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- **Takagi, Shinji**
Kariya-shi, Aichi 448-8671 (JP)
- **Ushiwatari, Hiroshi**
Kariya-shi, Aichi 448-8671 (JP)
- **Arai, Ryuji**
Kariya-shi, Aichi 448-8671 (JP)
- **Makino, Isao**
Kariya-shi, Aichi 448-8671 (JP)

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(71) Applicant: **Kabushiki Kaisha Toyota Jidoshokki**
Kariya-shi, Aichi 448-8671 (JP)

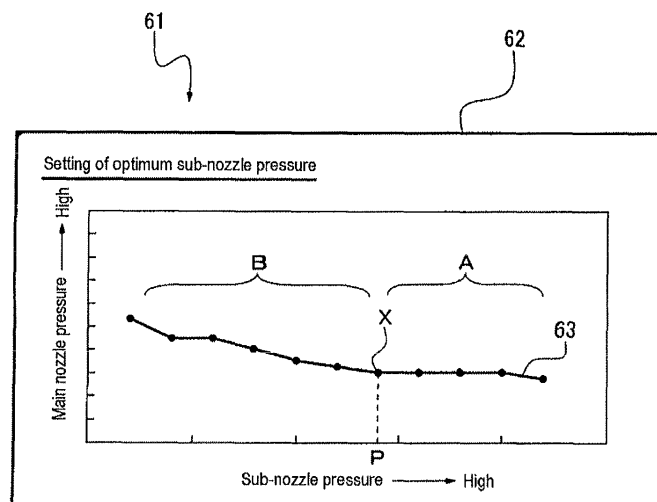
(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(72) Inventors:
 • **Makino, Yoichi**
Kariya-shi, Aichi 448-8671 (JP)

(54) Air jet loom with a display device

(57) There is provided a display device of an air jet loom (1) that includes a weft insertion device (2) causing a weft yarn (Y) released from a weft measuring and storing device (11) to move by compressed air injected from a main nozzle (7) and plural sub-nozzles (5) arranged in the direction of weft insertion, a setting and measuring device (21, 24, 28, 29, 37, 45) that serves to set and measure pressure or flow rate of the main nozzle (7) and also to set and measure pressure of the sub nozzle (5),

and a controller (47) storing the measured pressure or flow rate of the main nozzle (7) and equipped with a display (61). The controller (47) causes the display (61) to show a line graph (63) representing pressure or flow rate of the main nozzle (7) with which weft insertion is completed at a previously set angular position of the air jet loom (1) for each of different predetermined pressures of the sub-nozzle (5).

FIG. 2

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a display device of an air jet loom.

[0002] In weaving a fabric in an air jet loom, empirically obtained data of weaving conditions based on given fabric condition such as the kind of weft yarn and warp yarn is previously set in the air jet loom. For example, data of air injection pressures or air injection timings of a main nozzle and sub-nozzles of a weft insertion device suitable for stable weft insertion is set as the weaving conditions. There also has been recently proposed the need of reducing compressed air consumption at the main nozzle or the sub-nozzles in order to provide energy saving in an air jet loom.

[0003] Japanese Unexamined Patent Application Publication No. 5-51842 discloses that the time of weft yarn release is detected by a weft release sensor provided in a weft measuring and storing device and the time of weft yarn arrival is detected by a weft arrival sensor provided on the side of the reed opposite from the main nozzle. The weft release sensor and the weft arrival sensor detect the time of weft yarn release and the time of weft yarn arrival, respectively, in weft inserting operation for each of different sub-nozzle pressures, and a suitable sub-nozzle pressure is set on the basis of the difference between such times. Specifically, based on the relation between the sub-nozzle pressure and such time difference, the sub-nozzle pressure just before the time difference starts to change is selected and set as the suitable sub-nozzle pressure.

[0004] Generally, a major part of energy consumption in an air jet loom is the compressed air consumption by the main nozzle and the sub-nozzles, and more specifically, the compressed air consumption by the sub-nozzles is more responsible for the energy consumption. Thus, selecting sub-nozzle pressure based on the relation between the sub-nozzle pressure and the time difference as disclosed in the above-cited publication No. 5-51842 is an effective method for reducing compressed air consumption while maintaining stable weft insertion.

[0005] In the method disclosed in the publication No. 5-51842, however, the time difference does not necessarily change clearly depending on the weaving conditions and the fabric conditions. A factor of such unclear change is, for example, the mounting position of the yarn release sensor on the weft measuring and storing device. Depending on the mounting position of the yarn release sensor, the time of weft yarn release may not be an actually detected value, but a calculated value. It can be thought that in the latter case the time of weft release tends to be varied and, therefore, the time difference occurs only in an inapparent manner, which makes it difficult to select a sub-nozzle pressure suitable for reducing the compressed air consumption and also may cause unstable weft insertion depending on the selected value of the

sub-nozzle pressure.

[0006] The present invention is directed to providing a display device for selection of sub-nozzle pressure which offers stable weft insertion and reduced air consumption.

SUMMARY OF THE INVENTION

[0007] In accordance with an aspect of the present invention, there is provided a display device of an air jet loom that includes a weft insertion device causing a weft yarn released from a weft measuring and storing device to move by compressed air injected from a main nozzle and plural sub-nozzles arranged in the direction of weft insertion, a setting device that serves to set pressure or flow rate of the main nozzle and also to set pressure of the sub nozzle, a measuring device that serves to measure pressure or flow rate of the main nozzle and also to measure pressure of the sub nozzle, and a controller storing the measured pressure or flow rate of the main nozzle and equipped with a display. The controller causes the display to show a line graph representing pressure or flow rate of the main nozzle with which weft insertion is completed at a previously set angular position of the air jet loom for each of different predetermined pressures of the sub-nozzle.

[0008] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a configuration block diagram of a weft insertion device and a display device of an air jet loom according to a first embodiment of the present invention;

Fig. 2 is a diagram showing a line graph representing the main nozzle pressure for each of sub-nozzle pressures in the first embodiment of the present invention;

Fig. 3 is a diagram showing a line graph representing the angular position of weft insertion completion for each of sub-nozzle pressures, as well as the line graph of Fig. 2, in a second embodiment of the present invention; and

Fig. 4 a diagram showing a line graph representing the variation of angular difference for each of sub-nozzle pressures, as well as the line graphs of Figs. 2 and 3, in a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0010] The following will describe the first embodiment of a display device of an air jet loom according to the present invention with reference to Figs. 1 and 2. It is noted that the terms "upstream" and "downstream" appearing in the following description are used to denote directions or relative positions with respect to the direction in which a weft yarn is inserted into a warp shed and also in which compressed air supplied from an external source flows.

[0011] Referring to Fig. 1, the air jet loom designated by 1 includes a weft insertion device 2, plural sub-nozzles 5 and end nozzles 6 disposed downstream of the weft insertion device 2 along a reed 4 having a number of reed dents 3. In the drawing, compressed air supply line to the weft insertion device 2, the sub-nozzles 5 and the end nozzles 6 is also shown in the form of a block diagram. The weft insertion device 2 has a main nozzle 7 and a tandem nozzle 8 disposed upstream of the main nozzle 7. The main nozzle 7, the sub-nozzles 5, the end nozzles 6 and the reed 4 are disposed on a slay (not shown) and swing back and forth with the slay.

[0012] The tandem nozzle 8 is fixedly mounted to a frame (not shown) of the air jet loom 1 or to a bracket (not shown either) mounted on the floor. There is provided upstream of the tandem nozzle 8 a weft measuring and storing device 11 equipped with a movable pin 10 that is operable to engage with or disengage from a weft yarn Y. The weft measuring and storing device 11 serves to measure a predetermined length of weft yarn Y, i.e. a length that corresponds to the weaving width of the loom, drawn from a yarn supply package 9 and also to store temporarily the weft yarn Y. The weft measuring and storing device 11 is equipped with a sensor 12 that detects a balloon formed by the weft yarn Y being released from the weft measuring and storing device 11, for the purpose of detecting the number of releases of weft yarn Y and the angular position of weft release completion, that is the angular position at which release of weft yarn Y from the weft measuring and storing device 11 is completed.

[0013] There is also provided downstream of the end nozzles 6 another sensor 13 that detects the arrival of weft yarn Y at the side of the reed 4 opposite from the main nozzle 7, for the purpose of detecting the angular position of weft insertion completion, that is the angular position at which insertion of weft yarn Y is completed, or any failure in weft insertion. The time of weft release completion and the time of weft insertion completion detected by the respective sensors 12, 13 are both recognized as an angular position of the air jet loom 1 which is detected by an encoder 14.

[0014] Although only one set of the weft insertion device 2 and its associated yarn supply package 9 and weft measuring and storing device 11 is shown in Fig. 1, the air jet loom 1 in the present embodiment is intended to include two sets of the weft insertion devices 2 and their associated yarn supply packages 9 and weft measuring

and storing devices 11, serving as a multicolor weft insertion device. It is noted that the multicolor weft insertion device may use not only weft yarns of different colors, but also weft yarns of the same color. The sub-nozzles 5 and the end nozzles 6 are used commonly for such two sets of the weft insertion devices 2.

[0015] The main nozzle 7 is connected through a pipe 16 to a main valve 15 that allows or stops the supply of compressed air to the main nozzle 7. The tandem nozzle 8 is connected through a pipe 18 to a tandem valve 17 that allows or stops the supply of compressed air to the tandem nozzle 8. The main valve 15 is connected through a pipe 19 to a common main air tank 20. The tandem valve 17 is also connected to the main air tank 20 through a throttle valve 21 and a pipe 22. The main air tank 20 is connected through a main pressure gauge 23, a main regulator 24, an initial pressure gauge 25 and a filter 26 to a common air compressor (not shown) installed in a weaving factory.

[0016] The initial pressure gauge 25 measures initial pressure of compressed air to be supplied from the factory air compressor to the air jet loom 1. The compressed air supplied from the air compressor is regulated to a predetermined pressure by the main regulator 24 and stored in the main air tank 20. The main pressure gauge 23 measures the pressure of compressed air to be supplied to the main air tank 20.

[0017] The main nozzle 7 is also connected to a breeze circuit 27 that is connected to the pipe 16 at a position downstream of the main valve 15 and bypasses the main valve 15. The breeze circuit 27 has a throttle valve 28 and a breeze regulator 29 and is connected directly to a pipe 30 that connects between the main regulator 24 and the initial pressure gauge 25 both provided upstream of the main air tank 20. The compressed air of initial pressure supplied from the air compressor is regulated by the breeze regulator 29 and the throttle valve 28 of the breeze circuit 27 so that a slight amount of low pressure compressed air is supplied constantly from the breeze circuit 27 through the pipe 16 to the main nozzle 7 and injected from the main nozzle 7. The compressed air thus injected from the main nozzle 7 serves to hold the weft yarn Y remaining in the main nozzle 7 after the completion of weft insertion in an appropriate position.

[0018] In the present embodiment, the sub-nozzles 5 are divided into three separate groups. The three groups of sub-nozzles 5 are connected through pipes 32 to respective sub-valves 31 which are fixedly mounted to a frame (not shown) of the air jet loom 1. The sub-nozzles 5 need not necessarily be separated into three groups. For example, four or more groups of sub-nozzles 5 and their associated sub-valves 31 may be provided depending on the weaving width of the loom. The sub-valves 31 are connected through pipes 33 to a common sub-air tank 34.

[0019] The sub-air tank 34 is connected to a sub-regulator 37 through a pipe 35 that is equipped with a sub-pressure gauge 36. The sub-regulator 37 is connected

through a pipe 38 to the pipe 30 that connects between the main regulator 24 and the initial pressure gauge 25. The pressure of the compressed air supplied from the air compressor is adjusted to a predetermined pressure by the sub-regulator 37 and stored in the sub-air tank 34. The pressure of the compressed air supplied to the sub-air tank 34 is always measured by the sub-pressure gauge 36.

[0020] The end nozzles 6 are provided by plural sub-nozzles disposed adjacent to the selvage of woven fabric on the side of the reed 4 opposite from the main nozzle 7. The end nozzles 6 are connected through pipes 39 to a sub-valve 40 that is in turn connected through a pipe 41 to a sub-air tank 42. The sub-air tank 42 is connected to a sub-regulator 45 through a pipe 43 that is equipped with a sub-pressure gauge 44. The sub-regulator 45 is connected through a pipe 46 to the pipe 38 that is connected to the pipe 30.

[0021] The pressure of the compressed air supplied from the air compressor is regulated to a predetermined pressure by the sub-regulator 45 and stored in the sub-air tank 42. The sub-regulator 45 regulates the pressure of the compressed air to be supplied to the sub-air tank 42 to a pressure that is below the pressure of compressed air regulated by the sub-regulator 37. The sub-pressure gauge 44 measures the pressure of compressed air to be supplied to the sub-air tank 42. The end nozzles 6 inject air whose pressure has been regulated below the injection pressure at the sub-nozzles 5, thereby controlling the flight speed of the weft yarn Y just before the completion of weft insertion and also reducing the consumption of compressed air.

[0022] The main valve 15, the tandem valve 17, the sub-valves 31, the sub-valve 40, the initial pressure gauge 25, the main pressure gauge 23, the sub-pressure gauge 36 and the sub-pressure gauge 44 are electrically connected to a controller 47 of the air jet loom 1 through electric wires 48, 49, 50, 51, 52, 53, 54, 55 and 56. The pin 10 of the weft measuring and storing device 11, the sensors 12, 13 and the encoder 14 are also electrically connected to the controller 47 through electric wires 57, 58, 59 and 60. The controller 47 is equipped with a display 61 for indication and input of information and data. The display 61 has a screen 62 (see Fig. 2) where data and information of various items are indicated. Data for respective items may be newly input and rewritten directly on the screen 62.

[0023] The initial pressure gauge 25 measures the initial pressure of compressed air supplied from the air compressor and transmits its data to the controller 47. The main pressure gauge 23 measures the pressure of compressed air regulated by the main regulator 24, the sub-pressure gauge 36 measures the pressure of compressed air regulated by the sub-regulator 37, and the sub-pressure gauge 44 measures the pressure of compressed air regulated by the sub-regulator 45. Such pressure data is respectively transmitted to the controller 47.

[0024] The controller 47 previously stores data regard-

ing the time when the pin 10 of the weft measuring and storing device 11, the main valve 15, the tandem valve 17 and the sub-valves 31, 40 should start to operate and also data of the duration of such operation. The controller 47 transmits signals to the pin 10, the main valve 15 and the tandem valve 17 to start insertion of weft yarn Y, and subsequently transmits signals to the sub-valves 31, 40 during the insertion of weft yarn Y, so that insertion of weft yarn Y is completed. In the present embodiment, the main pressure gauge 23 and the sub-pressure gauges 36, 44 cooperate to serve as the measuring device of the present invention. The throttle valves 21, 28, the breeze regulator 29, the main regulator 24, the sub-regulators 37, 45 cooperate to serve as the setting device of the present invention.

[0025] The controller 47 counts the number of detection signals transmitted from the sensor 12 and each indicative of a balloon formed by the weft yarn Y, and transmits a signal that causes the pin 10 to engage with the weft yarn Y when the counted number of balloons reaches a predetermined value. The time when the number of balloons reaches the predetermined value corresponds to the time when release of weft yarn Y from the weft measuring and storing device 11 is completed, and the angular position of the air jet loom 1 then detected based on a signal from the encoder 14 is stored in the controller 47 as the angular position where release of weft yarn Y from the weft measuring and storing device 11 is completed, that is the angular position of weft release completion. In response to a detection signal from the sensor 13 that is indicative of the arrival of the leading end of the weft yarn Y, the controller 47 determines whether or not any failure of weft insertion has occurred. The time of the arrival of weft yarn Y corresponds to the time when insertion of weft yarn Y is completed, and the angular position of the air jet loom 1 then detected based on a signal from the encoder 14 is stored in the controller 47 as the angular position where insertion of weft yarn Y is completed, that is the angular position of weft insertion completion.

[0026] For optimum selection of the pressure of sub-nozzles having a large influence on the consumption of air, the air jet loom 1 of the present embodiment is so configured that the screen 62 of the display 61 shows a line graph 63 that is indicative of the main nozzle pressure for each of different predetermined sub-nozzle pressures, as shown in Fig. 2. The line graph 63 is made on the basis of the pressure of the main nozzle 7 when weft insertion is completed at a previously set angular position during weaving operation at various main nozzle pressures under a fixed sub-nozzle pressure. To be more specific, weft insertion is performed for a plurality of times using different main nozzle pressures with the sub-nozzle pressure set at a predetermined value, and the main nozzle pressure with which weft insertion is completed at a previously set desired angular position is selected. Such weft insertion is performed repeatedly for a plurality of times for each of different predetermined sub-nozzle

pressures, and the selected main nozzle pressures for each of the different predetermined sub-nozzle pressures are plotted on the line graph 63.

[0027] In weaving a fabric in the air jet loom 1 under specific fabric and weaving conditions, the pressures of the main nozzle 7 and the sub-nozzles 5 are measured by the main pressure gauge 23 and the sub-pressure gauge 36, respectively, during the weaving operation and data of such pressures is stored in the controller 47. The weaving operation is performed at various different predetermined sub-nozzle pressures and also performed at various main nozzle pressures for each of such different predetermined sub-nozzle pressures.

[0028] The controller 47 has therein a program that stores a data of the pressure of the main nozzle 7 with which weft insertion is completed at the previously set angular position of the air jet loom 1 for each of the different predetermined sub-nozzle pressures. The controller 47 further has a program that makes the line graph 63 that represents the pressure of the main nozzle 7 for each of the different predetermined pressures of the sub-nozzles 5 and then causes the screen 62 of the display 61 to show such line graph 63.

[0029] For setting of the optimum sub-nozzle pressure, operator of the loom makes the screen 62 of the display 61 to show the line graph 63 shown in Fig. 2 indicative of the pressure of the main nozzle 7 for each of the different predetermined pressures of the sub-nozzles 5. In Fig. 2 showing the line graph 63, the horizontal axis represents the sub-nozzle pressure or the pressure of air injected from the sub-nozzles 5, and the vertical axis represents the main nozzle pressure or the pressure of air injected from the main nozzle 7. Higher main nozzle pressure and sub-nozzle pressure lead to an increased air consumption and an increased energy consumption, while lower main nozzle pressure and sub-nozzle pressure lead to a reduced air consumption and an increased energy saving.

[0030] According to the line graph 63, the main nozzle pressure is approximately constant at a low level in the range where the sub-nozzle pressure is higher than the pressure P at the point X (such range hereinafter being referred to as high pressure range A), but gradually increases in the range as the sub-nozzle pressure is decreased from the pressure P at the point X (such range hereinafter being referred to as low pressure range B). In the high pressure range A where the sub-nozzle pressure is high, the flight of weft yarn Y is well assisted and, therefore, weft insertion is completed at the previously set angular position even when the main nozzle pressure is lowered. On the other hand, in the low pressure range B where the sub-nozzle pressure is low, the flight of weft yarn Y is less assisted, which leads to a delay in the angular position of weft insertion completion. In this case, the main nozzle pressure needs to be increased so as to compensate for less assist of the flight of weft yarn Y by the sub-nozzles 5.

[0031] In the high pressure range A, even when the

sub-nozzle pressure is lowered as much as possible for reducing the air consumption, weft insertion is completed at the previously set angular position without an increase of the main nozzle pressure. However, when the main nozzle pressure is increased in the low pressure range B, the pressure of the main nozzle 7 to insert weft yarn Y becomes too strong relative to the pressure of the sub-nozzles 5 to assist the flight of the inserted weft yarn Y, which may cause irregular flight of weft yarn Y and hence unstable weft insertion.

[0032] While referring to the line graph 63, the operator of the loom can make sure that the sub-nozzle pressure P at the point X should be selected for minimizing air consumption of the sub-nozzles 5 while maintaining stable weft insertion and stabilizing the angular position where weft insertion is completed during weaving operation. To be on the safe side, it can be appreciated that a pressure that is a little higher than P should preferably be selected as the optimum sub-nozzle pressure. Thus, the display device of the present embodiment allows appropriate selection of the sub-nozzle pressure which offers stable weft insertion and reduced air consumption.

[0033] Fig. 3 shows the second embodiment of the display device according to the present invention. In the drawing, same reference numerals are used for the common elements or components in the first and the second embodiments, and the description of such elements or components of the second embodiment will be omitted. In the second embodiment, the controller 47 has therein a program that stores a data of the pressure of the main nozzle 7 with which weft insertion is completed at the previously set angular position of the air jet loom 1 for each of the different predetermined sub-nozzle pressures and also a data of the angular position of weft insertion completion at such main nozzle pressure. The controller 47 further has a program that makes the line graph 63 that represents the main nozzle pressure for each of the different predetermined sub-nozzle pressures and also the line graph designated by 65 indicative of the angular position where weft insertion is completed for each of the different predetermined sub-nozzle pressures, and then causes the screen 64 of the display 61 to show such line graphs 63, 65.

[0034] For setting of the optimum sub-nozzle pressure, the operator of the loom can make the screen 64 to show the line graphs 63, 65 as shown in Fig. 3. In Fig. 3 showing the line graphs 63, 65, the horizontal axis represents the sub-nozzle pressure or the pressure of air injected from the sub-nozzles 5, the left-hand side vertical axis represents the angular position where weft insertion is completed, and the right-hand side vertical axis represents the main nozzle pressure or the pressure of air injected from the main nozzle 7.

[0035] The line graph 65 of the angular position of weft insertion completion for each of the different predetermined pressures of the sub-nozzles 5 is shown on the display 64 together with the line graph 63 of the pressure of the main nozzle 7 for each of the different predeter-

mined pressures of the sub-nozzles 5. The display device of the second embodiment allows the loom operator to refer to the line graph 65 of the angular position of weft insertion completion and to select the pressure P at the point X or a pressure that is a little higher than the pressure P within the high pressure range A as the sub-nozzle pressure on the basis of the line graph 63. This allows the loom operator to select the optimum sub-nozzle pressure while making sure from the line graph 65 that the angular position of weft insertion completion is stable approximately at the level E, thereby offering stable weft insertion and reduced air consumption.

[0036] Fig. 4 shows the third embodiment of the display device according to the present invention. In the drawing, same reference numerals are used for the common elements or components in the first and the third embodiments, and the description of such elements or components of the third embodiment will be omitted. In the third embodiment, the controller 47 has a program that stores a data of the pressure of the main nozzle 7 with which weft insertion is completed at the previously set angular position of the air jet loom 1 for each of the different predetermined sub-nozzle pressures, the angular position of weft insertion completion at such main nozzle pressure and the angular difference between the angular position of weft insertion completion and the angular position of weft release completion. The controller 47 further has a program that makes the line graph 63 that represents the main nozzle pressure for each of the different predetermined sub-nozzle pressures, the line graph 65 of the angular position of weft insertion completion for each of the different predetermined sub-nozzle pressures and the line graph designated by 66 indicative of the above angular difference for each of the different predetermined sub-nozzle pressures, and then causes the screen 67 of the display 61 to show such line graphs 63, 65, 66.

[0037] For setting of the optimum sub-nozzle pressure, the operator of the loom makes the screen 67 to show the line graphs 63, 65, 66 as shown in Fig. 4. In Fig. 4 showing the line graphs 63, 65, 66, the horizontal axis represents the sub-nozzle pressure or the pressure of air injected from the sub-nozzles 5, the left-hand side vertical axis represents the angular position where weft insertion is completed, and the right-hand side vertical axis represents the main nozzle pressure or the pressure of air injected from the main nozzle 7. The right-hand side vertical axis also represents the angular difference between the angular position of weft insertion completion and the angular position of weft release completion. The line graph 66 of the angular difference for each of the different predetermined pressures of the sub-nozzles 5 is shown on the display 67 together with the line graph 63 of the pressure of the main nozzle 7 and the line graph 65 of the angular position of weft insertion completion for each of the different predetermined pressures of the sub-nozzles 5.

[0038] As is clear from the line graph 66, the angular difference is approximately constant in the range where

the sub-nozzle pressure is higher than the pressure P at the point X1, but gradually increased with a decrease of the sub-nozzle pressure from the pressure P at the point X1. A factor of such an increase of the angular difference is that the flight of weft yarn Y is less assisted when the sub-nozzle pressure is low, which leads to a variation in the angular position of weft insertion completion, such as delayed weft insertion completion. To prevent such variation in the angular position of weft insertion completion which causes unstable weft insertion, the pressure of air injected from the main nozzle 7 or the tandem nozzle 8 is increased so as to increase weft insertion speed and hence to stabilize the angular position of weft insertion completion at the level of E.

[0039] Increasing the air injection pressure of the main nozzle 7 or the tandem nozzle 8 hastens the weft release completion, thereby increasing the angular difference, that is the difference between the constant angular position of weft insertion completion and the angular position of weft release completion. Excessive increase of the speed of weft insertion by the main nozzle 7 or the tandem nozzle 8 may result in unstable flight of the weft yarn Y and cause unstable weft insertion.

[0040] As shown in Fig. 4, the points X and X1 at which the main nozzle pressure and the angular difference start to increase with a decrease of the sub-nozzle pressure, respectively, appear apparently in the line graphs 63 and 66, and the sub-nozzle pressures at the points X, X1 are both P. Thus, it can be appreciated from the line graphs 63, 66 that the pressure of compressed air to be supplied to the sub-nozzles 5 should be such that provides the optimum sub-nozzle pressure P.

[0041] If the point X is not clearly seen in the line graph 63 of the main nozzle pressure, the pressure P at the point X1 in the line graph 66 can be selected as the optimum sub-nozzle pressure. If the point X1 is not clearly seen in the line graph 66 of the angular difference, the pressure P at the point X in the line graph 63 can be selected as the optimum sub-nozzle pressure. In the display device of the present embodiment, the line graphs 63, 66 shown together on the display 61 are in complementary relation to each other in selecting the optimum sub-nozzle pressure which offers stable weft insertion and reduced air consumption.

[0042] The display device of the present embodiment allows the loom operator to select the pressure P at the points X, X1 or a pressure that is a little higher than the pressure P within the high pressure range A as the sub-nozzle pressure on the basis of the line graphs 63, 66 while referring to the line graph 65 of the angular position of weft insertion completion. This allows the loom operator to select the optimum sub-nozzle pressure while checking that the angular position of weft insertion completion is stable approximately at the level of E from the line graph 65.

[0043] It is to be understood that the present invention is not limited to the above-described embodiments, but it may be modified in various ways as exemplified below

without departing from the scope of the invention.

(1) Although in the first to third embodiments the line graph 63 of the pressure of the main nozzle 7 is used in the selection of sub-nozzle pressure, the selection may be accomplished by using a line graph representing the flow rate of air. For example, it may be so configured that the flow rate of air injected from the main nozzle 7 is changed by adjusting the opening of the throttle valve 21 of the pipe 22 connected to the tandem nozzle 8 (see Fig. 1), the controller 47 stores data of such openings of the throttle valve 21 and makes a line graph of the flow rate at the main nozzle 7 from the stored data, and the controller 47 causes the display 61 to show such line graph.

(2) Although in the embodiment of Fig. 1 the sub-nozzles 5 connected to the sub-air tank 34 are provided separately from the end nozzles 6 connected to the sub-air tank 42, only the sub-nozzles 5 and their associated sub-air tank 34 may be provided.

(3) In the embodiment of Fig. 1, the weft insertion device 2 need not necessarily include both the main nozzle 7 and the tandem nozzle 8, but may include only the main nozzle 7.

[0044] There is provided a display device of an air jet loom that includes a weft insertion device causing a weft yarn released from a weft measuring and storing device to move by compressed air injected from a main nozzle and plural sub-nozzles arranged in the direction of weft insertion, a setting and measuring device that serves to set and measure pressure or flow rate of the main nozzle and also to set and measure pressure of the sub nozzle, and a controller storing the measured pressure or flow rate of the main nozzle and equipped with a display. The controller causes the display to show a line graph representing pressure or flow rate of the main nozzle with which weft insertion is completed at a previously set angular position of the air jet loom for each of different predetermined pressures of the sub-nozzle.

Claims

1. A display device of an air jet loom (1), the air jet loom (1) comprising:

a weft insertion device (2) causing a weft yarn (Y) released from a weft measuring and storing device (11) to move by compressed air injected from a main nozzle (7) and plural sub-nozzles (5) arranged in the direction of weft insertion;
a setting device (21, 24, 28, 29, 37, 45) that serves to set pressure or flow rate of the main nozzle (7) and also to set pressure of the sub nozzle (5);

a measuring device (23, 36, 44) that serves to measure pressure or flow rate of the main nozzle (7) and also to measure pressure of the sub nozzle (5); and

a controller (47) storing the measured pressure or flow rate of the main nozzle (7) and equipped with a display (61),

characterized in that the controller (47) causes the display (61) to show a line graph (63) representing pressure or flow rate of the main nozzle (7) with which weft insertion is completed at a previously set angular position of the air jet loom (1) for each of different predetermined pressures of the sub-nozzle (5).

2. The display device of claim 1, wherein the controller (47) stores a data of the pressure or flow rate of the main nozzle (7) with which weft insertion is completed at the previously set angular position for each of the different predetermined pressures of the sub-nozzle (5), and the controller (47) causes the display (61) to show the line graph (63) that represents the stored data of the pressure or flow rate of the main nozzle (7) for each of the different predetermined pressures of the sub-nozzle (5).
3. The display device of claim 1 or 2, wherein a line graph (66) indicative of angular difference between an angular position of weft insertion completion and an angular position of weft release completion for each of the different predetermined pressures of the sub-nozzles (5) is shown on the display (61) together with the line graph (63) of the pressure or flow rate of the main nozzle (7).
4. The display device of any one of claims 1 to 3, wherein a line graph (65) indicative of an angular position of weft insertion completion for each of the different predetermined pressures of the sub-nozzles (5) is shown on the display (61) together with the line graph (63) of the pressure or flow rate of the main nozzle (7).

FIG. 1

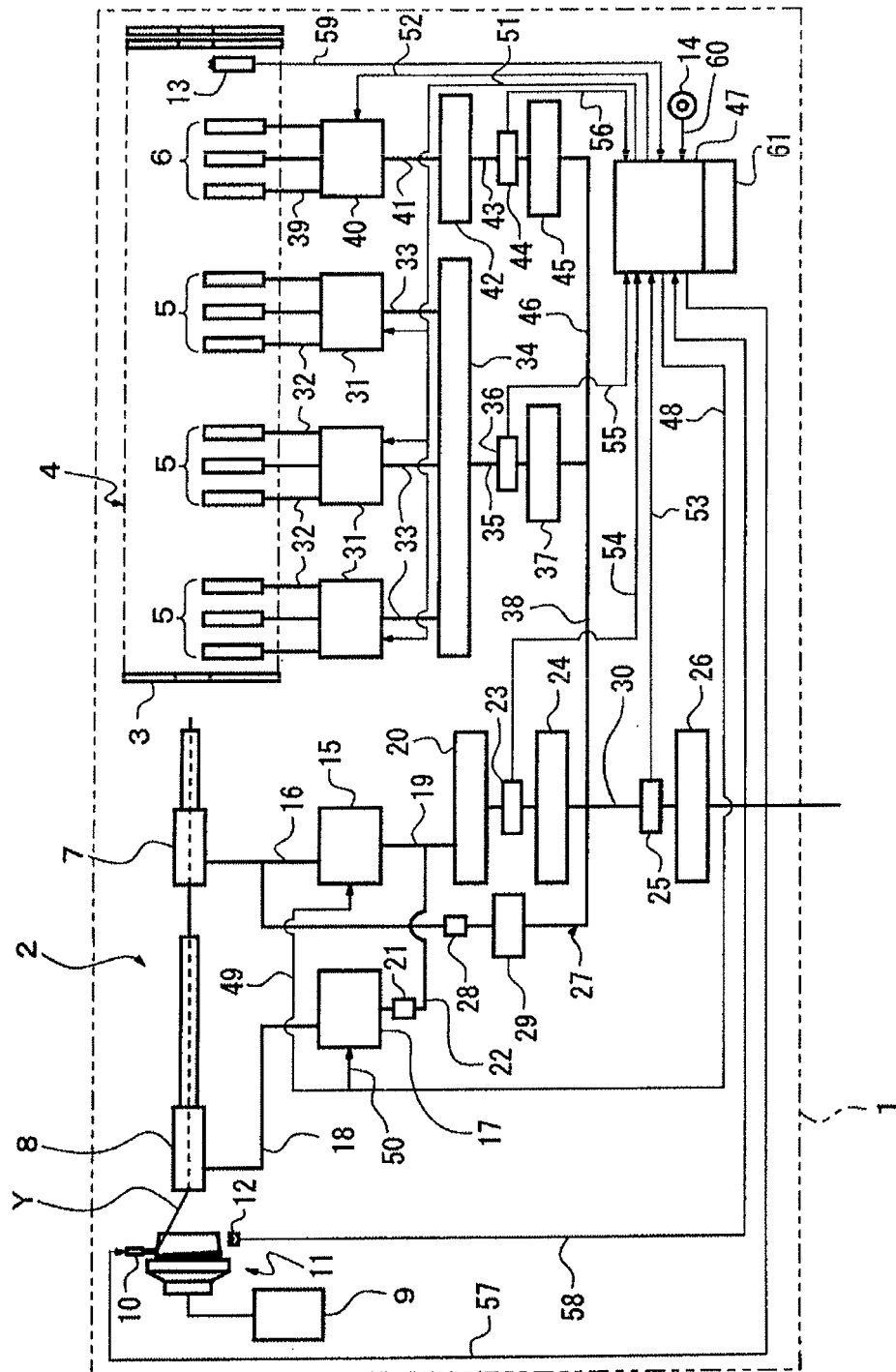


FIG. 2

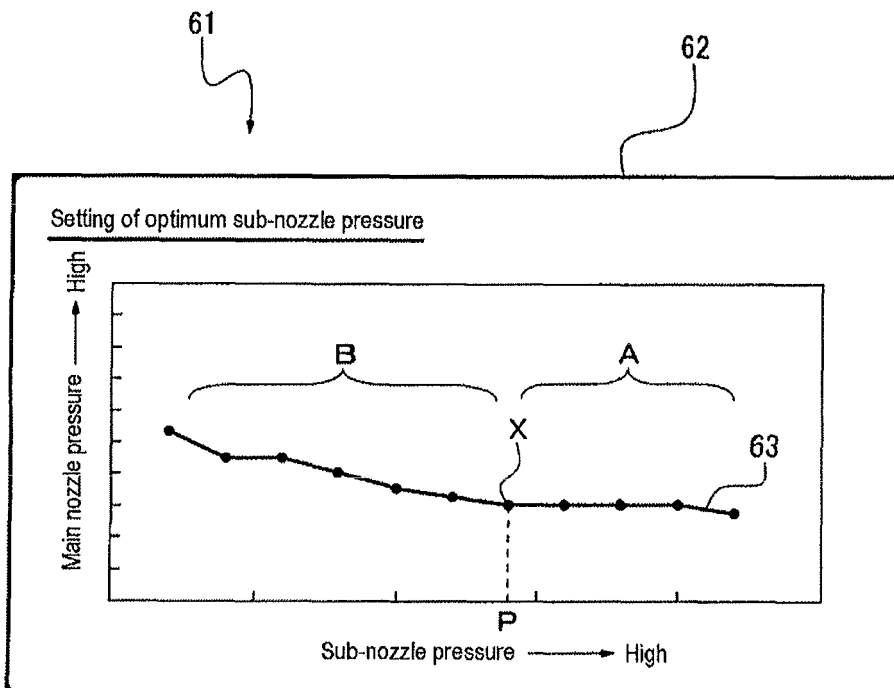


FIG. 3

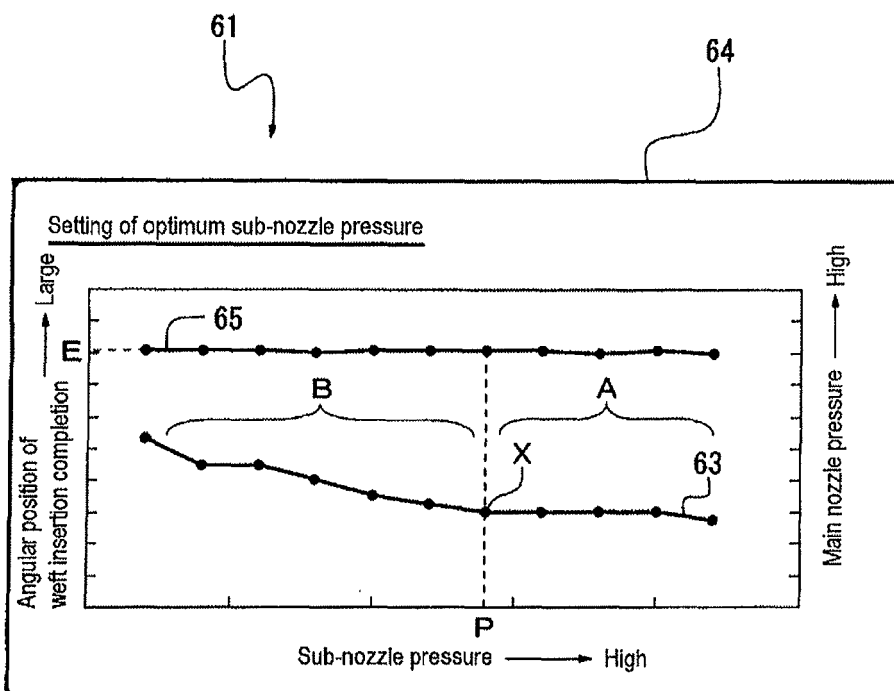
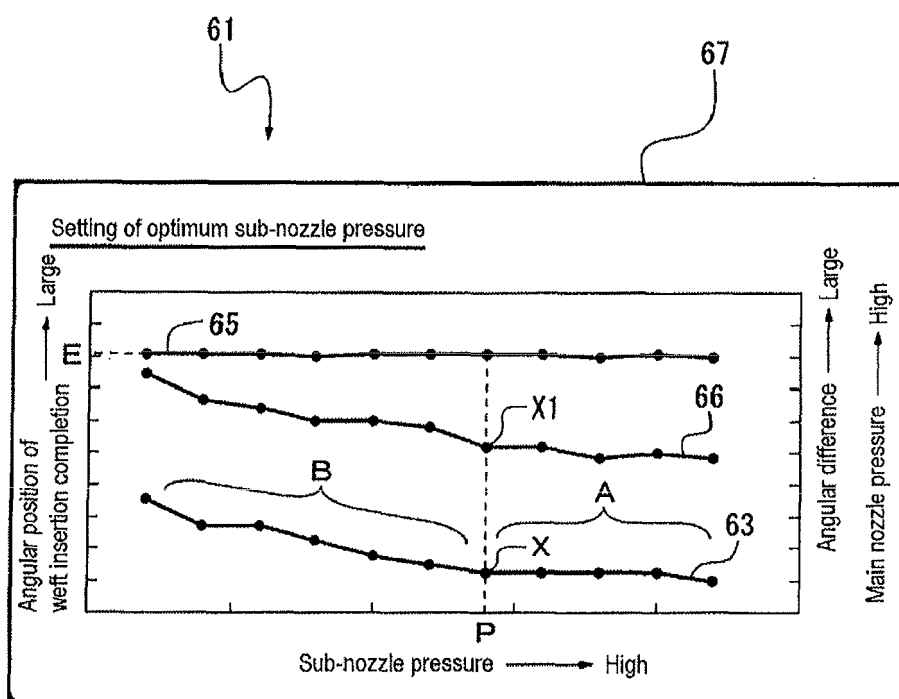


FIG. 4





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