal axis represents the crank angle by sampling the tension of the warp with each predetermined crank angle.

[0003] In a loom, a warp streak may be produced at a particular position at a woven fabric in a weaving-width direction thereof. A warp streak is thought to be produced in a fabric due to the production of a fluff in a warp at a particular position at the fabric in a weaving-width direction. One cause of the production of a fluff is an inappropriate relationship between weft insertion and shedding motion. More specifically, a fluff may be produced when, in a weft insertion process, the shedding amount of a warp shed during passage of a leading end of a weft is not a proper amount, or due to the tension of a warp even if the shedding amount of a warp shed itself is an allowable amount. When a warp streak is discovered at a particular position at a woven fabric in a weaving-width direction, in order to eliminate the warp streak, it is necessary to, for example, adjust a weaving-related member that is related to the cause of production of the warp streak. Examples of causes of the production of a warp streak include the following.

[0004] If, for example, a loom is a water jet loom, when a leading end portion of jetting water that is jetted from a weft insertion nozzle for performing weft insertion passes a warp shed, the jetting water comes into contact with a warp due to the shedding amount, as a result of which a fluff may be produced. More specifically, due to the shedding amount of the warp at a location where the leading end portion of the jetting water moves, the jetting water that is jetted from the weft insertion nozzle tends to come into contact with the warp in the warp shed, as a result of which a portion of a fiber of the warp is damaged, thereby producing a fluff.

[0005] However, the contact between the jetting water and the warp is related to, not only the relationship between the position of the leading end portion of the jetting water and the shedding amount of the warp at this position, but also changes in the size of the jetting water in a pulsing manner. More specifically, it is known that jetting water that is jetted from the weft insertion nozzle does not flow with a fixed size towards a side opposite to a weft supply side and into a warp shed, that is, the size of jetting water changes in a pulsing manner as it flows due to the effects of, for example, air resistance. Therefore, in the process in which a warp shed opens at an initial stage of weft insertion or in the process in which the warp shed is closed at the end of weft insertion, the jetting water and the warp are not necessarily in contact with each other over the entire range in which the shedding amount is less than or equal to a predetermined amount. As the size of the jetting water changes in a pulsing manner, the jetting water and the warp partly contact each other in the above-described range.

[0006] Fluffs (warp streaks) such as those mentioned above are not necessarily produced just because the jetting water and the warp are in contact with other. As mentioned above, the tension of the warp at the time of contact between the warp and the jetting water may influence the production of fluffs. That is, the higher the tension of the warp, the more easily fluffs are produced due to the above-described contact between the jetting water and the warp; and the lower the tension of the warp, the less frequently fluffs tend to be produced even if the above-described contact between the jetting water and the warp occurs.

[0007] Incidentally, it is known that the tension of a warp changes during one weaving cycle of a loom due to the influence of, for example, the operation of a weaving-related member. For example, in the process in which a heald frame causes the warp to move vertically for forming a warp shed, the tension of the warp tends to increase as the

shedding amount increases to a maximum. However, general looms include an easing device for suppressing variations in the tension during one weaving cycle. The operation of the easing device reduces the increased tension of the warp, and thereafter suppresses an increase in the tension of the warp. Then, in the process in which, after the shedding amount of the warp becomes a maximum, the heald frame moves the warp for moving the warp again to a closing position, the tension of the warp is gradually reduced. Accordingly, the tension of the warp changes during one loom cycle. If the tension of the warp when the jetting water and the warp contact each other is a high value that causes the production of a fluff, the contact between the warp and the jetting water causes a fluff to be produced, as a result of which the aforementioned warp streak is produced.

[0008] Considering what is described above, when a warp streak is produced at a particular position at a woven fabric in the weaving-width direction, in particular, when the position where the warp streak is produced is at a position in the weaving-width direction that corresponds to the position of passage of the leading end portion of the jetting water at the initial stage or end of weft insertion, an operator tries to determine the cause thereof. To determine the cause, hitherto, the operator causes a shed curve graph such as that disclosed in PTL 1 or a graph related to changes in the tension of a warp such as that disclosed in PTL 2 to be displayed on a display screen of a display unit, determines the cause of the production of the fluff (warp streak) from these graphs, and adjusts, for example, a weaving-related member that has something to do with the cause.

[0009] More specifically, when, as a result of confirming the shed curve graph, the operator thinks that the cause of the production of the fluff is the shedding amount of the warp at the initial stage or end of weft insertion, the operator, for example, changes the operation of the heald frame by adjusting the shedding device. In contrast, when the operator does not think that the only cause is the shedding amount, the operator confirms the graph related to changes in the tension of the warp. When, as a result of confirming this graph, the operator thinks that the tension state of the warp is influencing the production of the fluff, the operator adjusts, for example, the easing device and the shedding device that influence the changes in the tension of the warp.

[0010] However, from the displays of graphs related to the operation of a weaving-related member, such as those disclosed in PTL 1 and PTL 2, it is not possible to easily determine the tension of a warp and the shedding amount of the warp when a warp streak has been produced, that is, the tension of the warp and the shedding amount when the leading end portion of the jetting water passes the position where the warp streak has been produced (crank angle). Therefore, it takes effort and time to determine the cause of production of the warp streak. The details are as follows.

[0011] Since a warp streak that is produced in a fabric that is woven appears on a surface of the fabric, the distance of the position where the warp streak has been produced from a selvage at a weft-supply side can be easily determined. However, if it is assumed that the leading end portion of the jetting water and the warp are in contact with each other at this position, the crank angle at the position of contact between the jetting water and the warp cannot be determined even if the woven fabric is observed. In the graph display in the related art, as disclosed in PTL 1 and PTL 2, the horizontal axis represents the crank angle. That is, the crank angle along the horizontal axis is in correspondence with the passage of time in a weaving process instead of with the position on the fabric.

[0012] Therefore, hitherto, when a warp streak is produced at a particular position at a fabric in a weaving-width direction, in order to determine the cause of production of the warp streak, an operator, first, determines the crank angle when the leading end portion of the jetting water passes the position where the warp streak has been produced by, for example, calculation. Then, on the basis of the determined crank angle, the operator must, for example, confirm the shedding amount of the warp from the display of the shed curve graph of a heald frame disclosed in PTL 1 or confirm the tension of the warp from the display of a graph of changes in the tension of the warp disclosed in PTL 2. Therefore, it takes effort and time to determine the cause of production of the warp streak.

[0013] Accordingly, the operation for determining the cause of production of a warp streak is troublesome, and it takes time and effort to perform adjustments for eliminating the problem from the time the cause of production of the warp streak is determined.

SUMMARY OF THE INVENTION

[0014] Accordingly, it is an object of the present invention to provide an information display method and an information display device for a loom for providing an operator with information (index) serving as reference for determining the cause of a problem regarding the loom occurring at a particular position at a fabric in a weaving-width direction.

[0015] To this end, according to an aspect of the present invention, there is provided an information display method for a loom, in which a change of a weaving-related member, provided at the loom, occurring as weaving is performed is associated with a rotation angle of a main shaft, and the change is displayed as a graph in a graph region of a display screen of a display unit, a horizontal axis representing the rotation angle of the main shaft in the graph region. The information display method includes forming a line graph corresponding to a position of a selvage of a fabric in the graph region on the basis of a rotation angle of the main shaft at which a leading end portion of weft insertion means or a leading end of a weft that is inserted passes the selvage of the fabric; and forming a line graph corresponding to an

arbitrary position at the fabric in a weaving-width direction in the graph region by determining a rotation angle of the main shaft corresponding to the arbitrary position, wherein the rotation angle of the main shaft corresponding to the arbitrary position is determined on the basis of a weaving width of the fabric and the rotation angle of the main shaft at which the leading end portion of the weft insertion means or the leading end of the weft that is inserted passes the selvage of the fabric.

[0016] According to another aspect of the present invention, there is provided an information display device for a loom, in which a change of a weaving-related member, provided at the loom, occurring as weaving is performed is associated with a rotation angle of a main shaft, and the change is displayed as a graph in a graph region of a display screen of a display unit, a horizontal axis representing the rotation angle of the main shaft in the graph region. The information display device includes a storage unit that stores a rotation angle of the main shaft at which a leading end portion of weft insertion means or a leading end of a weft that is inserted passes a selvage of a fabric; an setting unit that sets an arbitrary position at the fabric in a weaving-width direction; an angle determining unit that determines a rotation angle of the main shaft corresponding to the arbitrary position that is set by the setting unit; and a display controlling unit that forms a line graph corresponding to a position of the selvage of the fabric in the graph region on the basis of the rotation angle of the main shaft that is stored in the storage unit and at which the leading end portion of the weft insertion means or the leading end of the weft passes the selvage of the fabric, the display controlling unit also forming a line graph corresponding to the arbitrary position in the graph region on the basis of the rotation angle of the main shaft corresponding to the arbitrary position determined by the angle determining unit, wherein the angle determining unit determines the rotation angle of the main shaft corresponding to the arbitrary position on the basis of a weaving width of the fabric and the rotation angle of the main shaft at which the leading end portion of the weft insertion means or the leading end of the weft that is inserted passes the selvage of the fabric.

[0017] The term "weaving-related member" in the present invention refers to threads, such as warps and wefts, used in weaving, and a member (such as a heald frame and a weft insertion nozzle) that is used in weaving-related operations (such as a warp shedding operation and weft insertion).

[0018] Regarding the expression "a leading end portion of weft insertion means or a leading end of a weft that is inserted" in the present invention, the term "weft insertion means" used here refers to means for transporting the weft from a weft supply side to a side opposite to the weft supply side in weft insertion. More specifically, it refers to jetting water that is jetted from the weft insertion nozzle when the loom is a water jet loom, and to a rapier head when the loom is a rapier loom. From the viewpoint that the weft insertion means is means for transporting a weft, air current that is jetted from the weft insertion nozzle when the loom is an air jet loom also corresponds to the weft insertion means. However, since the position of a leading end portion of the air current cannot be confirmed (by sight), when the loom is an air jet loom, for example, a line graph corresponding to the position of a selvage of a fabric is formed on the basis of "a leading end of a weft that is inserted".

[0019] According to the present invention, in the graph region that displays changes of a weaving-related member occurring as weaving is performed and in which the horizontal axis represents the rotation angle (crank angle) of the main shaft, a line graph corresponding to the position of a selvage of a fabric is formed, and a line graph corresponding to an arbitrary position in the weaving-width direction formed and displayed by determining the crank angle corresponding to the arbitrary position is determined. Therefore, when a defect occurs at a particular position at a woven fabric in the weaving-width direction, an operator sets information regarding the particular position (such as the distance from a selvage in the weaving-width direction), so that a line graph corresponding to this particular position is formed in the graph region in which the horizontal axis represents the crank angle. Therefore, the operator can easily confirm at the display unit the changes of a weaving-related member occurring as weaving is performed at the crank angle when a leading end portion of weft insertion means or a leading end of a weft passes the particular position. Since the operator only needs to adjust the weaving-related member or a weaving-related device including the weaving-related member on the basis of the information (index) obtained from the display unit, it is possible considerably reduce the effort and time required for carrying out all the operations compared to the effort and time hitherto required in making adjustments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 shows an overall structure of a water jet loom;
Fig. 2 is a block diagram of an embodiment of the present invention;
Fig. 3 shows the content of a screen display according to the embodiment of the present invention;
Fig. 4 shows the content of the screen display according to a modification;
Fig. 5 shows the content of the screen display according to another modification; and
Fig. 6 shows the content of the screen display according to still another modification.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] An embodiment of the present invention is hereunder described with reference to Figs. 1 to 3. In the embodiment, a loom is described as being a water jet loom. In the embodiment, the water jet loom includes a display unit. In addition, in order to provide the function of displaying changes in the tension of a warp (serving as a weaving-related member), detected with each predetermined crank angle, on a display screen of the display unit, the water jet loom includes a tension detection device.

[0022] Fig. 1 schematically illustrates the overall structure of a water jet loom 1. In the water jet loom 1, a plurality of warps 3 that are let off in the form of a sheet from a warp beam 2 are wound upon a back roller 13 and an easing roller 16 and are transferred towards a cloth fell 10, after which the warps 3 are inserted into a plurality of healds (not shown), mounted to a plurality of heald frames 5 at a warp shedding device 4, pass a read 9 of a beating device 8, and extend to the cloth fell 10. As illustrated in Fig. 1, in the water jet loom 1 that is presupposed in the present invention, the warp shedding device 4 and the beating device 8 are connected to a main shaft 12 of the loom, and are driven by a rotational motion of the main shaft 12. That is, the main shaft 12 is a driving source.

[0023] During weaving, the warps 3 are separated into upper warps 3a and lower warps 3b by the operation of the warp shedding device 4, and wefts W are inserted into a warp shed 6, formed by the upper warps 3a and the lower warps 3b, by a weft insertion device 7 (not shown). In the embodiment, since the loom is a water jet loom, the weft insertion is one in which weft insertion means is jetting water, and the wefts W are transported to a side opposite to a weft supply side by being ejected from a weft insertion nozzle by jetting water that has been jetted from the weft insertion nozzle. Then, the inserted wefts W are pushed against (beated against) the cloth fell 10 by the reed 9 where the inserted wefts swing along a warp direction, so that a fabric 11 is formed.

[0024] The tension of the warps 3 (hereunder may also be simply referred to as "warp tension") let off in the form of a sheet from the warp beam 2 is detected via a load cell 15, connected to the back roller 13, and is input to a warp tension detecting device 14. The warp tension detecting device 14 associates, as warp tension data T, the warp tension, input from the load cell 15, and the crank angle at the time of input with each predetermined crank angle, that is, with every 20 degrees, and stores the warp tension data T. The warp tension data T for a predetermined period that is greater than or equal to one weaving cycle is stored, and is successively updated with every predetermined crank angle, so that the most recent warp tension data T is stored. As in the illustration, a display controlling device 107 included in a loom information display device 100 according to the present invention (described later) is connected to the warp tension detecting device 14, and a display unit 106 is connected to the display controlling device 107.

[0025] In the water jet loom 1, as mentioned above, on the basis of the warp tension data T stored in the warp tension detecting device 14, the display controlling device 107 forms a graph (warp tension) related to the warp tension for one weaving cycle. In addition, in the water jet loom 1, a display screen 200 of the display unit 106 displays a warp-3 tension waveform that has been formed for one weaving cycle in a graph region 203 in which the horizontal axis represents the crank angle and the vertical axis represents the tension of warps 3.

[0026] Fig. 2 shows the loom information display device 100 according to the embodiment. As in the illustration, the loom information display device 100 includes the display controlling device 107, an inputting unit 101 that is connected to the display controlling device 107 and that sets each piece of information, and the display unit 106 including, for example, a display for display a graph or the like. The display controlling device 107 primarily includes a storage unit 102 to which the inputting unit 101 is connected, an angle determining unit 103 to which the storage unit 102 is connected at an input side, and a display controlling unit 105 that is connected to the angle setting unit 103 at the input side and to the display unit 106 at an output side.

[0027] The warp tension detecting device 14 is connected to the input side of the display controlling unit 105 of the display controlling device 107. The display controlling unit 105 forms the tension waveform of the warps 3 described above, and controls the display of, for example, the tension waveform and the graph region 203 on the display screen 200 of the display unit 106.

[0028] The inputting unit 101 is, for example, a touch panel type using the display screen 200 of the display unit 106. For example, a numeric keypad and an input setting section displayed on the display screen 200 of the display unit 106 function as the inputting unit 101. Using the inputting unit 101 that is displayed on the display screen 200 of the display unit 106, each piece of information is input and set. In the embodiment, it is assumed that operation buttons for displaying, for example, a graph on the display screen 200 of the display unit 106 are included in the inputting unit 101. However, the inputting unit 101 may be formed by, for example, a keyboard connected to the display unit 106.

[0029] The storage unit 102 in the display controlling device 107 is for storing information that has been input and set by the inputting unit 101, and corresponds to what is called a memory. In the embodiment, as information for forming line graphs corresponding to the positions of selvages of a fabric 11 in the graph region 203, a weft insertion start timing Tjet (which corresponds to the rotation angle (hereunder may also be referred to as a "crank angle") of the main shaft 12 when a leading end portion of jetting water, serving as weft insertion means, passes a selvage at the weft supply side of the fabric 11 at the time of weft insertion) and an arrival timing Tarr (which corresponds to the crank angle when

the leading end portion of the jetting water passes a selvage at the side opposite to the weft supply side) are input and set by the inputting unit 101, and stored in the storage unit 102.

[0030] The operator may obtain the weft insertion timing Tjet and the arrival timing Tarr by observing the selvage at the weft supply side and the selvage at the side opposite to the weft supply side of the fabric 11 using, for example, a stroboscopic device, or by using a structure in which the leading end portion of the jetting water or a leading end of the wefts W is detected by sensors or the like (provided at the selvage at the weft supply side and the selvage at the side opposite to the weft supply side of the fabric 11), and the crank angle at the time of detection thereof is made to be associated therewith.

[0031] As information that is input and set for determining a passage timing Tany corresponding to the crank angle when the leading end portion of the jetting water passes an arbitrary position Pa at the fabric 11 in the weaving-width direction, in addition to the weft insertion start timing Tjet and the arrival timing Tarr, a weaving width L of the fabric 11 is stored in the storage unit 102 by being input and set by the inputting unit 101. The inputting unit 101 is capable of inputting and setting information regarding the arbitrary position Pa. The weaving width L of the fabric 11 that is stored in the storage unit 102 may be input and set on the basis of a weaving width that is specified in, for example, a fabric specification of the fabric 11 that is woven. As the information regarding the arbitrary position Pa that is input and set by the inputting unit 101, in the embodiment, a distance La from the selvage at the weft supply side is input and set.

[0032] The angle determining unit 103 of the display controlling device 107 determines the passage timing Tany at the arbitrary position Pa on the basis of each of the aforementioned pieces of information that are stored in the storage unit 102. The angle determining unit 103 is connected to the inputting unit 101 at the input side thereof. When an operation button included in the inputting unit 101 and used for causing the display unit 106 to display a graph or the like is operated, a display command signal that is output by operating the operation button is input to the angle determining unit 103. Due to the input of the display command signal, the angle setting unit 103 reads each of the aforementioned pieces of information from the storage unit 102, and determines the passage timing Tany on the basis of a computational expression that is previously set in the angle setting unit 103. The method of determining the passage timing Tany is described in detail below.

[0033] The display controlling unit 105 causes line graphs corresponding to the positions of selvages of the fabric 11 to be formed and displayed in the graph region 203 of the display screen 200 on the basis of the weft insertion start timing Tjet and the arrival timing Tarr that are stored in the storage unit 102. As shown in Fig. 3, the line graphs corresponding to the positions of the selvages of the fabric 11 are formed as line graphs that are parallel to a vertical axis at the position of the weft insertion start timing Tjet and the position of the arrival timing Tarr at a horizontal axis.

[0034] In the embodiment, in order to make it easier for an operator to understand that the line graphs correspond to the positions of selvages of the fabric 11, as shown in Fig. 3, graphics that make one visualize the fabric 11 are provided between both lines at the top portion of the graph region 203. In order to make it easier to know that this provided part corresponds to the vicinity of the cloth fell 10 of the fabric 11, schematics that correspond to the weft insertion nozzle, a thread cutter CL1, and a selvage yarn cutter CL2 are drawn in the portion where the graphics are provided. The display controlling unit 105 also displays the graphics on the display screen 200.

[0035] The display controlling unit 105 causes the passage timing Tany determined by the aforementioned angle determining unit 103 to be displayed on the display screen 200 of the display unit 106, and the line graph corresponding to the passage timing Tany to be formed and displayed in the graph region 203 that is displayed on the display screen 200. As shown in Fig. 3, the line graph corresponding to the passage timing Tany is formed as a line graph that is parallel to the line graphs corresponding to the positions of the selvages at the position of the determined passage timing Tany on the horizontal axis. In the embodiment, the passage timing Tany is displayed at the position corresponding to the line graph of the passage timing Tany at a location above the graph region 203. Further, in the illustrated embodiment, in order to make it easier for the operator to know that the passage timing Tany corresponds to the crank angle when the leading end portion of the jetting water passes the arbitrary position Pa, a mark (a black circle in Fig. 3) that represents the leading end portion of the jetting water (leading end of the wefts W) is provided at the portion where the graphics of the fabric 11 are displayed.

[0036] Regarding each input set value that is stored in the storage unit 102, as mentioned above, in the embodiment, the weft insertion start timing Tjet corresponds to the crank angle when the leading end portion of the jetting water that has been jetted from the weft insertion nozzle passes the selvage at the weft supply side. However, the weft insertion start timing Tjet may be a crank angle when a leading end of the wefts W passes the selvage at the weft supply side. That is, in weft insertion of a general water jet loom, the jetting of the jetting water is started before the ejection of the wefts W. Therefore, the crank angle when the leading end portion of the jetting water passes the selvage at the weft supply side and the crank angle when the leading end of the wefts W passes the selvage at the weft supply side are not exactly the same. However, the difference between these crank angles is so small as to be negligible in the weft insertion. Therefore, for the weft insertion start timing Tjet, either of these crank angles may be input and set. As mentioned above, the arrival timing Tarr corresponds to the crank angle when the leading end portion of the jetting water that has been jetted from the weft insertion nozzle passes the selvage at the side opposite to the weft supply side. However, similarly

to the weft insertion start timing Tjet, for the arrival timing Tarr, a crank angle when the leading end of the wefts W passes the selvage at the side opposite to the weft supply side may be input and set.

[0037] The weft insertion start timing Tjet may be a crank angle when the jetting water from the weft insertion nozzle is jetted. That is, since the position of an end of the weft insertion nozzle is set at a position that is slightly separated from the selvage at the weft supply side, the crank angle when the jetting water is jetted from the weft insertion nozzle and the crank angle when the jetting water passes the selvage at the weft supply side are not exactly the same. However, the difference between these crank angles is so small as to be negligible in the weft insertion. Therefore, for the weft insertion start timing Tjet, either of these crank angles may be input and set. Further, the weft insertion start timing Tjet may be a crank angle when the wefts W are ejected from the weft insertion nozzle.

[0038] The method of determining the passage timing Tany by the angle determining unit 103 in the water jet loom 1 according to the embodiment described above is hereunder described in detail below.

[0039] First, the angle determining unit 103 determines the passage timing Tany by subtracting the weft insertion start timing Tjet from the arrival timing Tarr and determining the period (crank angle range) required for the leading end portion of the jetting water to move from the selvage at the weft supply side to the selvage at the side opposite to the weft supply side. The determined crank angle range becomes a crank angle range required for the leading end portion of the jetting water to move through the distance from the selvage at the weft supply side to the selvage at the side opposite to the weft supply side, that is, the distance corresponding to the weaving width L of the fabric 11. Therefore, from the input and set weaving width L of the fabric 11 and the crank angle range obtained by the aforementioned subtraction, it is possible to obtain the relationship between the distance through which the leading end portion of the jetting water moves and the crank angle range required for the leading end portion of the jetting water to move through this distance. On the basis of this relationship, the angle determining unit 103 determines the crank angle period required for the leading end portion of the jetting water to move through a distance up to the arbitrary position Pa at the fabric 11 in the weaving-width direction, that is, a distance La from the selvage at the weft supply side to the arbitrary position Pa.

[0040] When the distance La from the selvage at the weft supply side to the arbitrary position Pa is input at the inputting unit 101, the angle determining unit 103 determines the crank angle range required for the leading end portion of the jetting water to move through the distance La on the basis of the aforementioned relationship. By adding the weft insertion start timing Tjet, which corresponds to the crank angle when the leading end portion of the jetting water passes the selvage at the weft supply side of the fabric 11, to the crank angle range, the angle determining unit 103 determines the passage timing Tany, which corresponds to the crank angle when the leading end portion of the jetting water passes the arbitrary position Pa. More specifically, the computational expression is as follows:

$$Tany = La \times (Tarr - Tjet)/L + Tjet$$

[0041] When the crank angle range required for the leading end portion of the jetting water to move through the distance corresponding to the weaving width L of the fabric 11 mentioned above is used, it is possible to determine the speed of the jetting water, that is, the weft insertion speed. The determined weft insertion speed may be displayed on a display section 202b of the display screen 200 as shown in Fig. 3. The weft insertion speed that is determined by the aforementioned method is strictly an average speed, and is not exactly the same as the weft insertion speed of each portion in the weaving-width direction. This is because weft insertion in an actual water jet loom is such that the jetting water does not flow into the warp shed 6 at a constant speed, but flows at the highest speed directly after the jetting water is jetted from the weft insertion nozzle and its speed gradually decreases due to, for example, air resistance from when the speed is highest. However, it is desirable to tentatively display even the weft insertion speed as reference for making adjustments for an operator.

[0042] The weft insertion speed is determined by determining the number of rotations (rps) per second of the main shaft 12 from the rotational speed of the main shaft 12, that is, the operation speed of the water jet loom 1. For example, if the operation speed of the water jet loom 1 is 600 rpm, the number of rotations (rps) per second of the main shaft 12 is 600/60 = 10 rps. As shown in Fig. 3, if the crank angle corresponding to the weft insertion start timing Tjet is 100 degrees and the crank angle corresponding to the arrival timing Tarr is 230 degrees, the crank angle period required for the jetting water to flow through the weaving width L is 230 - 100 = 130 degrees. Further, if, as shown in Fig. 3, the weaving width L of the fabric 11 is 150 cm, that is, 1.5 m, a crank angle of 130 degrees is required for the jetting water to flow 1.5 m. Therefore, from these relationships, the distance that the jetting water flows per second, that is, the weft insertion speed (m/s) is determined from the following computational expression:

$$360 \times 1.5 \times 10/130 = \text{approximately } 41.5 \text{ m/s}$$

[0043] In the foregoing description, the weft insertion speed when the leading end portion of the jetting water flows through a distance corresponding to the weaving width L of the fabric 11 is determined, and the determined weft insertion speed is displayed. However, in addition to this, for example, it is also possible to similarly determine the weft insertion speed when the leading end portion of the jetting water flows through the distance La up to the arbitrary position Pa that has been input and set, and display the determined weft insertion speed.

[0044] Next, the operation of the loom information display device 100 in the structure according to the embodiment is described. For example, as a problem regarding the loom, when a fluff (warp streak) is produced at a particular position of the fabric 11 in the weaving-width direction and it is assumed that cause of the production of the fluff is contact between the jetting water and the warps 3, the operator uses the loom information display device 100 and confirms, from the display in the graph region 203, any change in the tension of the warps 3 when the leading end portion of the jetting water passes the particular position. This allows the operator to determine whether or not the cause of the production of the fluff is contact between the jetting water and the warps 3.

[0045] First, the operator measures the length (distance La) from a selvage at the weft supply side to the location where the fluff is produced, that is, the aforementioned particular position in the weaving-width direction. Next, in order to confirm any change in the tension of the warps 3 during weaving, the operator operates the inputting unit 101 of the loom information display device 100 to display a graph of changes in the warp tension on the screen shown in Fig. 3.

[0046] At this time, in the loom information display device 100, a screen display command signal is output from the inputting unit 101 to the display controlling unit 105 of the display controlling device 107. When the screen display command signal is input, the display controlling unit 105 reads the warp tension data T for one weaving cycle from the warp tension detecting device 14, and forms a graph related to the warp tension for one weaving cycle at the lower side of the graph region 203 of the display screen 200 of the display unit 106 on the basis of the read warp tension data T. In the graph related to the warp tension for one weaving cycle, the vertical axis represents the tension of the warps 3 and the horizontal axis represents the crank angle.

[0047] The operator inputs and sets the measured distance La at an input section 201a of the display screen 200, and operates an operation button. By this, in the loom information display device 100, the distance La is output to the storage unit 102 of the display controlling device 107 from the inputting unit 101, and a display command signal is output to the angle determining unit 103.

[0048] When the distance La is input, the storage unit 102 stores the distance La. When the display command signal is input to the angle determining unit 103, the angle determining unit 103 reads, as information for determining the passage timing Tany, the distance La (that is, the distance from the selvage at the weft supply side to the arbitrary position Pa), the weft insertion start timing Tjet, the arrival timing Tarr, and the weaving width L from the storage unit 102. From the read information, the angle determining unit 103 determines the passage timing Tany, and outputs the determined passage timing Tany to the display controlling unit 105.

[0049] When the passage timing Tany is input from the angle determining unit 103 to the display controlling unit 105, the display controlling unit 105 displays the passage timing Tany in the predetermined display section 202a of the display screen 200, and, on the basis of the passage timing Tany, forms a line graph corresponding to the arbitrary position Pa in the graph region 203. Further, on the basis of the weft insertion start timing Tjet and the arrival timing Tarr, the display controlling unit 105 forms line graphs corresponding to the selvages of the fabric 11. As a result, three lines (vertical lines) are formed in the graph region 203, where the graph related to the warp tension is formed, so as to exist at the portion where the graphics are displayed at the upper portion of the graph region 203 and the portion where the graph is displayed at the lower portion of the graph region 203.

[0050] By these displays on the display screen 200, the operator can easily confirm the relationship between the warp tension at the position where the fluff is produced and the crank angle when the leading end portion of the jetting water (leading end of the wefts W) passes the position where the fluff is produced at the fabric 11 in the weaving-width direction. The operator tries to eliminate the fluff (warp streak) by confirming the warp tension when the fluff is produced from the displays and by making adjustments using a weaving-related member or a weaving-related device including the weaving-related member for adjusting the tension of the warps 3 at the position where the fluff is produced. Then, after making the adjustments, the operator operates the water jet loom 1, confirms the state of production of the fluff, and confirms the change in the tension of the warps after the adjustments on the display screen 200.

[0051] In this way, according to the loom information display device 100 of the present invention used to describe an example according to the embodiment, when a problem regarding the loom occurs at a particular position in the weaving width direction, the operator can easily confirm at the display unit 106 any change in the weaving-related member occurring as weaving is performed at the crank angle when the leading end portion of the jetting water passes the particular position. In addition, the operator only needs to perform adjustments of the weaving-related member on the basis of information (index) obtained from the display unit 106, so that the time and effort required for the operation can be considerably reduced compared to existing adjustment operations.

[0052] Although an embodiment of the present invention is described above, the present invention is not limited to the above-described embodiment. That is, according to the present invention, line graphs corresponding to the positions of

selvages of a fabric and a line graph corresponding to an arbitrary position at a fabric in the weaving-width direction (hereunder may also be referred to as a "fabric position line graph") are formed in the graph region for a graph indicating a change of a weaving-related member occurring as weaving is performed (hereunder may also be referred to as a "change curve"). Although, in the embodiment, the change graph is a graph indicating changes in the tension of the warps 3, the present invention is not limited thereto, so that the fabric position line graph may be formed at the change curves described below.

(1) As shown in Fig. 4, the change graph may be a graph indicating displacement (change) of the heald frames 5 (weaving-related member) occurring as weaving is performed. More specifically, the graph indicating the displacement of the heald frames is one in which the amount of displacement of the heald frames 5 caused by weaving at each point in time in one weaving cycle, that is, the shedding amount of the warp shed 6, formed by vertical movement of the heald frames 5 during the weaving, is associated with the crank angle at each of these points in time and stored as shed data; and the shed data is graphed. For example, the amount of displacement of the heald frames 5 at each point in time (shedding amount of the warp shed 6) can be determined by detecting the position of the height of the heald frames 5 with reference to the position of the height of the cloth fell 10 using a sensor that is provided at the warp shedding device 4. The crank angle at each of these points in time becomes a crank angle at the time of detection thereof. The shed data includes shed data of two heald frames 5, that is, the heald frame 5 that moves upward and the heald frame 5 that moves downward in the same weaving cycle. The difference (distance) between the positions of the heights of the two heald frames 5 at the same crank angle becomes the shedding amount. However, the shed data is not limited to that in which the positions of the heights of the heald frames 5 are actually detected as mentioned above. The shed data may be obtained on the basis of operation patterns of the heald frames 5 that are previously set at the warp shedding device 4. For example, when the operation patterns of heald frames 5 are previously set in the warp shedding device 4 as in an electric shedding apparatus that drives each heald frame using a motor, the shed data based on the operation patterns of the heald frames 5 that have been set, that is, the positions of the heights of the head frames 5 at each crank angle may be determined. The warp shedding device 4 uses the main shaft 12 (main shaft motor M) as a driving source and has a mechanical structure including, for example, a cam mechanism or a crank mechanism, that vertically moves the heald frames 5. When the relationship between the crank angle and the displacement amounts of the heald frames 5 is determined by, for example, simulation or calculation from its mechanical structure, the shed data may be obtained by, for example, such simulation or calculation.

The display controlling unit 105 connected to the warp shedding device 4 reads the shed data and, on the basis of the shed data, forms a graph related to changes in the shedding amount of the warp shed 6 for one weaving cycle (shed curve) as a graph indicating the displacement amounts of the heald frames 5. In addition, the display controlling unit 105 forms the formed graph in the graph region 203 (in which the horizontal axis represents the crank angle and the vertical axis represents the height position) of the display screen 200 of the display unit 106. Incidentally, in the example shown in Fig. 4, an auxiliary line corresponding to the position of the height of the cloth fell 10 is drawn parallel to the horizontal axis as a reference of the vertical axis (height position).

In the modification, the fabric position line graph is formed in the graph region 203 where a graph related to changes in the shedding amount of the warp shed 6 formed in this way is displayed. Therefore, according to this structure, the operator can easily confirm the relationship between the shedding amount of the warp shed 6 and the crank angle when a leading end portion of jetting water (leading end of wefts W) passes the position where a fluff is produced. For example, when it is supposed that the cause of production of a fluff (warp streak), which is a problem regarding the loom, according to the embodiment is contact between the jetting water and the warps 3, the operator confirms the shedding amount of the warp shed 6 when the leading end portion of the jetting water passes the position where the fluff is produced by looking at the display of the shed curve in the graph region 203. This allows the operator to determine whether or not the cause of the production of the fluff is contact between the jetting water and the warps 3. When the operator determines that the cause is contact between the jetting water and the warps 3, the operator can adjusting the weaving-related member so as to avoid the contact by confirming the display of the graph.

(2) The change graph may be displayed as a graph indicating displacement (change) of the easing roller 16 (which is a weaving-related member for adjusting the tension of the warps 3) in a front-back direction as weaving is performed. The easing roller 16 is included in an easing device (not shown) serving as a weaving-related device. As mentioned above, the easing roller 16 suppresses variations in the tension of the warps 3 during one weaving cycle. More specifically, the warps 3 that are let off from the warp beam 2 are wound upon the easing roller 16. The easing roller 16 swings to change the length of a path of the warps 3 between the back roller 13 and the cloth fell 10 and suppresses the variations in the tension resulting from shedding motion of the warps 3.

[0053] The change graph indicating the displacement of the easing roller 16 is one in which the amount of displacement

(easing amount) of the easing roller 16 at each point in time in one weaving cycle is associated with the crank angle at each of these points in time, and stored as easing data; and the easing data is formed into a graph. Incidentally, for example, the easing amount of the easing roller 16 is determined with the most retreated position (that is, the position closest to a side opposite to the cloth fell 10 in a swing range) of the easing roller 16 being a reference.

[0054] The easing data may be considered as one in which, for example, the displacement amount (easing amount) of the easing roller 16 is detected with each predetermined crank angle using a sensor or the like and associating the detected values with the crank angles at the time of detections. The easing data is not limited to one in which the easing amount is actually detected. The easing data may be one in which the relationship between the crank angle and the easing amount is determined by, for example, simulation or calculation from its mechanical structure. That is, a general easing device uses the main shaft 12 (main shaft motor M) as a driving source, and swings the easing roller 16 in the front-back direction by its mechanical structure. Since the easing amount is determined on the basis of, for example, the length of an easing lever connected to the easing roller 16, the relationship between the crank angle and the easing amount (easing data) may be determined by, for example, simulation or calculation from the mechanical structure of the easing device. Further, when the easing device is driven independently of the main shaft 12 by a dedicated motor that is separate from the main shaft motor M, and an operation pattern of swinging of the easing roller 16 is previously set, the easing data may be obtained on the basis of the set operation pattern of the easing roller 16.

[0055] The display controlling unit 105 reads the easing data from the easing device (not shown). On the basis of the easing data, the display controlling unit 105 forms a change graph (easing curve) indicating changes in the easing amount for one weaving cycle as a graph indicating the displacement amount of the easing roller 16, and produces it in the graph region 203 of the display screen 200 of the display unit 106, with the horizontal axis representing the crank angle in the graph region 203.

[0056] Incidentally, in the exemplary change graph shown in Fig. 6, the vertical axis of the graph represents the easing amount with an auxiliary line drawn parallel to the horizontal axis of the graph serving as a reference, that is, corresponding the most retreated position of the easing roller 16. In a downward direction from the auxiliary line, the easing amount is increased, that is, the position of the easing roller 16 in the front-back direction (swing direction) defines a front direction (that is, the position at the side of the cloth fell 10). More specifically, when the easing curve extends downward, the easing roller 16 is moving forward, whereas, when the easing curve is extends upward, the easing roller 16 is retreated. This is because, when the swing direction of the easing roller 16 is made to match the front-back direction of the graphics display indicating the vicinity of the cloth fell 10 in the fabric position line graph, the operator can easily visualize the swinging of the easing roller 16 in one weaving cycle.

[0057] In this way, in the modification, the fabric position line graph is formed in the graph region 203 where the easing curve (corresponding to a change graph related to the displacement of the easing roller 16) is displayed. Therefore, this structure makes it possible for the operator to confirm changes in the easing amount before and after the time when a leading end portion of jetting water (leading end of the wefts W) passes an arbitrary position in the weaving-width direction. Therefore, according to this modification, whether the rotation of the easing roller 16 has something to do with the cause of production of a fluff (warp streak), which is a problem regarding the loom, appearing at a woven fabric can be easily determined. More specifically, when the easing roller 16 is swinging stably, the aforementioned problem should not occur. However, the easing amount may change suddenly due to a disturbance in the swinging of the easing roller 16 for some reason. As a result, the tension of the warps 3 may become higher than usual. When such a state occurs during a period when the jetting water and the warps 3 contact each other (initial stage and end of weft insertion), a fluff may be produced at the warps 3. It is possible to easily determine whether or not the swinging of the easing roller 16 (a sudden change in the easing amount) is the cause of production of the fluff by confirming any changes in the easing amount in front of and behind the arbitrary point (at which the leading end portion of the jetting water passes the position where the fluff is produced), which are indicated by the fabric position line graph, using the easing curve in the graph region 203.

[0058] In the foregoing description, as regards a change graph, the fabric position line graph is formed in the graph region 203 where a change graph related to the operation of one weaving-related member is displayed. However, the present invention is not limited thereto. The fabric position line graph may be formed in the graph region 203 where change graphs related to the operations of a plurality of weaving-related members are displayed with the horizontal axes (crank angles) being matched. Such modifications are shown in Figs. 5 and 6.

[0059] Fig. 5 shows a modification in which the fabric position line graph is formed in the graph region 203 where the graph related to changes in the tension of the warps 3 according to the embodiment and the shed curve in the aforementioned item (1) are displayed with the crank angles being matched. According to this modification, an operator can confirm at the same time the tension of the warps 3 and the shedding amounts of the heald frames 5 when a leading end portion of jetting water has passed the position where a fluff is produced (the arbitrary position Pa in the embodiment), which is a problem regarding the loom. Therefore, it is easy to determine which of the shedding amount or the amount of warp tension is the primary cause of the production of the fluff.

[0060] Fig. 6 shows a modification in which the fabric position line graph is formed in the graph region 203 where the

graph related to changes in the tension of the warps 3 and the easing curve in the aforementioned item (2) are displayed with the crank angles being matched. In this modification, when, as a result of confirming the graph related to changes in the tension of the warps 3, an operator determines that the cause of the production of a fluff is a high tension of the warps 3 when a leading end portion of jetting water has passed the position where the fluff is produced, the operator can also confirm at the same time the easing amount of the easing roller 16 at this point in time. Therefore, when adjusting the tension of the warps 3, it is possible to easily determine whether or not it is necessary to adjust the easing operation of the easing roller 16 that influences the tension.

[0061] Further, although not illustrated, the fabric position diagram may be formed in the graph region 203 where the graph related to changes in the tension of the warps 3, the shed curve in the aforementioned item (1), and the easing curve in the aforementioned item (2) are displayed with the crank angles being matched.

[0062] By forming the fabric position line graph in the graph region 203 where a plurality of change graphs are displayed, the cause of production of the fluff (warp streak), which is a problem regarding the loom, is effectively determined.

Claims

1. An information display method for a loom (1), in which a change of a weaving-related member, provided at the loom (1), occurring as weaving is performed is associated with a rotation angle of a main shaft, and the change is displayed as a graph in a graph region of a display screen of a display unit (106), a horizontal axis representing the rotation angle of the main shaft in the graph region, **characterized in that** the information display method comprises:

   forming a line graph corresponding to a position of a selvage of a fabric in the graph region on the basis of a rotation angle of the main shaft at which a leading end portion of weft insertion means or a leading end of a weft (W) that is inserted passes the selvage of the fabric; and
   forming a line graph corresponding to an arbitrary position at the fabric in a weaving-width direction in the graph region by determining a rotation angle of the main shaft corresponding to the arbitrary position, wherein the rotation angle of the main shaft corresponding to the arbitrary position is determined on the basis of a weaving width of the fabric and the rotation angle of the main shaft at which the leading end portion of the weft insertion means or the leading end of the weft (W) that is inserted passes the selvage of the fabric.

2. An information display device for a loom (1), in which a change of a weaving-related member, provided at the loom (1), occurring as weaving is performed is associated with a rotation angle of a main shaft, and the change is displayed as a graph in a graph region of a display screen of a display unit (106), a horizontal axis representing the rotation angle of the main shaft in the graph region, **characterized in that** the information display device comprises:

   a storage unit (102) that stores a rotation angle of the main shaft at which a leading end portion of weft insertion means or a leading end of a weft (W) that is inserted passes a selvage of a fabric;
   an inputting unit (101) that inputs and sets an arbitrary position at the fabric in a weaving-width direction;
   an angle determining unit (103) that determines a rotation angle of the main shaft corresponding to the arbitrary position that is input and set by the inputting unit (101); and
   a display controlling unit (105) that forms a line graph corresponding to a position of the selvage of the fabric in the graph region on the basis of the rotation angle of the main shaft that is stored in the storage unit (102) and at which the leading end portion of the weft insertion means or the leading end of the weft (W) passes the selvage of the fabric, the display controlling unit (105) also forming a line graph corresponding to the arbitrary position in the graph region on the basis of the rotation angle of the main shaft corresponding to the arbitrary position determined by the angle determining unit (103), wherein the angle determining unit (103) determines the rotation angle of the main shaft corresponding to the arbitrary position on the basis of a weaving width of the fabric and the rotation angle of the main shaft at which the leading end portion of the weft insertion means or the leading end of the weft (W) that is inserted passes the selvage of the fabric.

Patentansprüche

1. Informationsanzeigeverfahren für einen Webstuhl (1), bei welchem eine beim Durchführen des Webens eintretende Änderung eines am Webstuhl (1) vorgesehenen, mit dem Weben verknüpften Elements einem Drehwinkel einer Hauptwelle zugeordnet wird, und die Änderung als eine Kurve in einem Grafikbereich eines Anzeigebildschirms einer Anzeigeeinheit (106) angezeigt wird, wobei eine horizontale Achse in dem Grafikbereich den Drehwinkel der Hauptwelle darstellt, **dadurch gekennzeichnet, dass** das Informationsanzeigeverfahren umfasst:

Bilden einer Kurve in dem Grafikbereich, welche einer Position einer Webkante eines Gewebes entspricht, auf Grundlage eines Drehwinkels der Hauptwelle, bei dem ein vorderer Endbereich einer Schusseintragseinrichtung oder ein vorderes Ende eines Schusses (W), der eingetragen wird, die Webkante des Gewebes überschreitet; und

Bilden einer Kurve in dem Grafikbereich, welche einer beliebigen Position am Gewebe in einer Webbreitenrichtung entspricht, durch Bestimmen eines der beliebigen Position entsprechenden Drehwinkels der Hauptwelle, wobei der der beliebigen Position entsprechende Drehwinkel der Hauptwelle bestimmt wird auf Grundlage einer Webbreite des Gewebes und des Drehwinkels der Hauptwelle, bei welchem der vordere Endbereich der Schusseintragseinrichtung oder das vordere Ende des Schusses (W), der eingetragen wird, die Webkante des Gewebes überschreitet.

2. Informationsanzeigevorrichtung für einen Webstuhl (1), bei welchem eine beim Durchführen des Webens eintretende Änderung eines am Webstuhl (1) vorgesehenen, mit dem Weben verknüpften Elements einem Drehwinkel einer Hauptwelle zugeordnet ist, und die Änderung als eine Kurve in einem Grafikbereich eines Anzeigebildschirms einer Anzeigeeinheit (106) angezeigt ist, wobei eine horizontale Achse in dem Grafikbereich den Drehwinkel der Hauptwelle darstellt, **dadurch gekennzeichnet, dass** die Informationsanzeigevorrichtung umfasst:

eine Speichereinheit (102), welche einen Drehwinkel der Hauptwelle speichert, bei dem ein vorderer Endbereich einer Schusseintragseinrichtung oder ein vorderes Ende eines eingetragenen Schusses (W) die Webkante des Gewebes überschreitet;
eine Eingabeeinheit (101), welche eine beliebige Position am Gewebe in einer Webbreitenrichtung eingibt und festlegt;
eine Winkelbestimmungseinheit (103), welche einen Drehwinkel der Hauptwelle bestimmt, der der durch die Eingabeeinheit (101) eingegebenen und festgelegten beliebigen Position entspricht; und
eine Anzeigesteuerungs-/-regelungseinheit (105), welche eine einer Position einer Webkante des Gewebes entsprechende Kurve in dem Grafikbereich auf Grundlage des Drehwinkels der Hauptwelle bildet, der in der Speichereinheit (102) gespeichert ist und bei dem der vordere Endbereich der Schusseintragseinrichtung oder das vordere Ende des Schusses (W) die Webkante des Gewebes überschreitet, wobei die Anzeigesteuerungseinheit (105) auch eine der beliebigen Position entsprechende Kurve in dem Grafikbereich auf Grundlage des Drehwinkels der Hauptwelle bildet, welcher der durch die Winkelbestimmungseinheit (103) bestimmten beliebigen Position entspricht, wobei die Winkelbestimmungseinheit (103) den der beliebigen Position entsprechenden Drehwinkel der Hauptwelle bestimmt auf Grundlage einer Webbreite des Gewebes und des Drehwinkels der Hauptwelle, bei welchem der vordere Endbereich der Schusseintragseinrichtung oder das vordere Ende des eingetragenen Schusses (W) die Webkante des Gewebes überschreitet.

Revendications

1. Procédé d'affichage d'informations pour un métier (1) à tisser, dans lequel on associe un changement d'un élément se rapportant au tissage, prévu sur le métier (1) à tisser, se produisant alors que le tissage est effectué à un angle de rotation d'un arbre principal et on affiche le changement sous la forme d'un graphe dans une région de graphe d'un écran d'affichage d'une unité (106) d'affichage, un axe horizontal représentant l'angle de rotation de l'arbre principal dans la région du graphe, **caractérisé en ce que** le procédé d'affichage d'informations comprend :

former un graphe dual correspondant à une position d'une lisière d'un tissu dans la région du graphe sur la base d'un angle de rotation de l'arbre principal auquel une partie d'extrémité menante d'un moyen d'insertion de trame ou une extrémité menante d'une trame (W) qui est insérée passe dans la lisière du tissu et
former un graphe dual correspondant à une position arbitraire au tissu dans une direction en largeur du tissage dans la région du graphe, en déterminant un angle de rotation de l'arbre principal correspondant à la position arbitraire, l'angle de rotation de l'arbre principal correspondant à la position arbitraire étant déterminé sur la base d'une largeur de tissage du tissu et de l'angle de rotation de l'arbre principal auquel la partie d'extrémité menante du moyen d'insertion de trame ou l'extrémité menante de la trame (W) qui est insérée passe dans la lisière du tissu.

2. Procédé d'affichage d'informations pour un métier (1) à tisser, dans lequel on associe un changement d'un élément se rapportant au tissage, prévu sur le métier (1) à tisser, se produisant alors que le tissage est effectué à un angle de rotation d'un arbre principal et on affiche le changement sous la forme d'un graphe dans une région de graphe d'un écran d'affichage d'une unité (106) d'affichage, un axe horizontal représentant l'angle de rotation de l'arbre

principal dans la région du graphe, **caractérisé en ce que** le procédé d'affichage d'informations comprend :

une unité (102) de mémorisation qui mémorise un angle de rotation de l'arbre principal, auquel une partie d'extrémité menante d'un moyen d'insertion de trame ou une extrémité menante d'une trame (W) qui est insérée passe dans la lisière d'un tissu ;
une unité (101) d'entrée qui entre et fixe une position arbitraire au tissu dans la direction en largeur du tissage ;
une unité (103) de détermination d'angle, qui détermine un angle de rotation de l'arbre principal correspondant à la position arbitraire qui est entrée et fixée par l'unité (101) d'entrée et
une unité (105) de commande d'affichage qui forme un graphe dual correspondant à une position de la lisière du tissu dans la région du graphe sur la base de l'angle de rotation de l'arbre principal qui est mémorisé dans l'unité (102) de mémorisation et auquel la partie d'extrémité menante du moyen d'insertion de trame ou l'extrémité menante de la trame (W) passe dans la lisière du tissu, l'unité (105) de commande d'affichage formant aussi un graphe dual correspondant la position arbitraire dans la région du graphe sur la base de l'angle de rotation de l'arbre principal correspondant à la position arbitraire déterminée par l'unité (103) de détermination d'angle, l'unité (103) de détermination d'angle déterminant l'angle de rotation de l'arbre principal correspondant à la position arbitraire sur la base d'une largeur de tissage du tissu et de l'angle de rotation de l'arbre principal auquel la partie d'extrémité menante du moyen d'insertion de trame ou l'extrémité menante de la trame (W)qui est insérée passe dans la lisière du tissu.

FIG. 1

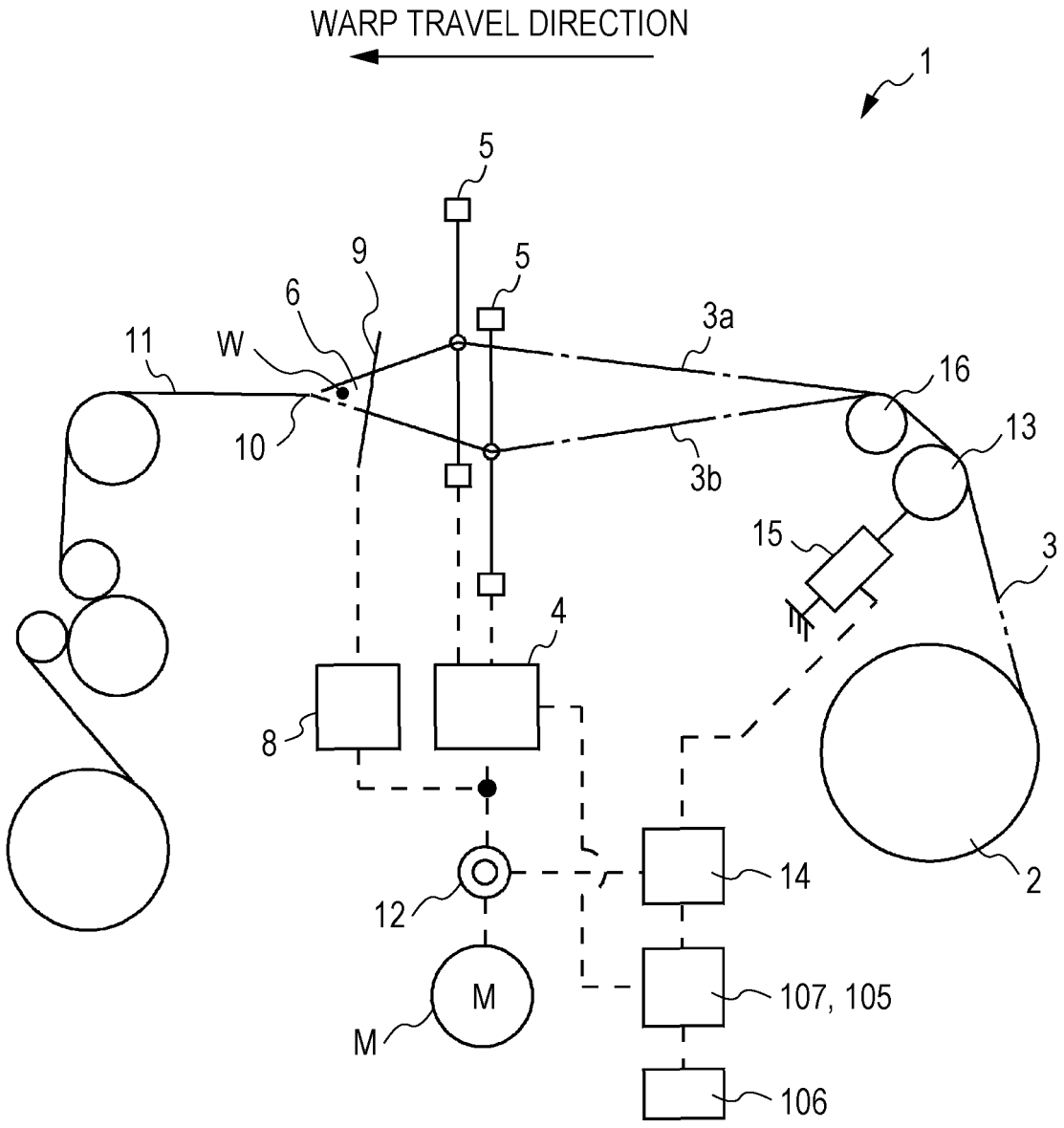

WARP TRAVEL DIRECTION
1
5
9
5
6
3a
11
W
16
10
13
3b
15
3
4
8
2
12
14
M
M
107, 105
106

FIG. 2

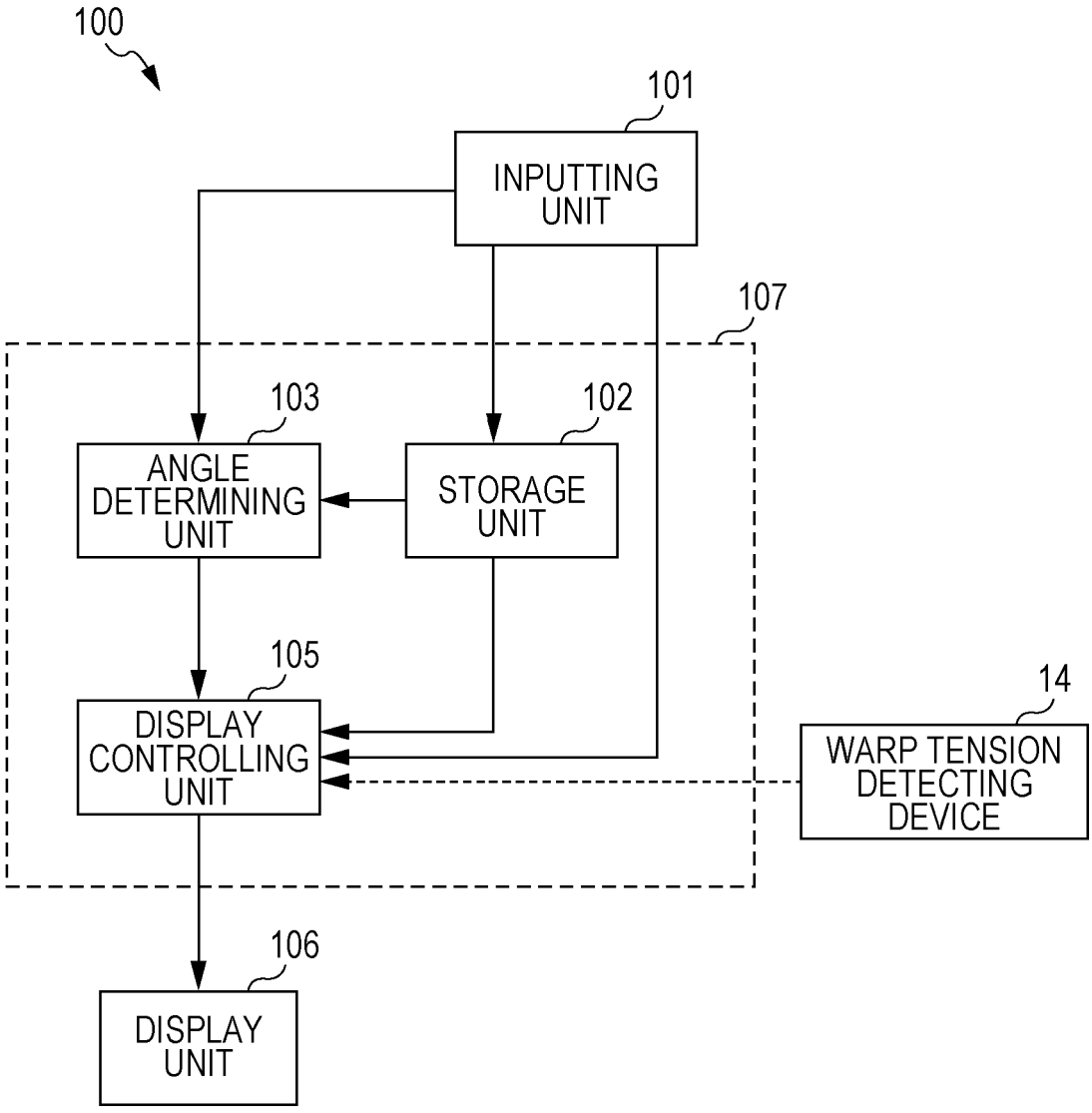

100
101
INPUTTING UNIT
107
103
102
ANGLE DETERMINING UNIT
STORAGE UNIT
105
14
DISPLAY CONTROLLING UNIT
WARP TENSION DETECTING DEVICE
106
DISPLAY UNIT

FIG. 3

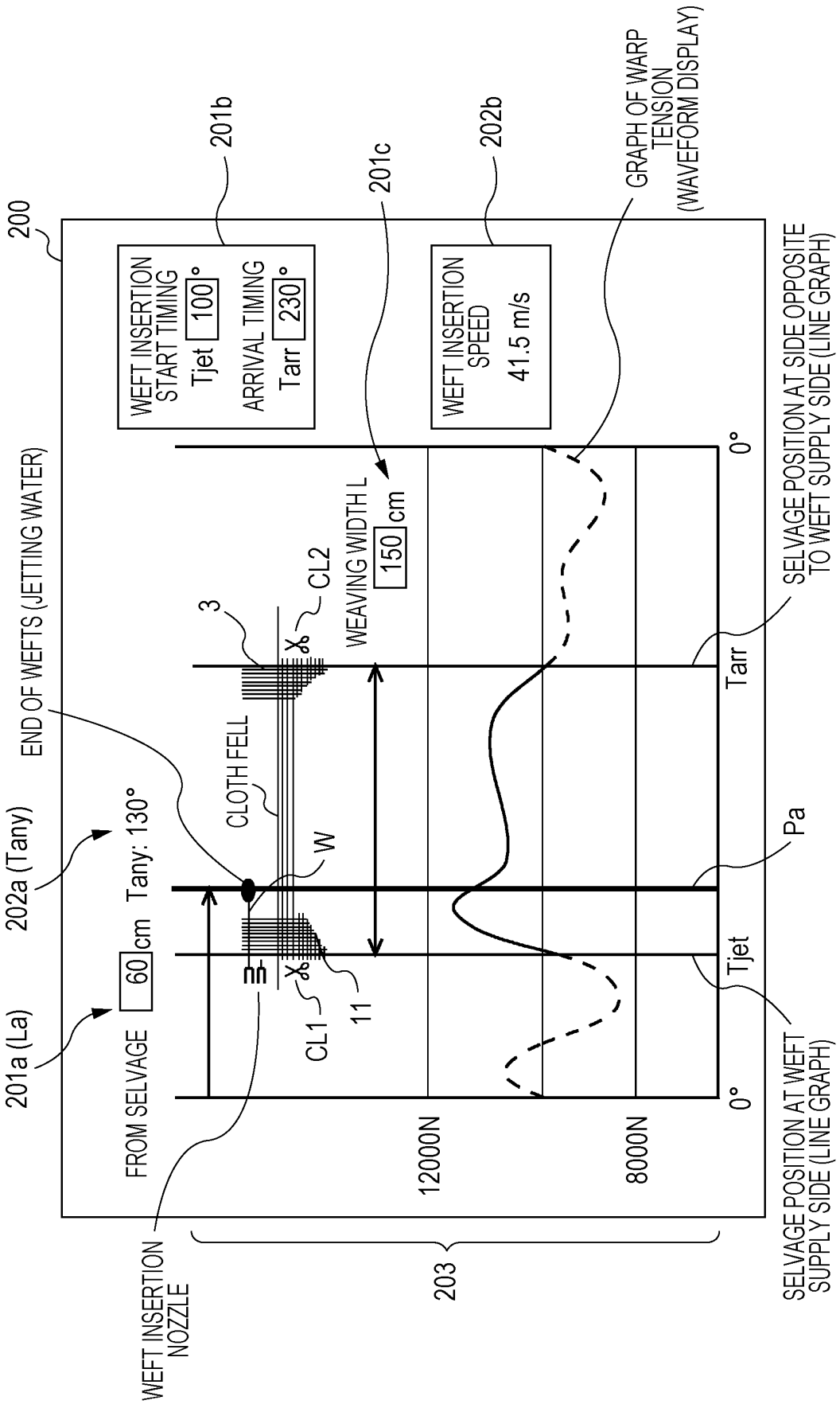

200
201b
201c
202b
GRAPH OF WARP TENSION (WAVEFORM DISPLAY)
WEFT INSERTION START TIMING
Tjet 100°
ARRIVAL TIMING
Tarr 230°
WEFT INSERTION SPEED
41.5 m/s
WEAVING WIDTH L
150 cm
END OF WEFTS (JETTING WATER)
202a (Tany)
Tany: 130°
201a (La)
FROM SELVAGE 60 cm
CLOTH FELL
CL1
CL2
3
11
W
WEFT INSERTION NOZZLE
12000N
8000N
0°
Tarr
Tjet
Pa
SELVAGE POSITION AT SIDE OPPOSITE TO WEFT SUPPLY SIDE (LINE GRAPH)
SELVAGE POSITION AT WEFT SUPPLY SIDE (LINE GRAPH)
203

FIG. 4

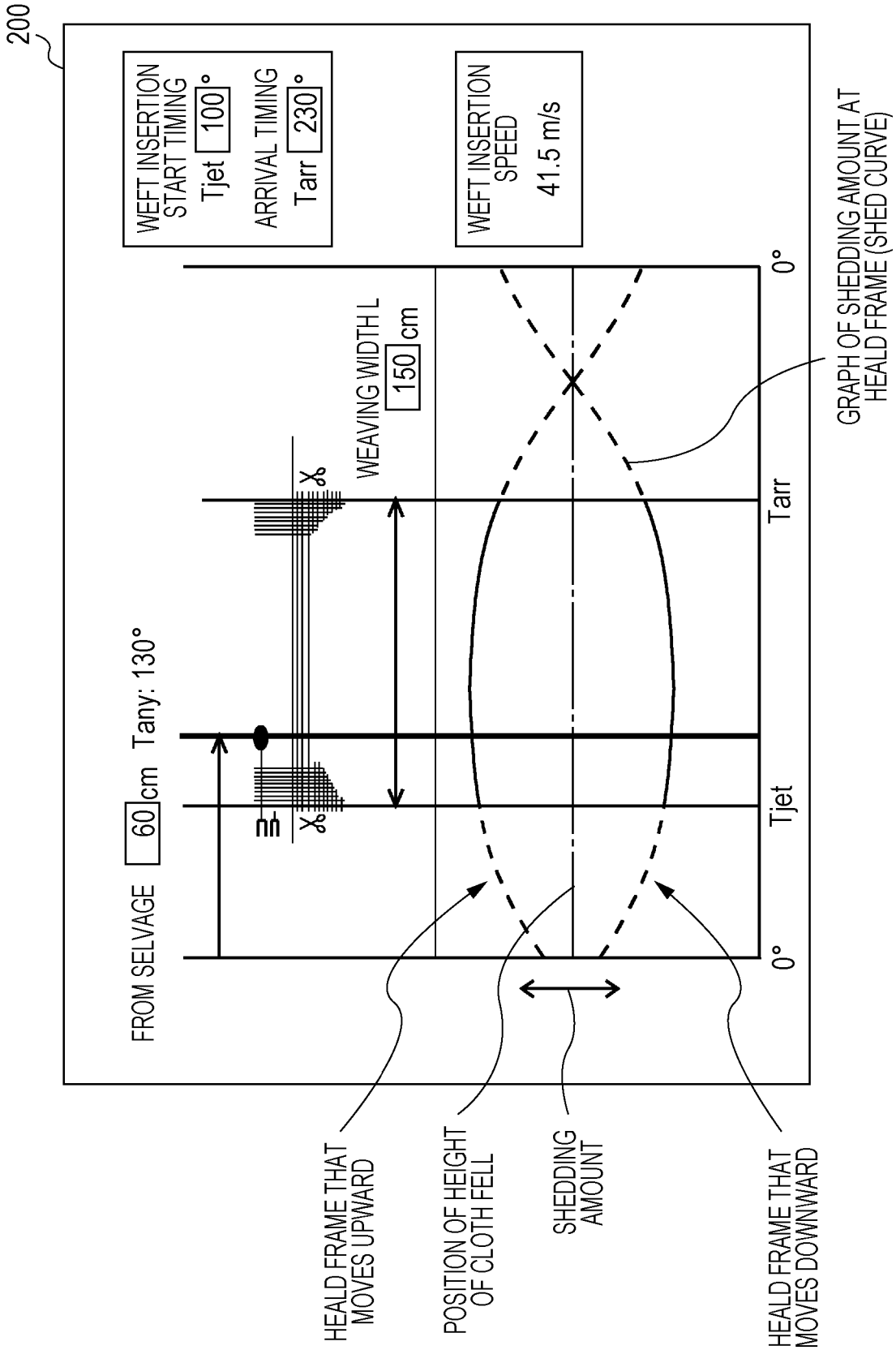

200
WEFT INSERTION START TIMING
Tjet 100°
ARRIVAL TIMING
Tarr 230°
WEFT INSERTION SPEED
41.5 m/s
WEAVING WIDTH L
150 cm
FROM SELVAGE 60 cm Tany: 130°
0°
Tarr
Tjet
0°
GRAPH OF SHEDDING AMOUNT AT HEALD FRAME (SHED CURVE)
HEALD FRAME THAT MOVES UPWARD
POSITION OF HEIGHT OF CLOTH FELL
SHEDDING AMOUNT
HEALD FRAME THAT MOVES DOWNWARD

FIG. 5

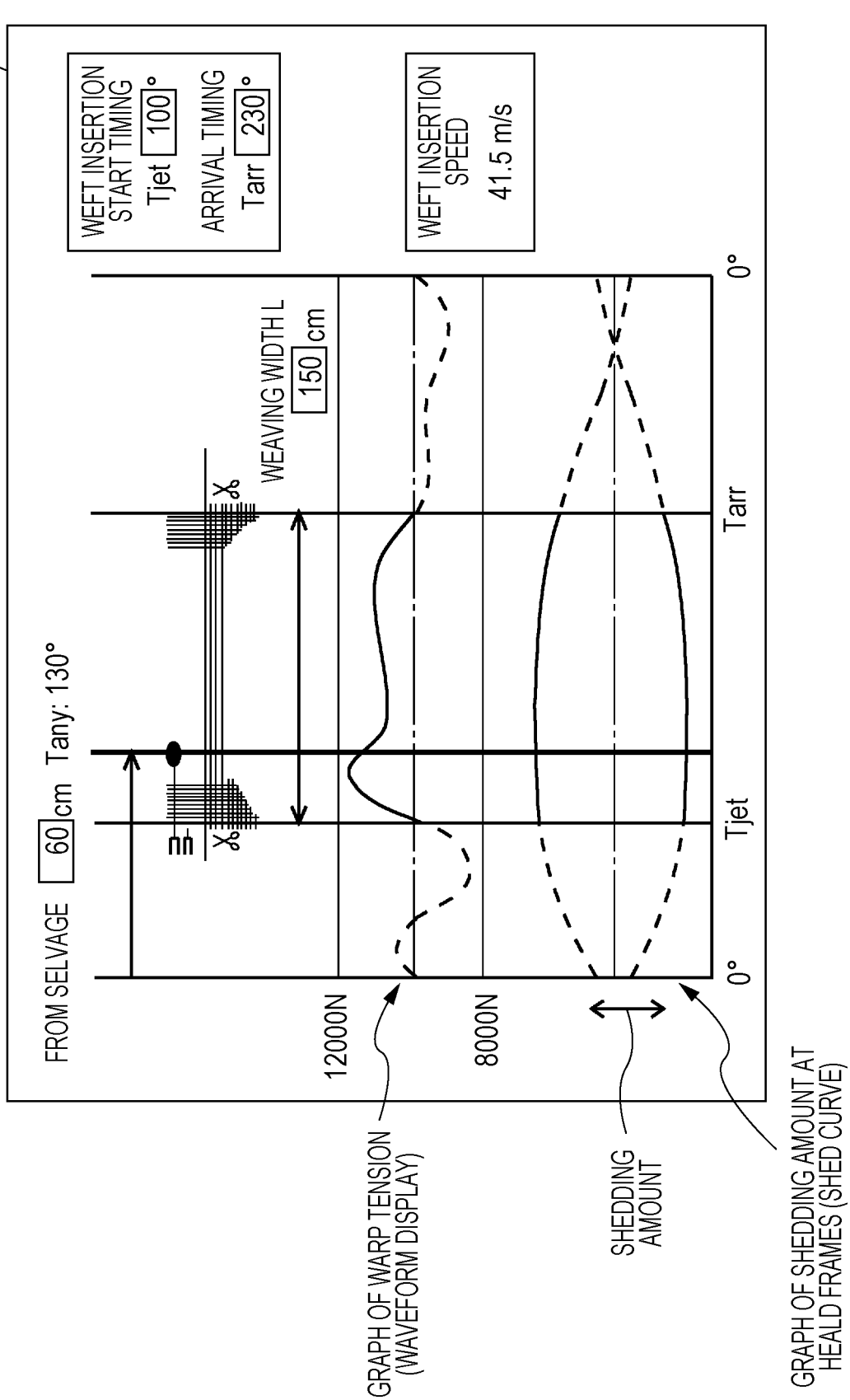
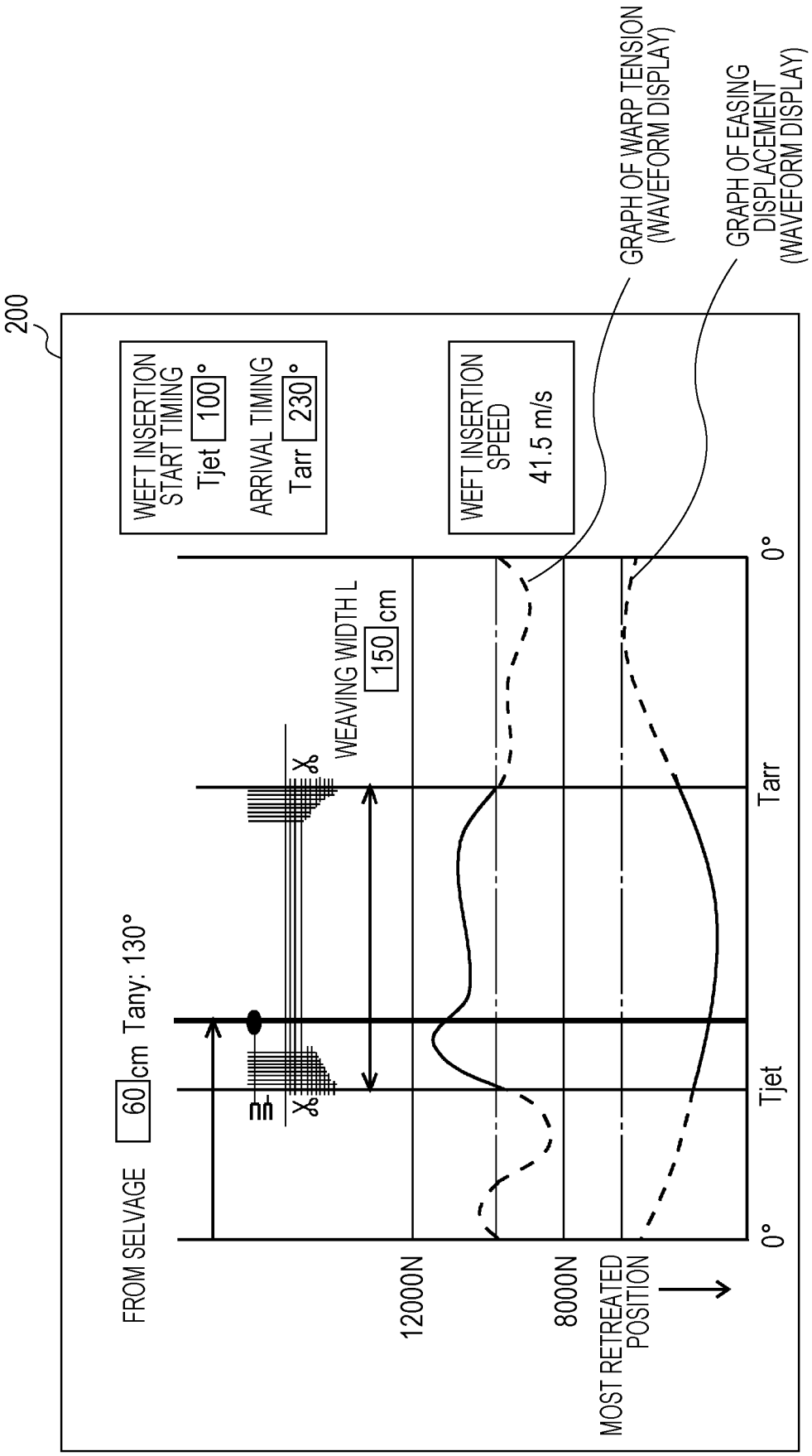

200
WEFT INSERTION START TIMING
Tjet 100°
ARRIVAL TIMING
Tarr 230°
WEFT INSERTION SPEED
41.5 m/s
WEAVING WIDTH L
150 cm
FROM SELVAGE 60 cm Tany: 130°
0°
Tarr
Tjet
0°
12000N
8000N
GRAPH OF WARP TENSION (WAVEFORM DISPLAY)
SHEDDING AMOUNT
GRAPH OF SHEDDING AMOUNT AT HEALD FRAMES (SHED CURVE)

FIG. 6


200
WEFT INSERTION START TIMING
Tjet 100°
ARRIVAL TIMING
Tarr 230°
WEFT INSERTION SPEED
41.5 m/s
GRAPH OF WARP TENSION (WAVEFORM DISPLAY)
GRAPH OF EASING DISPLACEMENT (WAVEFORM DISPLAY)
WEAVING WIDTH L
150 cm
FROM SELVAGE
60 cm
Tany: 130°
12000N
8000N
MOST RETREATED POSITION
0°
Tarr
Tjet
0°

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 10130987 A **[0002]**
- JP 2005336643 A **[0002]**