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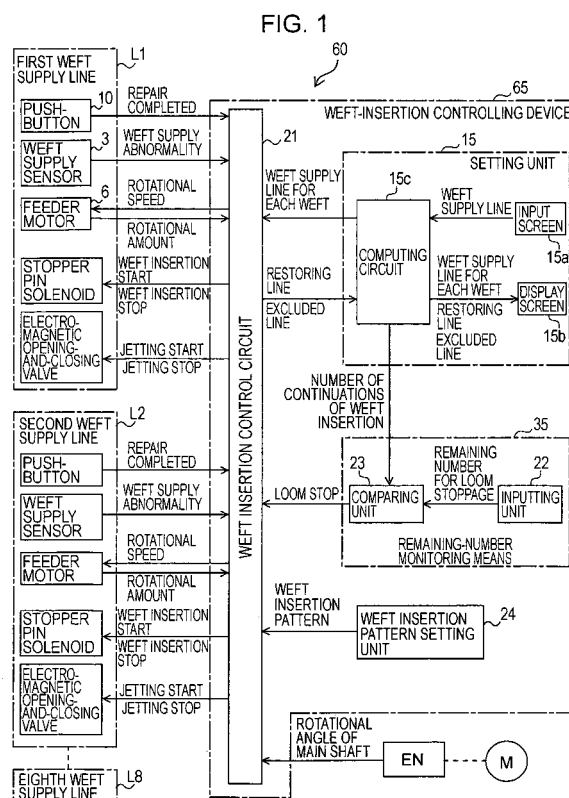
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(54) **Multiple-color weft inserting apparatus of fluid jet loom**

(57) A multiple-color weft inserting apparatus (60,70) of a fluid jet loom includes at least three weft supply lines (L), a weft-insertion controlling device (65,75). The controlling device (65,75) performs grouping of weft supply lines (L), and performs multiple-color weft insertion (60,70) in accordance with a predetermined weft-insertion pattern using the weft supply lines (L) in the group and at least one remaining weft supply line (L). The weft supply lines (L) in the group are where the weft of the same type is set. In the case where the controlling device (65,75) executes the insertion of the weft of the type corresponding to the group while the weft supply lines (L) in the group successively operate by turns, when the weft supply sensor (3) of any weft supply line (L) in the group detects a weft supply abnormality, the controlling device (65,75) excludes the any weft supply line (L) and continues the insertion of the weft of the type corresponding to the group using the other weft supply line or lines (L) in the group.



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a multiple-color weft inserting apparatus of a fluid jet loom, used to insert different types of weft in accordance with a predetermined weft insertion pattern.

2. Description of the Related Art

[0002] A multiple-color weft inserting apparatus of a fluid jet loom includes a plurality of weft supply lines, each including a weft supply package, a weft measuring-and-storing unit, a weft-insertion nozzle, and a weft supply sensor disposed upstream from the weft measuring-and-storing unit. Weft of each weft supply line is transported and inserted into a warp shed by fluid jetting from the corresponding weft insertion nozzle. The fluid jetting is performed in accordance with a predetermined weft insertion pattern.

[0003] Each weft supply sensor detects a weft supply abnormality, such as thread breakage of the weft supply package or completion of weft consumption, and outputs a detection signal to a weft-insertion controlling device. A loom is stopped each time any weft supply sensor performs these operations. Therefore, when, in any weft supply package, for example, low-strength weft, very fluffy weft, or bulky, short weft exists, a weft supply abnormality is frequently detected, causing the loom to stop. Therefore, the operating rate of the loom is reduced, and a weft bar is produced, thereby reducing the quality of a fabric cloth.

[0004] To reduce frequent stoppage of the loom to restrict a reduction in the operating rate of the loom and to restrict the production of a weft bar, in Japanese Patent No. 2673447, a multiple-color weft inserting apparatus is used as a single-color weft inserting apparatus, that is, a weft inserting apparatus in which all weft supply lines supply the same type of weft. The weft supply lines are used successively by turns for weft insertion. In addition, a weft supply line in which a weft supply abnormality, such as thread breakage, is detected is excluded from the process in which the weft supply lines are used successively by turns for the weft insertion, so that, until weft supply abnormalities are detected by weft supply sensors of all of the weft supply lines, the loom continues operating without stopping.

[0005] In Japanese Patent No. 2673447, when a multiple-color fabric cloth in which different types of weft are inserted is woven, different types of weft are set in the weft supply lines. The loom is stopped each time on the basis of a signal of detection of a weft supply abnormality from the weft supply sensor of any one of the weft supply lines. Therefore, as expected, the operating rate of the loom is reduced, and weft bar of a fabric cloth is produced.

SUMMARY OF THE INVENTION

[0006] Accordingly, it is an object of the present invention to provide a multiple-color fluid jet loom in which different types of weft are inserted in accordance with a predetermined weft insertion pattern, so that the number of loom stoppages, which is based on a signal of a detection of a weft-supply abnormality (such as thread breakage) from a weft supply sensor, is reduced, thereby increasing operating rate of a loom and providing a high-quality fabric cloth not having a weft bar.

[0007] To this end, according to the present invention, there is provided a multiple-color weft inserting apparatus of a fluid jet loom, which includes at least three weft supply lines and which inserts weft from each weft supply line in accordance with a predetermined weft-insertion pattern. Each weft supply line includes a weft supply package, a weft measuring-and-storing device, a weft-insertion nozzle, and a weft supply sensor that is disposed upstream from the weft measuring-and-storing device. The multiple-color weft inserting apparatus further includes a weft-insertion controlling device. The weft-insertion controlling device performs grouping of a plurality of weft supply lines included among the at least three weft supply lines, and performs the multiple-color weft insertion in accordance with the predetermined weft-insertion pattern using the weft supply lines in the group and at least one remaining weft supply line included among the at least three weft supply lines. The weft supply lines in the group are where the weft of the same type is set. The number of weft supply lines in the group is less than the number of all of the at least three weft supply lines where the wefts are actually set. In the case where the weft-insertion controlling device executes the insertion of the weft of the type corresponding to the group while the weft supply lines in the group successively operate by turns, when the weft supply sensor of any weft supply line in the group detects a weft supply abnormality, the weft-insertion controlling device excludes said any weft supply line and continues the insertion of the weft of the type corresponding to the group using the other weft supply line or lines in the group.

[0008] In another form, the weft-insertion controlling device performs the grouping; sets the at least one remaining weft supply line so as to be included in at least one other group, or so as to be provided as at least one single weft supply line that is not grouped, or so as to be included in said at least one other group and provided as said at least one single weft supply line; and changes the number of weft supply lines making up the group or groups, so that a weft-insertion operation mode for all of the at least three weft supply lines is changeable, and the weft types that are set at the group or the groups and said at least one single weft supply line differ from each other.

[0009] In still another form, the weft-insertion controlling device includes a setting unit for setting the weft-insertion operation mode. The setting unit is capable of

individually selecting the weft supply lines, and has a first function that groups selected weft supply lines of the at least three weft supply lines and a second function that sets selected said at least one remaining weft supply line as the at least one single weft supply line.

[0010] In still another form, the weft-insertion controlling device includes a storage unit, which stores a plurality of weft-insertion operation modes, and a setting unit. The setting unit selects one operation mode from the plurality of operation modes and sets the predetermined operation mode.

[0011] In still another form, the setting unit includes a display screen having display areas in correspondence with all of the at least three weft supply lines. Display colors of the display areas for the weft supply lines of the same group or each of the same groups are the same, and are different from that of the display area for the other weft supply line not included in the same group or those of the display areas for the other weft supply lines not included in the same group.

[0012] In still another form, the display area corresponding to the any weft supply line in the group or any of the groups that is excluded due to the detection of the weft supply abnormality performs a displaying operation in a different mode and with the same color as that corresponding to the weft supply lines in the same group that are used successively by turns for the weft insertion.

[0013] In still another form, the multiple-color weft inserting apparatus of the fluid jet loom further includes remaining-number monitoring means for excluding the any weft supply line in the group or any of the groups due to the detection of the weft supply abnormality, so that, when the number of weft supply lines in the group or the any of the groups used to continue the weft insertion reaches a predetermined remaining number, the remaining-number monitoring means outputs a loom operation stoppage signal.

[0014] In still another form, the multiple-color weft inserting apparatus of the fluid jet loom further includes restoring means that is manually operated and that is connected to the weft-insertion controlling device. The weft-insertion controlling device restores the any weft supply line that is excluded to a state in which the any weft supply line that is excluded performs the weft insertion corresponding to the group or any of the groups, in accordance with a signal output from the restoring means.

[0015] According to Claim 1, in the multiple-color weft inserting apparatus of the fluid jet loom, in the case where the weft-insertion controlling device sets a plurality of weft supply lines as a group and executes insertion of a weft of a type corresponding to the group while the weft supply lines in the group successively take turns to operate, when the weft supply sensor in any one of the weft supply lines in the group detects a weft supply abnormality, the abnormal line is excluded, so that the insertion of weft of the type corresponding to the group is continued using only the other line or lines of the group. Therefore, even

if a weft supply abnormality, such as completion of weft consumption or thread breakage in a weft supply package, is detected in any weft supply line in the group, it is possible to continue the weft insertion using the normal weft supply lines. Consequently, the loom is not stopped each time a weft supply abnormality is detected, its operating rate is increased, and a high-quality fabric cloth can be provided.

[0016] According to Claim 2, since a weft insertion operation mode for all of the weft supply lines can be changed, the weft insertion operation mode can be changed to a mode that is suitable for a weaving condition, so that it is possible to restrict stoppage of the loom caused by a detection of a weft supply abnormality. In other words, even if, in a weft supply package of one weft type, for example, low-strength weft, very fluffy weft, or bulky, short weft exists, a plurality of weft supply lines for this one weft type are provided and grouped, and the weft supply lines are used successively by turns for weft insertion. In addition, when a weft supply abnormality is detected, it is possible to continue the weft insertion using only the normal weft supply lines.

[0017] According to Claim 3, the setting unit can individually select the weft supply lines. Therefore, when the weaving condition is changed, the weft insertion operation mode can be changed. In addition, the weft supply lines may be grouped after setting the weft supply packages. Therefore, when setting the weft supply packages, it is not necessary to specify the weft supply lines on the basis of the weft types, so that re-setting of the weft supply packages due to erroneous setting of the weft supply packages is not required. In addition, it is possible to use one or more weft supply packages that are set in a previous weaving operation.

[0018] According to Claim 4, since the setting unit selectively sets a predetermined operation mode from a plurality of operation modes, when the weaving condition is changed, it is possible to precisely and easily change the weft insertion operation mode.

[0019] According to Claim 5, since the display areas of the respective weft supply lines of the same group are all of the same color, and perform a displaying operation using this color that is different from the color or colors of the other weft supply line or lines, it is possible to confirm the grouping of the weft supply lines by color perception. Therefore, erroneous setting can be avoided.

[0020] According to Claim 6, a display area corresponding to a weft supply line that has been excluded due to a detection of a weft supply abnormality in a group performs a displaying operation in a different operation mode and using the same color as that used in the weft supply lines that are used successively by turns for weft insertion. Therefore, the excluded weft supply line can be instantly and easily specified from color perception, so that the weft supply package that needs to be repaired or replaced can be precisely known. The display area may perform a displaying operation in a mode that is different from the displaying mode of the weft supply lines

that are used successively by turns for weft insertion in the following way. It may perform a displaying operation by, for example, a performing a flashing operation, changing illumination intensity, or using a symbol or a picture; or turning on and off lamps serving as display areas and corresponding to the respective weft supply lines.

[0021] Each weft measuring-and-storing device includes a rotating yarn guide and a motor that drives the rotating yarn guide. Weft from each weft supply package is inserted into its corresponding rotating yarn guide, and each motor rotates its corresponding rotating yarn guide to wind up the weft upon a storing portion of its corresponding weft measuring-and-storing device. When a weft supply line is excluded due to a detection of a weft supply abnormality in a group, the number of weft supply lines for which weft insertion is continued is reduced. To continue the weft insertion, it is necessary to increase the rotational speeds of the motors, or to reduce stoppage time when they are intermittently rotated, so that weft supply capability is not reduced. Alternatively, it is necessary to reduce the operating speed of the loom in correspondence with the reduction of the weft supply capability. According to Claim 7, when the number of weft supply lines for which the weft insertion is continued reaches a predetermined remaining number, the remaining-number monitoring means outputs a loom operation stoppage signal and stops the loom. Therefore, the motors of the normal weft supply lines are not driven under a severe condition for continuing the weft insertion, and the operating speed of the loom is not reduced more than necessary. In the case where the number of weft supply lines for which the weft insertion is continued reaches the predetermined remaining number, for stopping the operation of the loom, when the remaining-number monitoring means is set to the predetermined remaining number, and the number of weft supply lines for which the weft insertion is continued reaches the set number, a loom stoppage signal is output. When the remaining-number monitoring means is set to a number that is one more than the predetermined remaining number, and the number of weft supply lines for which the weft insertion is continued is one less than the set number, the loom stoppage signal is output. Alternatively, the number of excluded weft supply lines may be set. When the number of excluded weft supply lines is equal to or one more than the set number, the number of weft supply lines for which the weft insertion is continued reaches the predetermined remaining value, so that the loom stoppage signal is output.

[0022] According to Claim 8, the excluded weft supply line is included again for weft insertion. Therefore, in the weft supply lines for which the weft insertion is continued, operating conditions of the motors of the weft storing-and-measuring devices are moderated, and release speed of the weft from each weft supply package and winding speed of the weft upon each weft measuring-and-storing device are reduced. Consequently, for ex-

ample, fluff is reduced, so that damage is prevented from occurring. In addition, even if, afterwards, a weft supply abnormality occurs in a weft supply line in a group, it is possible to prevent the loom from stopping.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a control block diagram of a multiple-color weft inserting apparatus 60 according to a first embodiment of the present invention;

Fig. 2 shows an input screen 15a, a display screen 15b of a setting unit 15, and an inputting unit 22 according to the first embodiment;

Fig. 3 is a schematic view of the multiple-color weft inserting apparatus 60 when weft C is broken;

Fig. 4 shows the display screen 15b when the weft C is broken;

Fig. 5 shows numbers of weft supply lines L for which respective weft insertions are performed;

Fig. 6 is a control block diagram of a multiple-color weft inserting device 70 according to a second embodiment of the present invention;

Fig. 7 shows an input screen 25a, a display screen 25b of a setting unit 25, and an inputting unit 22 according to the second embodiment;

Fig. 8 shows weft insertion operation modes that can be set at the multiple-color weft inserting apparatus 70 according to the second embodiment; and

Fig. 9 shows weft insertion operation modes that can be set at the multiple-color weft inserting apparatus 70 according to the second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] Embodiments of the present invention will hereunder be given with reference to the drawings. Figs. 1 to 4 show a multiple-color weft inserting apparatus 60 according to a first embodiment of the present invention used in an air jet loom. Fig. 1 is a control block diagram of the multiple-color weft inserting apparatus 60. Fig. 2 shows an input screen 15a and a display screen 15b of a setting unit 15. Fig. 3 is a schematic view of the multiple-color weft inserting apparatus 60 when weft C is broken. Fig. 4 shows the input screen 15a and the display screen 15b when the weft C is broken.

[0025] As shown in Fig. 3, the multiple-color weft inserting apparatus 60 includes eight weft supply lines L, a first weft supply line L1 to an eighth weft supply line L8, as a plurality of weft supply lines. This embodiment relates to an 8-color weft inserting apparatus which can insert wefts C of up to eight different types.

[0026] Each weft supply line L includes a weft supply package 1, yarn guides 11 and 12, a tensor 2, a weft measuring-and-storing device 30, a weft supply sensor 3, a yarn guide 13, and a weft-insertion nozzle 9. Each weft supply package is mounted to its corresponding weft

supply peg (not shown). Each of the yarn guides 11 and 12 guides weft C, which is released from the corresponding weft supply package 1, downstream in a weft traveling direction. Each tensor 2 is disposed between the corresponding yarn guides 11 and 12. Each weft supply sensor 3 is disposed between the corresponding yarn guide 12 and weft storing-and-measuring device 30. Each yarn guide 13 is disposed downstream from the weft storing-and-measuring device 30. Each weft-insertion nozzle 9 is disposed downstream from the corresponding yarn guide 13. An end of each weft-insertion nozzle 9 opposes a warp shed. Each weft storing-and-measuring device 30 includes a storage drum 4, a rotating yarn guide 5, a feeder motor 6, and a stopper pin 7. Each rotating yarn guide 5 receives the weft C from the corresponding weft supply package 1 having a pipe shape, is disposed upstream from the corresponding storage drum 4, and its downstream end opposes the outer peripheral surface of the corresponding storage drum 4. Each feeder motor 6 drives the corresponding rotating yarn guide 5. Each stopper pin 7 is disposed downstream from the corresponding storage drum 4, and is set so as to be incapable of releasing the weft C wound upon the outer peripheral surface of the corresponding storage drum 4 and so as to be capable of releasing the wound weft C by advancing and retreating from the corresponding storage drum 4 as a result of being driven by a solenoid. The length of each weft C that is wound upon the corresponding storage drum 4 is equal to or greater than the length of each weft C to be fed for one weft insertion operation. Each weft storing-and-measuring device 30 further includes a release sensor (not shown), which is disposed at the downstream end of the corresponding storage drum 4, and which detects the weft C that is released from the storage drum 4. In addition, each weft supply line L includes a pushbutton 10 as restoring means that is manually operated for a weft supply line that has been excluded from a weft insertion operation. In the embodiment, each pushbutton 10 is mounted to an outer frame of its corresponding feeder motor 6. In addition, each weft supply sensor 3 used in the embodiment is a thread breakage sensor, and is of a type that outputs a weft supply abnormality signal when a contact pressure of weft C is measured and the contact pressure is lower than a predetermined threshold value. The breakage of the weft C detected by any one of the weft supply sensor 3 occurs when the weft C is released from its corresponding weft supply package 1, that is, as the corresponding rotating yarn guide 5 rotates. The thread breakage occurs between any weft supply sensor 3 and rotating yarn guide 5 as shown, for example, in Fig. 3 at a location that is upstream from the wound weft upon the outer peripheral surface of the storage drum 4.

[0027] As shown in Fig. 1, a weft-insertion controlling device 65 of the multiple-color weft inserting apparatus 60 includes a weft-insertion controlling circuit 21, the setting unit 15, remaining-number monitoring means 35, and a weft-insertion pattern setting unit 24. The setting unit

15 includes an input screen 15a, a display screen 15b, and a computing circuit 15c, and sets a weft-insertion operation mode. The remaining-number monitoring means 35 includes an inputting unit 22 and a comparing unit 23. When the number of weft supply lines L for which weft insertion is continued reaches a predetermined remaining number as a result of excluding a weft supply line L when a weft supply abnormality is detected, the remaining-number monitoring means 35 outputs a loom operation stop signal and stops the operation of the loom.

[0028] As shown in Fig. 2, the input screen 15a and the display screen 15b of the setting unit 15 are provided at a same screen of an operation-condition input/display liquid crystal panel that is set at an operating panel. The input screen 15a is provided with a "weft supply line No." section 15ad serving as a selecting portion for selecting the individual weft supply lines L. When a circular area including a corresponding number in the "weft supply line No." section 15ad is touched, the weft supply line L corresponding to the number is selected. Circles displaying identifying colors of the respective wefts C are provided on the left of weft-C sections of the input screen 15a, that is, a "first weft C1" section, a "second weft C2" section, a "third weft C3" section, a "fourth weft C4" section, a "fifth weft C5" section, a "sixth weft C6" section, a "seventh weft C7" section, and an "eighth weft C8" section. The identifying colors of the circles for the respective wefts C are red, blue, yellow, brown, purple, green, pink, and orange. The colors are indicated by patterns in the circles for convenience. The display screen 15b has eight circular areas that display numbers from 1 to 8. The circular areas are provided so as to display numbers that correspond to the numbers of the weft supply lines L, that is, so that, for example, the No. 1 circular area corresponds to the first weft supply line L1 and the No. 2 circular area corresponds to the second weft supply line L2. Each circular area is turned on with the same color as the corresponding weft C using the identifying color of the corresponding weft C. This makes it possible for an operator to know by color perception which weft C is set in the weft supply line of a certain number.

[0029] Next, a method of setting a weft-insertion operation mode will be described. On the basis of a woven fabric specification, and considering the frequency of the weft insertion and the physical property of the weft (for example, a weak weft that is easily broken is often set), the number of weft supply lines L that are set in accordance with the wefts C is determined. In an example of the woven fabric specification in the embodiment, a four-color woven fabric including, as weft-C types, the first weft C1, the second weft C2, the third weft C3, and the fourth weft C4 is used, and a weft-insertion pattern in which weft insertion in the order of C1 → C2 → C3 → C4 → C1 → C2 → C1 → C3 is defined as one cycle is used. In this weft-insertion pattern, the weft insertion of the first weft C1 is performed most frequently, and the weft insertion of the fourth weft C4 is performed least frequently. Therefore, in the embodiment, considering the frequency

of the weft insertion, three weft supply lines L for the first weft C1 are set, two weft supply lines L for the second weft C2 are set, two weft supply lines L for the third weft C3 are set, and one weft supply line L for the fourth weft C4 is set. The weft C that is inserted with a higher frequency is set upon a larger number of weft supply lines L. In the embodiment, on the basis of an instruction that three weft supply lines L for the first weft C1 are set, two weft supply lines L for the second weft C2 are set, two weft supply lines L for the third weft C3 are set, and one weft supply line L for the fourth weft C4 is set, the operator sets the wefts C at the specified number of weft supply lines L. As a result, the first weft C1 is set at the first weft supply line L1, the second weft supply line L2, and the fifth weft supply line L5, the second weft C2 is set at the third weft supply line L3 and the sixth weft supply line L6, the third weft C3 is set at the fourth weft supply line L4 and the seventh weft supply line L7, and the fourth weft C4 is set at the eighth weft supply line L8.

[0030] Next, the operator sets a weft-insertion operation mode at the weft-insertion controlling device 65. One group including three weft supply lines L, two groups each including two weft supply lines L, and one single weft supply line L that is not included in a group are set. More specifically, the first weft supply line L1, the second weft supply line L2, and the fifth weft supply line L5 at which the first weft C1 is set are set in one group including three weft supply lines L, and this group is made to correspond to weft insertion of the first weft C1. The third weft supply line L3 and the sixth weft supply line L6 at which the second weft C2 is set are set in one group including two weft supply lines L, and this group is made to correspond to weft insertion of the second weft C2. The fourth weft supply line L4 and the seventh supply line L7 at which the third weft C3 is set are set in one group including two weft supply lines L, and this group is made to correspond to weft insertion of the third weft C3. The eighth weft supply line L8 at which the fourth weft C4 is set is set as a single weft supply line L not included in a group, and is made to correspond to weft insertion of the fourth weft C4.

[0031] The setting of the weft-insertion operation mode to the weft-insertion controlling device 65 is carried out from the input screen 15a. First, the operator touches a "setting start" section at the "first weft" section at the input screen 15a. This makes it possible to set the first weft C1, that is, the weft supply lines L for which weft insertion is performed in accordance with when the selection of the first weft C1 of the weft-insertion pattern is performed. Next, after touching and selecting the circular area including the number 1 in the "weft supply line No." section 15ad, an "include" section 15ac is touched. This sets the first weft supply line L1 as a weft supply line L for which weft insertion is performed in accordance with when the selection of the first weft C1 is performed, and causes the circular area including the number 1 at the display screen 15b to turn red. Similarly, after touching and selecting the circular area including the number 2 in the

"weft supply line No." section 15ad, the "include" section 15ac is touched. In addition, after touching and selecting the circular area including the number 5 in the "weft supply line No." section 15ad, the "include" section 15ac is touched. Then, a confirmation is made as to whether the circular areas including the numbers 1, 2, and 5 at the display screen 15b are all turned on with a red color, and the other circular areas including their respective numbers are not turned on with a red color. When any of the other circular areas including their respective numbers is turned on with a red color, after touching and selecting the circular area including the corresponding number in the "weft supply line No." section 15ad, a "delete" section 15ae is touched. The circular area including the corresponding number at the display section 15b and turned on with a red color is turned on with a blue color, which is the identifying color of the next second weft C2. Next, a "setting completed" section 15ab at the "first weft" section is touched. This determines that the first weft supply line L1, the second weft supply line L2, and the fifth weft supply line L5 are to be set as the weft supply lines L for which weft insertion is performed in accordance with when the selection of the first weft C1 is performed. In other words, the first weft supply line L1, the second weft supply line L2, and the fifth weft supply line L5 are set as a weft supply line L group for which weft insertion is successively performed by turns in accordance with when the selection of the first weft C1 of the weft-insertion pattern is performed. At the "second weft" section at the input screen 15a, the same operations that are performed at the "first weft" section are performed. A confirmation is made as to whether the circular areas including the numbers 3 and 6 at the display screen 15b are turned on with a blue color. After the confirmation, a "setting completed" section 15ab of the "second weft" section is touched. This sets the third weft supply line L3 and the sixth weft supply line L6 as a weft supply line L group for which weft insertion is successively performed by turns in accordance with when the selection of the second weft C2 of the weft-insertion pattern is performed. The same operations are carried out at the "third weft" section at the input screen 15a. A confirmation is made as to whether the circular areas including the numbers 4 and 7 at the display screen 15b are turned on with a yellow color. After the confirmation, a "setting completed" section 15ab of the "third weft" section is touched. This sets the fourth weft supply line L4 and the seventh weft supply line L7 as a weft supply line L group for which weft insertion is successively performed by turns in accordance with when the selection of the third weft C3 of the weft-insertion pattern is performed. Then, after touching a "setting start" section 15aa of the "fourth weft" section at the input section 15a, the circular area including the number 8 at the "weft supply line No." section 15ab is touched. Then, the "include" section 15ac is touched. This sets the eighth supply line L8 as a weft supply line L for which weft insertion is performed in accordance with when the selection of the fourth weft C4 is performed, and causes the

circular area including the number 8 at the display screen 15b to turn brown. After confirmation that the number 8 at the display screen 15b is turned on with a brown color, a "setting completed" section 15ab of the "fourth weft" section is touched. This determines that only the eighth weft supply line L8 is to be set as a weft supply line L for which weft insertion is performed in accordance with when the selection of the fourth weft C4 is performed. In other words, the eighth weft supply line L8 is set as a single weft supply line L that is not included in a group, and weft insertion is performed each time the fourth weft C4 of the weft pattern is selected. The setting unit 15 not only has a first function of setting a plurality of selected weft supply lines L in a group, but also has a second function of setting a selected weft supply line L as a single weft supply line L. Although selection is made for every weft supply line L to set each weft supply line L in accordance with its corresponding weft C, if a part of a previous weaving condition matches the current weaving condition, therefore, a weft supply line L is already set to the corresponding weft C, a selection operation and an inclusion operation of a weft supply line L may be omitted.

[0032] Next, using the inputting unit 22 of the remaining-number monitoring means 35, the remaining number of weft supply lines L for stopping loom operation is set for the wefts C1, C2, C3, and C4. The inputting unit 22 of the remaining-number monitoring means 35 is provided at the same screen as the input screen 15a and the display screen 15b of the setting unit 15, and includes "remaining number for loom stoppage" sections 22a. Since the frequency with which the first weft C1 is inserted is high, the number of weft supply lines L that are excluded due to a detection of a weft supply abnormality is large. When the number of normal weft supply lines for which weft insertion is continued is reduced to 1, that is, when the remaining number is 1 and the insertion of the first weft C1 is continued only using one weft supply line, the operating condition of the feed motor 6 of the weft supply line L for which the weft insertion is continued becomes severe. For example, in the case where the insertion of the first weft C1 is carried out using successively three weft supply lines L by turns, when the respective feeder motors 6 are operated at a rotational speed of 1000 rpm, and when the insertion of the first weft C1 is continued using only one weft supply line L due to the remaining number being reduced to 1, it is necessary to rotate the corresponding feeder motor 6 at a rotational speed of 3000 rpm (which is three times 1000 rpm) when a stoppage time is not reduced. Even if the stoppage time is reduced, the rotational speed of the corresponding feeder motor 6 may exceed a maximum rotational speed. In such a case, the operating speed of the loom must be reduced. In such a weft supply line L group in which the first weft C1 is inserted using successively the weft supply lines by turns, for preventing the feeder motor 6 from operating under a severe operating condition, the operator sets the remaining number of weft supply lines L whose operations are to be stopped.

[0033] The operator touches the "setting start" section 15aa of the "first weft" section at the input screen 15a to make it possible to set the first weft C1. Next, the operator touches the "remaining number for loom stoppage" section 22a. The displayed number is changed each time the operator repeatedly touches the "remaining number for loom stoppage" section 22a, so that numbers 0 to 3 are successively displayed as follows: 0 → 1 → 2 → 3 → 0 → 1 → 2 → 3. After changing the number to 1, the operator touches the "setting completed" section 15ab. This causes the remaining number of weft supply lines that are successively used by turns to perform the weft insertion to be set to 1 for the first weft C1. Accordingly, the inputting unit 22 of the remaining-number monitoring means 35 uses the "setting start" sections 15aa and the "setting completed" sections 15ab as the input screen 15a of the setting unit 15. Since the wefts other than the first weft C1 are not inserted frequently, the remaining number is set at 0. Until the weft supply lines L for which the insertion of the wefts C is performed is used up, the loom is not stopped. Accordingly, in addition to outputting a loom stoppage signal when a predetermined remaining number is set, and the number of weft supply lines for which the weft insertion is continued reaches the set number, it is possible to set a number that is one more than the predetermined remaining number, so that, when the number of weft supply lines for which the weft insertion is continued becomes one less than the set number, the loom stoppage signal is output. Alternatively, the number of excluded weft supply lines may be set. In this case, when the number of excluded weft supply lines becomes equal to or one more than the set value, the number of weft supply lines for which the weft insertion is continued reaches the predetermined remaining number, so that the loom stoppage signal is output.

[0034] The weft-insertion controlling device will be described on the basis of the block diagram of Fig. 1 illustrating controlling of the multiple-color weft inserting apparatus 60. At the setting unit 15, the weft supply lines L that are selected for the respective wefts C at the input section 15a are set so that, at the computing circuit 15c, a plurality of weft supply lines L that are grouped and a single weft supply line are set in accordance with the wefts C. More specifically, the first weft supply line L1, the second weft supply line L2, and the fifth weft supply line L5 are set in one group including three weft supply lines L, and this group is made to correspond to the insertion of the first weft C1. The third weft supply line L3 and the sixth weft supply line L6 are set in one group including two weft supply lines, and this group is made to correspond to the weft insertion of the second weft C2. The fourth weft supply line L4 and the seventh weft supply line L7 are set in one group including two weft supply lines L, and this group is made to correspond to the weft insertion of the third weft C3. The eighth weft supply line L8 is set as a single weft supply line L not included in a group, and is made to correspond to the weft insertion of the fourth weft C4. The computing circuit 15c displays

the weft supply lines in different predetermined identifying colors in accordance with the wefts C at the display screen 15b. On the basis of information of such weft-insertion operation modes that are input from the computing circuit 15c, the weft-insertion controlling circuit 21 determines the order of use of the weft supply lines L that are successively used by turns for weft insertion, in accordance with the groups for the wefts C. In the embodiment, the weft-insertion controlling circuit 21 determines the order of use of the weft supply lines L that are successively used by turns for the insertions of the first weft C1 to the third weft C3. For the insertion of the first weft C1, the order is L1 → L2 → L5, that is, the first weft supply line L1 → the second weft supply line L2 → the fifth weft supply line L5 → the first weft supply line L1 → the second weft supply line L2 → the fifth weft supply line L5. For the insertion of the second weft C2, the order is L3 → L6, that is, the third weft supply line L3 → the sixth weft supply line L6 → the third weft supply line L3 → the sixth weft supply line L6. For the insertion of the third weft C3, the order is L4 → L7, that is, the fourth weft supply line L4 → the seventh weft supply line L7 → the fourth weft supply line L4 → the seventh weft supply line L7. However, by changing the setting of the weft-insertion controlling circuit 21, the order may be changed, so that, for example, one weft supply line may be consecutively used two times, that is, the order may be L1 → L1 → L2 → L2 → L5 → L5 for the insertion of the first weft C1, the order may be L3 → L3 → L6 → L6 for the insertion of the second weft C2, and the order may be L4 → L4 → L7 → L7 for the insertion of the third weft C3. The weft-insertion controlling circuit 21 includes a storage unit (now shown), and stores weft-insertion pattern information input from the weft-insertion-pattern setting unit 24. The pushbuttons 10, the weft feed sensors 3, the feeder motors 6, the solenoids of the stopper pins 7, and electromagnetic opening-and-closing valves, which continually supply air from a pressure air source (not shown) to the weft-insertion nozzles 9 of the respective weft supply lines L are connected to the weft-insertion controlling circuit 21.

[0035] When the operation of the loom is started, the weft-insertion controlling circuit 21 reads out the weft C that is inserted from the stored weft pattern information. In addition, on the basis of the order of use of the weft supply lines L that are successively used by turns for the insertion of this weft C, it determines the weft supply line L for performing the weft insertion, each time a main shaft of the loom rotates once (weft-insertion cycle). On the basis of information of the rotational angle of the main shaft of the loom from an encoder EN connected to a main motor M that drives the loom main shaft (not shown), the weft-insertion controlling circuit 21 drives in a predetermined time the electromagnetic opening-and-closing valve of the predetermined weft supply line for performing the weft insertion, so that air jetting from the weft-insertion nozzle 9 is started and ended. In the embodiment, a four-color woven fabric including, as types of weft C, the first weft C1, the second weft C2, the third weft C3, and the

fourth weft C4 is used, and a weft-insertion pattern in which weft insertion in the order of C1 → C2 → C3 → C4 → C1 → C2 → C1 → C3 is defined as one cycle is used. Therefore, as shown in Fig. 5, the weft-insertion controlling circuit 21 executes weft insertion using a weft supply line L corresponding to an indicated number in each weft insertion.

[0036] When, in a weft supply line L, a weft supply abnormality, such as thread breakage, is detected by the weft supply sensor 3 and a weft supply abnormality signal is input, the weft-insertion controlling circuit 21 excludes this weft supply line L, so that the weft insertion is continued using the remaining normal weft supply lines. In the example shown in Fig. 5, after a 21st weft insertion, a weft supply abnormality is detected in the second weft supply line L2. Therefore, the second weft supply line L2 is excluded. Accordingly, a 29th weft insertion is carried out using the fifth weft supply line L5 instead of the second weft supply line L2. Thereafter, the first weft supply line L1 and the fifth weft supply line L5 are used successively by turns for weft insertion, so that the insertion of the first weft C1 of the weft-insertion pattern is continued.

[0037] Information of the excluded weft supply line L is input into the display screen 15b through the computing circuit 15c from the weft-insertion controlling circuit 21, and the excluded weft supply line L is displayed on the display screen 15b. In the embodiment, a lighting mode of the identifying color of the circular area at the display screen 15b for the excluded weft supply line L is changed from a continuous lighting mode to a flashing lighting mode. Therefore, as shown in Fig. 4, the circular area including the number 2 and corresponding to the second weft supply line L2 keeps flashing with a red color. From the continuous lighting of the two remaining red circular areas and the set value of 1 at the "remaining number for loom stoppage" section 22a of the "first weft" section corresponding to the same red color, the operator is informed that, when a weft supply abnormality is detected next in either one of the two weft supply lines L for which the insertion of the first weft C1 is continued, the loom will be stopped. Accordingly, the operator is informed by color perception that the weft supply package 1 of the second weft supply line L2 needs immediate repairing or replacement.

[0038] The operator replaces the weft supply package 1 or repairs the weft C of the excluded weft supply line L while operating or without stopping the loom. The breakage of the weft C occurs when the weft C is released from the weft supply package 1, that is, as the corresponding rotating yarn guide 5 rotates. The thread breakage occurs between the weft supply sensor 3 and rotating yarn guide 5 as shown in, for example, Fig. 3 at a location that is upstream from the weft wound upon the outer peripheral surface of the storage drum 4. After the operator removes the cause of the improper release of the weft C from the weft supply package 1 or replaces the weft supply package 1, the weft C from the weft supply package 1 and weft C connected to the wound weft upon the outer

peripheral surface of the storage drum 4 are knotted together, so that, thereafter, loosening of the weft C near the weft supply sensor 3 is eliminated. In addition, the wound weft upon the outer peripheral surface of the storage drum 4 may be provided by rotating the feeder motor 6. When such succession of operations is completed, the operator operates the pushbutton 10 mounted to the outer frame of the feeder motor 6. On the basis of a repair completion signal from the pushbutton 10, the weft-insertion controlling circuit 21 identifies the weft supply line L whose repairing is completed, so that the weft supply line L is restored to a state in which it is used to perform the insertion of the corresponding weft C. On the basis of information, input from the weft-insertion controlling circuit 21, regarding the restoring of the weft supply line L to a state in which it is used to perform the weft insertion, the computing circuit 15c causes the lighting mode of the identifying color of the circular area of the weft supply line L to be returned to continuous lighting.

[0039] Unless the repairing or replacement of the weft supply package 1 of the excluded weft supply line L is carried out before the number of normal weft supply lines L for which the weft insertion is continued reaches the set remaining number, the loom stops when a next weft supply abnormality occurs. That is, on the basis of information regarding the excluded and restored weft supply line, input from the weft-insertion controlling circuit 21, and the weft supply lines L for the respective groups for the wefts C, the computing circuit 15c computes the number of weft supply lines L for which the insertion of the corresponding wefts C is continued, in accordance with the groups for the wefts C, and outputs the computed result to the comparing unit 23 of the remaining-number monitoring means 35. The comparing unit 23 compares the remaining number set by the inputting unit 22 and the number of weft supply lines L, input from the computing circuit 15c, for which the weft insertion is continued, in accordance with the groups for the wefts C. When, at a group for a weft C, the number of weft supply lines L for which the weft insertion is continued reaches a predetermined remaining number, that is, reaches the remaining number set at the "remaining number for loom stoppage" section 22a in the embodiment, a loom stoppage signal is output to the weft-insertion controlling circuit 21 to stop the loom. In the embodiment, the remaining number of weft supply lines for the weft C that is inserted by the single weft supply line L is also set to 0 at the "remaining number for loom stoppage" section 22a. In the case where a weft supply abnormality is detected at the single weft supply line L, when the remaining-number monitoring means 35 determines that the number of weft supply lines for which the weft insertion is continued reaches 0, which is the predetermined remaining number, it outputs a loom stoppage signal. However, when a weft supply abnormality is detected in the single weft supply line L, the loom may be stopped without the remaining-number monitoring means 35. In this case, the weft-insertion controlling circuit 21 stops the loom on

the basis of a weft supply abnormality detection signal from the weft supply sensor 3 of the single weft supply line L.

[0040] In the embodiment, the weft-insertion controlling circuit 21 reads the weft C to be inserted from the stored weft-insertion pattern information. On the basis of a determined order of use of the weft supply lines that are successively used by turns for the insertion of the weft C, the weft-insertion controlling circuit 21 determines the weft supply line L that is used to perform the weft insertion, every time the main shaft of the loom rotates once (weft-insertion cycle). Each time a weft supply line in which a weft supply abnormality is detected is excluded, or each time the excluded weft supply line L is repaired and restored, the order of use of the weft supply lines L that are successively used by turns for the weft insertion is changed. However, on the basis of the weft-insertion pattern information and the order of use of the weft supply lines L for the weft C, the weft-insertion controlling circuit 21 may program and previously determine over a plurality of weft-insertion cycles the weft supply lines L that are used to perform the weft insertions in accordance with the respective weft insertions. In this case, each time a weft supply line L in which a weft supply abnormality is detected is excluded, or each time the excluded weft supply line L is repaired and restored, the programming is changed.

[0041] The weft-insertion controlling device 65 in the embodiment can freely select the weft supply lines L that constitute a group for a corresponding weft C, so that it can freely set the number of weft supply lines that are used successively by turns for inserting the corresponding weft C. In addition, it can freely select a single weft supply line L for a corresponding weft C. Therefore, it can freely set the number of groups, the number of weft supply lines L of one group, and the number of single weft supply lines L. Consequently, it can freely set a weft-insertion operation mode in accordance with a weaving condition. For example, as shown in Fig. 2, three groups and one single weft supply lines L may be set. Alternatively, it is possible to set all of the eight weft supply lines L as single weft supply lines and set different wefts C at the single weft supply lines L, or to set four groups each including two weft supply lines without setting any single weft supply line L. However, as in the following second embodiment, the weft-insertion controlling device may be one that is capable of setting only previously determined weft-insertion operation modes, so that an optimal weft-insertion mode for a weaving condition is selected and set.

[0042] With reference to Figs. 6 to 9, a multiple-color weft inserting apparatus 70 according to a second embodiment of the present invention including a weft-insertion controlling device 75 as a weft-insertion controlling device which is capable of setting only previously determined weft-insertion operation modes will be described. The multiple-color weft inserting apparatus 70 includes six weft supply lines L, a first weft supply line L1 to a sixth

weft supply line L6, as a plurality of weft supply lines. This embodiment relates to a 6-color weft inserting apparatus which can insert wefts C of up to six different types.

[0043] As shown in Fig. 6 that is a control block diagram of the weft-insertion controlling device 75 of the multiple-color weft inserting apparatus 70 includes a weft-insertion controlling circuit 21, a setting unit 25, remaining-number monitoring means 35, and a weft-insertion pattern setting unit 24. It also includes a storage unit 20 that is connected to a computing circuit 25c of the setting unit 25.

[0044] As shown in Fig. 7, an input screen 25a and a display screen 25b of the setting unit 25, and an inputting unit 22 of the remaining-number monitoring means 35 are provided at a same screen of an operation-condition input/display liquid crystal panel that is set at an operating panel. The input screen 25a is provided with a selecting portion for selecting any one of weft-insertion operation modes shown in Figs. 8 and 9. When a "previous" section 25ab or a "next" section 25ac of the selecting portion is touched, a selected weft-insertion operation mode is successively changed. The display screen 25b is provided with six circular areas that display numbers from 1 to 6. The circular areas are provided so as to display numbers that correspond to the numbers of the weft supply lines L, that is, so that, for example, the No. 1 circular area corresponds to the first weft supply line L1 and the No. 2 circular area corresponds to the second weft supply line L2. The circular areas are turned on with the same colors as corresponding wefts C using identifying colors of the corresponding wefts C provided on the left of "weft" sections that is, a "first weft" section, a "second weft" section, a "third weft" section, a "fourth weft" section, a "fifth weft" section, and a "sixth weft" section at the inputting unit 22 of the remaining-number monitoring means 35. Accordingly, weft-insertion operation modes that are selected at the input screen 25a are displayed by color perception.

[0045] Next, a method of setting weft-insertion operation modes will be described. An operator first touches a "selection start" section 25aa of the input screen 25a. This allows a weft-insertion operation mode to be set. Next, the operator touches the "previous" section 25ab or the "next" section 25ac of the selecting portion. By repeating the touching, Nos. 1 to 20 operation modes shown in Figs. 8 and 9 are successively selected, and the selected operation modes are displayed on the display screen 25b. Fig. 7 shows the display screen 25b displaying a state in which the No. 15 operation mode shown in Fig. 9 is selected. The first weft supply line L1 and the second weft supply line L2 are grouped and are used successively by turns to perform insertion of a first weft C1. The fourth weft supply line L4 and the fifth weft supply line L5 are grouped and are used successively by turns to perform insertion of a third weft C3. The third weft supply line L3 is used singly to perform insertion of a second weft C2, and the sixth weft supply line L6 is

used singly to perform insertion of a fourth weft C4. After the display of the operation mode at the display screen 25b is switched to a desired weft-insertion operation mode, the operator touches a "selection completed" section 25ad of the input screen 25a. The storage unit 20 stores the No. 1 to No. 20 operation modes shown in Figs. 8 and 9. On the basis weft-insertion operation mode information, such as an operation mode number, from the input screen 25a, the computing circuit 25c reads out the corresponding weft-insertion operation mode from the storage unit 20, and outputs the read operation mode to the weft-insertion controlling circuit 21. On the basis of information, which is input from the computing circuit 25c, regarding the weft supply lines of the groups for the respective wefts C, the weft-insertion controlling circuit 21 determines the order of use of the weft supply lines L in the groups that are used successively by turns to insert the respective wefts C.

[0046] Next, using the inputting unit 22 of the remaining-number monitoring means 35, the remaining number of weft supply lines L for stopping loom operation is set for the wefts C1, C2, C3, and C4. The inputting unit 22 of the remaining-number monitoring means 35 is provided at the same screen as the input screen 25a and the display screen 25b of the setting unit 25, and includes "setting start" sections 22a, "remaining number for loom stoppage" sections 22b, and "setting completed" sections 22c. The operator touches the "setting start" section 22aa of the "first weft" section to make it possible to set the first weft C1. Next, the operator touches the "remaining number for loom stoppage" section 22b. The displayed number is changed each time the operator repeatedly touches the "remaining number for loom stoppage" section 22b, so that numbers 0 to 3 are successively displayed as follows: 0 → 1 → 2 → 3 → 0 → 1 → 2 → 3. After changing the number to 1, the operator touches the "setting completed" section 22c. This causes the remaining number of weft supply lines that are used to continue the weft insertion to be set to 1 for the first weft C1. As with the first weft C1, the remaining numbers are similarly set for the second weft C2, the third weft C3, and the fourth weft C4.

[0047] When the operation of the loom is started, the weft-insertion controlling circuit 21 reads out the weft C that is inserted from the stored weft insertion pattern information. In addition, on the basis of the order of use of the weft supply lines L that are successively used by turns for inserting this weft C, it determines the weft supply line L used to carry out the weft insertion, each time a main shaft of the loom rotates once (weft-insertion cycle). On the basis of information of the rotational angle of the main shaft of the loom from an encoder EN connected to a main motor M, the weft-insertion controlling circuit 21 drives in a predetermined time an electromagnetic opening-and-closing valve of the predetermined weft supply line used to carry out the weft insertion, so that air jetting from a weft-insertion nozzle 9 is started and ended. Each time a weft supply line L in which a weft supply abnor-

mality is detected is excluded, or each time the excluded weft supply line L is repaired and restored, the weft-insertion controlling circuit 21 changes the order of use of the weft supply lines L that are successively used by turns to perform the weft insertion.

[0048] Even in this embodiment, as in the first embodiment, a lighting mode of an identifying color of the circular area at the display screen 15b for the weft supply line L that is excluded due to a detection of a weft supply abnormality is changed from a continuous lighting mode to a flashing lighting mode. After the excluded weft supply line L is repaired and restored, the lighting mode is returned to the continuous lighting mode.

[0049] The number of weft-insertion operation modes is increased in accordance with the number of weft supply lines L of the multiple-color weft inserting apparatus. Although, in the embodiment, the Nos. 1 to 20 weft-insertion operation modes shown in Fig. 8 and 9 can be executed in accordance with the 6-line multiple-color weft inserting apparatus, the number of operation modes may be reduced so that a plurality of them can be executed. For example, the No. 1 and the No. 5 weft-insertion operation modes shown in Fig. 8 may only be settable. That is, it is possible to make settable an operation mode in which all six of the weft supply lines L are single weft supply lines L and an operation mode in which only one group is formed, two weft supply lines L are included in the group, and the remaining four weft supply lines L are all single weft supply lines L.

[0050] Various other devices may be used for the input screen 15a and the display screen 15b according to the first embodiment and for the input screen 25a and the display screen 25b according to the second embodiment. In addition, various other inputting and display methods may be used for the inputting and displaying methods at the input screen 15a and the display screen 15b according to the first embodiment and at the input screen 25a and the display screen 25b according to the second embodiment. For example, when, ordinarily, only a display screen is provided and a setting section on a screen is touched, an input screen and a display screen are provided at the same screen only during a setting operation, or a keyboard may be used, instead of a method using an input screen.

[0051] The present invention is not limited to the above-described embodiments, so that various modifications may be made without departing from the gist of the present invention.

Claims

1. A multiple-color weft inserting apparatus (60, 70) of a fluid jet loom, which comprises at least three weft supply lines (L) and which inserts weft from each weft supply line (L) in accordance with a predetermined weft-insertion pattern, each weft supply line (L) including a weft supply package (1), a weft meas-

uring-and-storing device (30), a weft-insertion nozzle (9), and a weft supply sensor (3) that is disposed upstream from the weft measuring-and-storing device (30), the multiple-color weft inserting apparatus (60, 70) further comprising:

a weft-insertion controlling device (65, 75),

wherein the weft-insertion controlling device (65, 75) is **characterized in that** performs grouping of a plurality of weft supply lines (L) included among said at least three weft supply lines (L), and performs the multiple-color weft insertion in accordance with the predetermined weft-insertion pattern using the weft supply lines (L) in the group and at least one remaining weft supply line (L) included among said at least three weft supply lines (L), the weft supply lines (L) in the group being where the weft of the same type is set, the number of weft supply lines (L) in the group being less than the number of all of said at least three weft supply lines (L) where the wefts are actually set, and

wherein, in the case where the weft-insertion controlling device (65, 75) executes the insertion of the weft of the type corresponding to the group while the weft supply lines (L) in the group successively operate by turns, when the weft supply sensor (3) of any weft supply line (L) in the group detects a weft supply abnormality, the weft-insertion controlling device (65, 75) excludes said any weft supply line (L) and continues the insertion of the weft of the type corresponding to the group using the other weft supply line or lines (L) in the group.

2. The multiple-color weft inserting apparatus (60, 70) of the fluid jet loom according to Claim 1, wherein the weft-insertion controlling device (65, 75) performs said grouping; sets said at least one remaining weft supply line (L) so as to be included in at least one other group, or so as to be provided as at least one single weft supply line (L) that is not grouped, or so as to be included in said at least one other group and provided as said at least one single weft supply line (L); and changes the number of weft supply lines (L) making up the group or groups, so that a weft-insertion operation mode for all of said at least three weft supply lines (L) is changeable, and the weft types that are set at the group or the groups and said at least one single weft supply line (L) differ from each other.

3. The multiple-color weft inserting apparatus (60, 70) of the fluid jet loom according to Claim 2, wherein the weft-insertion controlling device (65, 75) includes a setting unit (15, 25) for setting said weft-insertion operation mode, the setting unit (15, 25) being capable of individually selecting the weft supply lines (L), the setting unit (15, 25) having a first function

that groups selected weft supply lines (L) of said at least three weft supply lines (L) and a second function that sets selected said at least one remaining weft supply line (L) as said at least one single weft supply line (L).

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4. The multiple-color weft inserting apparatus (70) of the fluid jet loom according to Claim 2, wherein the weft-insertion controlling device (65, 75) includes a storage unit (20), which stores a plurality of weft-insertion operation modes, and a setting unit (15, 25), wherein the setting unit (15, 25) selects one operation mode from the plurality of operation modes and sets the predetermined operation mode.

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5. The multiple-color weft inserting apparatus (60) of the fluid jet loom according to Claim 3, wherein the setting unit (15, 25) includes a display screen (15b, 25b) having display areas in correspondence with all of said at least three weft supply lines (L), and wherein display colors of the display areas for the weft supply lines (L) of the same group or each of the same groups are the same, and are different from that of the display area for the other weft supply line (L) not included in the same group or those of the display areas for the other weft supply lines (L) not included in the same group.

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6. The multiple-color weft inserting apparatus (60) of the fluid jet loom according to Claim 5, wherein the display area corresponding to said any weft supply line (L) in the group or any of the groups that is excluded due to the detection of the weft supply abnormality performs a displaying operation in a different mode and with the same color as that corresponding to the weft supply lines (L) in the same group that are used successively by turns for the weft insertion.

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7. The multiple-color weft inserting apparatus (60, 70) of the fluid jet loom according to any one of Claims 1 to 6, further comprising remaining-number monitoring means (35) for excluding said any weft supply line (L) in the group or any of the groups due to the detection of the weft supply abnormality, so that, when the number of weft supply lines (L) in the group or said any of the groups used to continue the weft insertion reaches a predetermined remaining number, the remaining-number monitoring means (35) outputs a loom operation stoppage signal.

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8. The multiple-color weft inserting apparatus (60, 70) of the fluid jet loom according to any one of Claims 1 to 6, further comprising restoring means (10) that is manually operated and that is connected to the weft-insertion controlling device (65, 75), wherein the weft-insertion controlling device (65, 75) restores said any weft supply line (L) that is excluded to a state in which said any weft supply line (L) that is

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excluded performs the weft insertion corresponding to the group or any of the groups, in accordance with a signal output from the restoring means (10).

FIG. 1

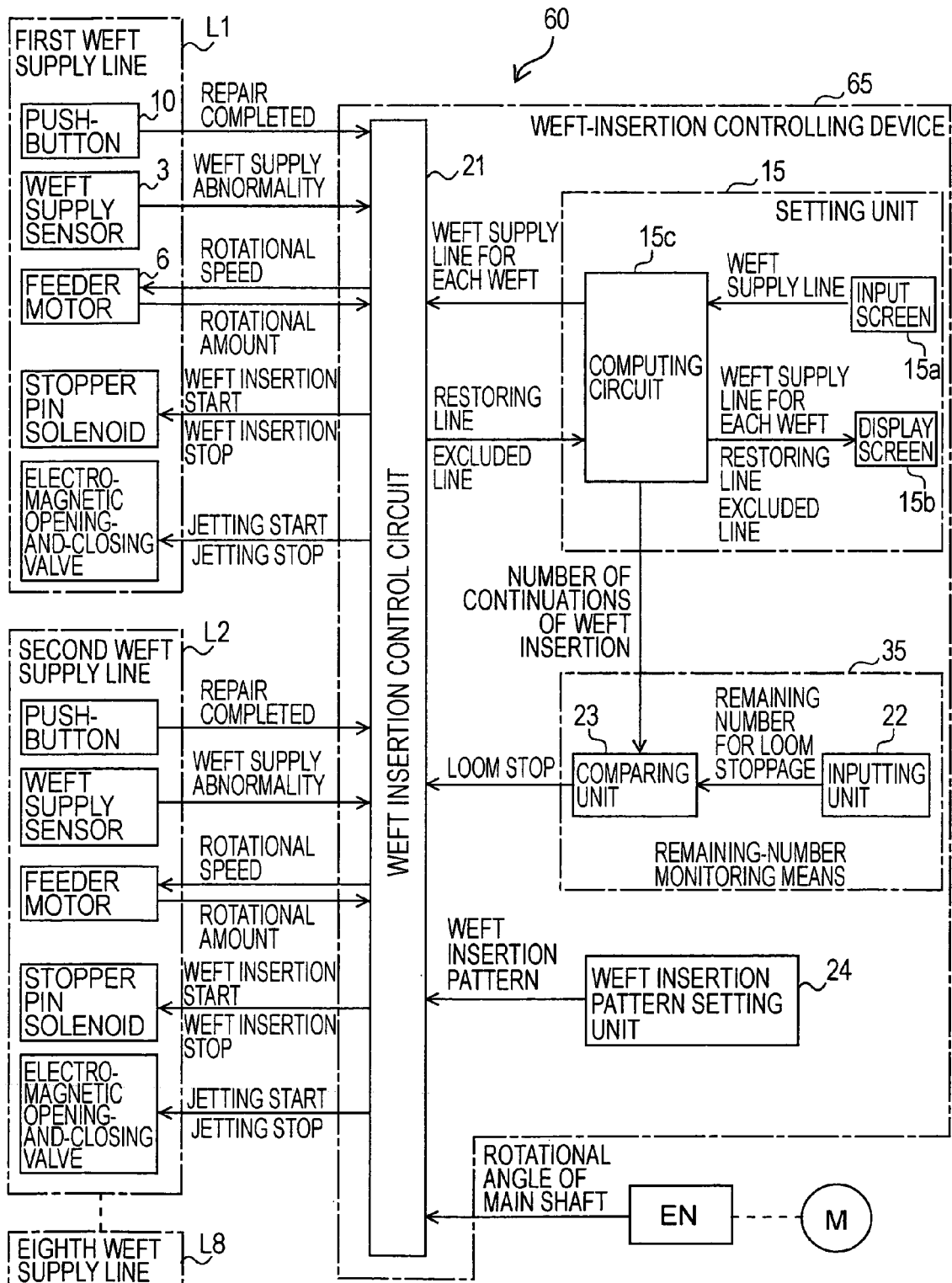


FIG. 2

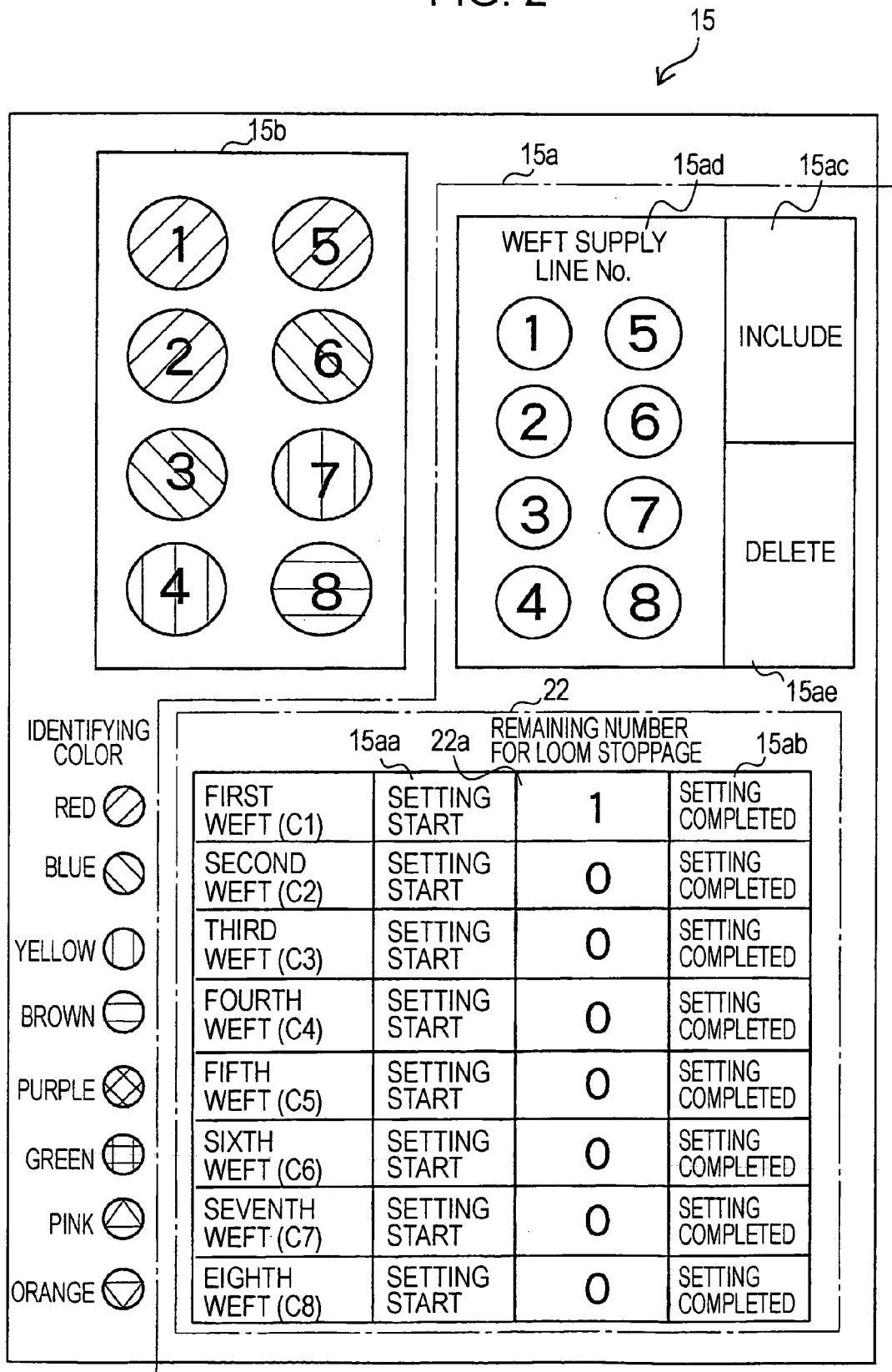


FIG. 3

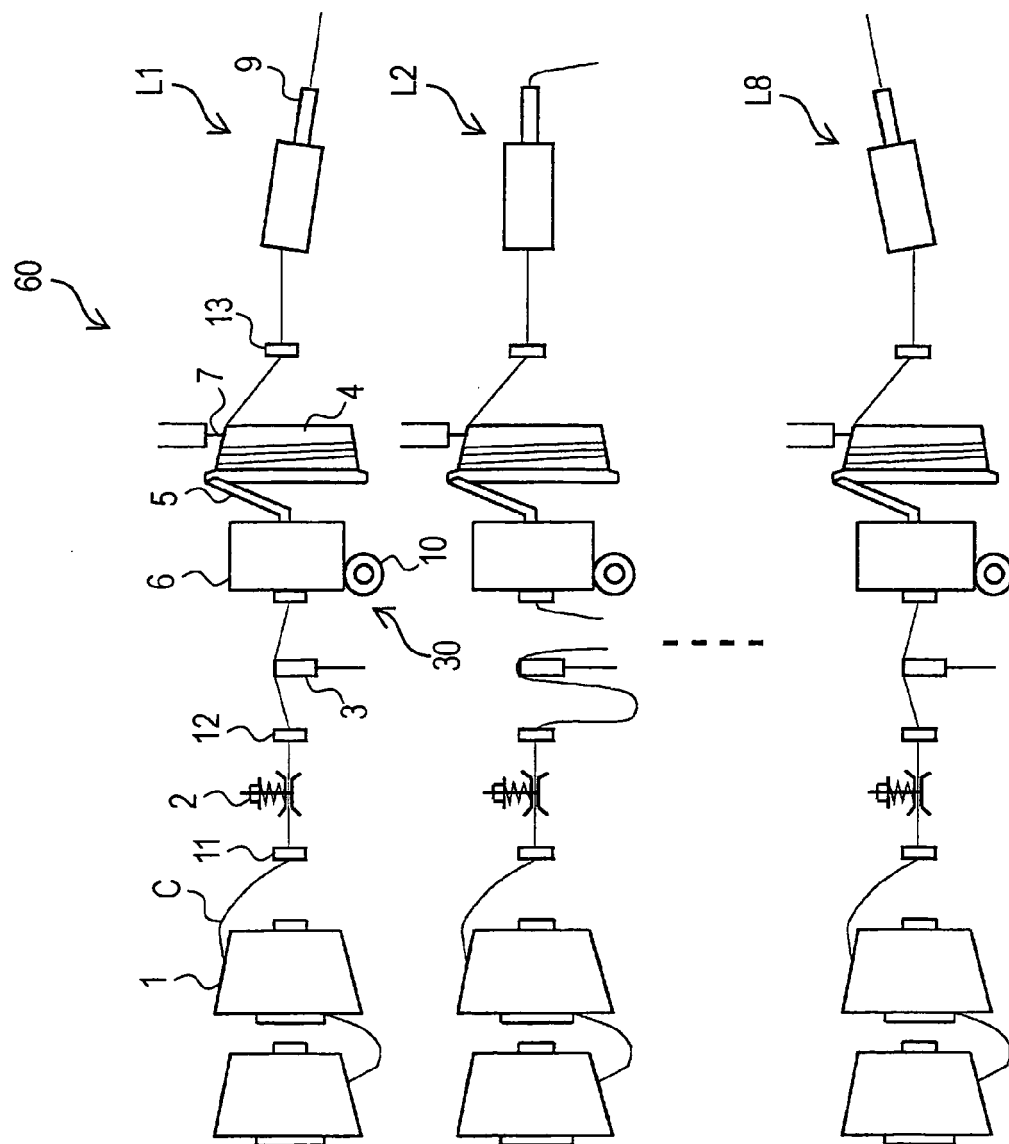


FIG. 4

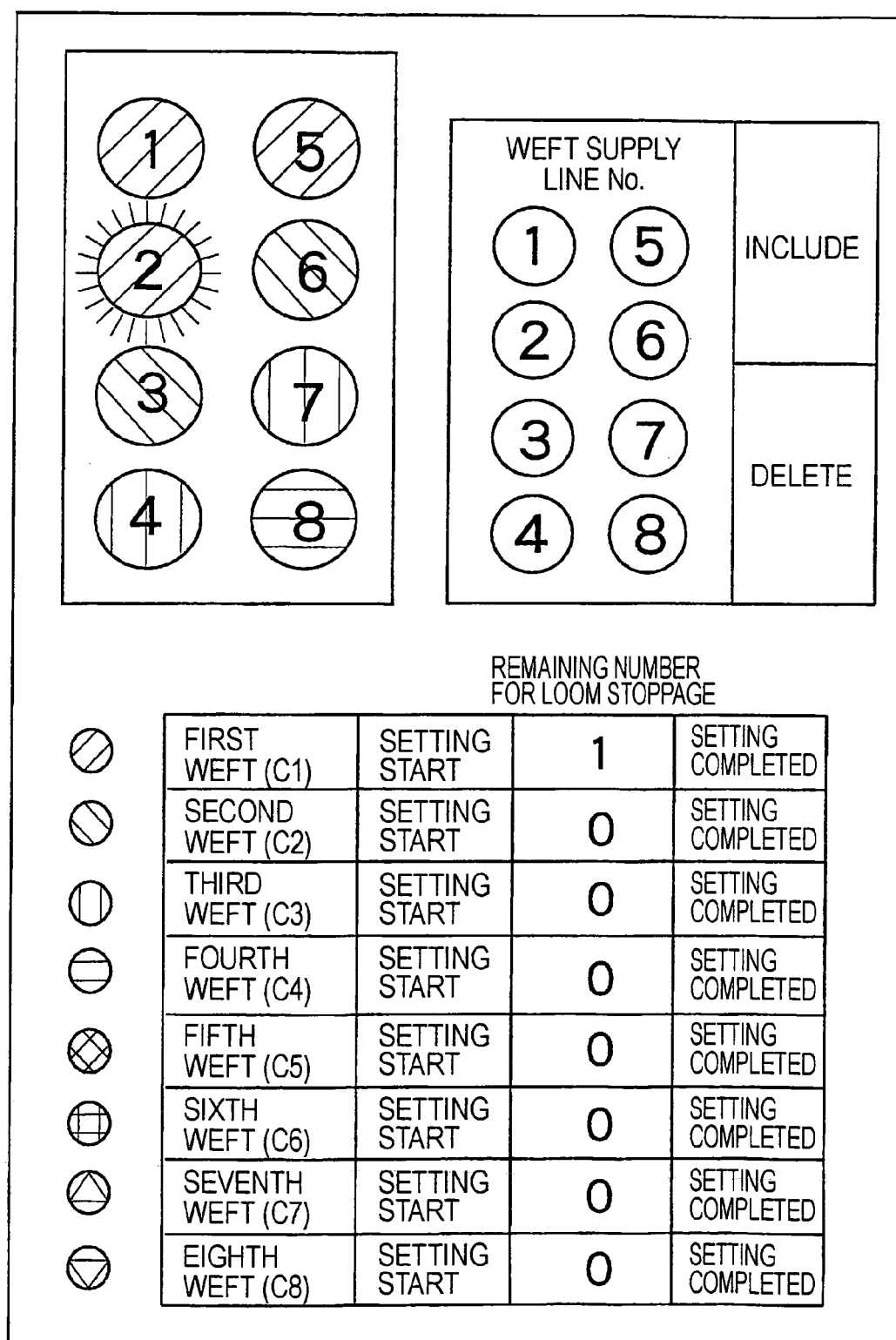


FIG. 5

ONE CYCLE OF WEFT INSERTION PATTERN

WEFT INSERTION NUMBER	1	2	3	4	5	6	7	8	9	10
WEFT	C 1	C 2	C 3	C 4	C 1	C 2	C 1	C 3	C 1	C 2
WEFT SUPPLY LINE	1	3	4	8	2	6	5	7	1	3

WEFT INSERTION NUMBER	11	12	13	14	15	16	17	18	19	20
WEFT	C 3	C 4	C 1	C 2	C 1	C 3	C 1	C 2	C 3	C 4
WEFT SUPPLY LINE	4	8	2	6	5	7	1	3	4	8

WEFT ABNORMALITY IN SECOND WEFT SUPPLY
LINE IS DETECTED

WEFT INSERTION NUMBER	21	22	23	24	25	26	27	28	29	30
WEFT	C 1	C 2	C 1	C 3	C 1	C 2	C 3	C 4	C 1	C 2
WEFT SUPPLY LINE	2	6	5	7	1	3	4	8	5	6

WEFT INSERTION NUMBER	31	32	33	34	35	36	37	38	39	40
WEFT	C 1	C 3	C 1	C 2	C 3	C 4	C 1	C 2	C 1	C 3
WEFT SUPPLY LINE	1	7	5	3	4	8	1	6	5	7

FIG. 6

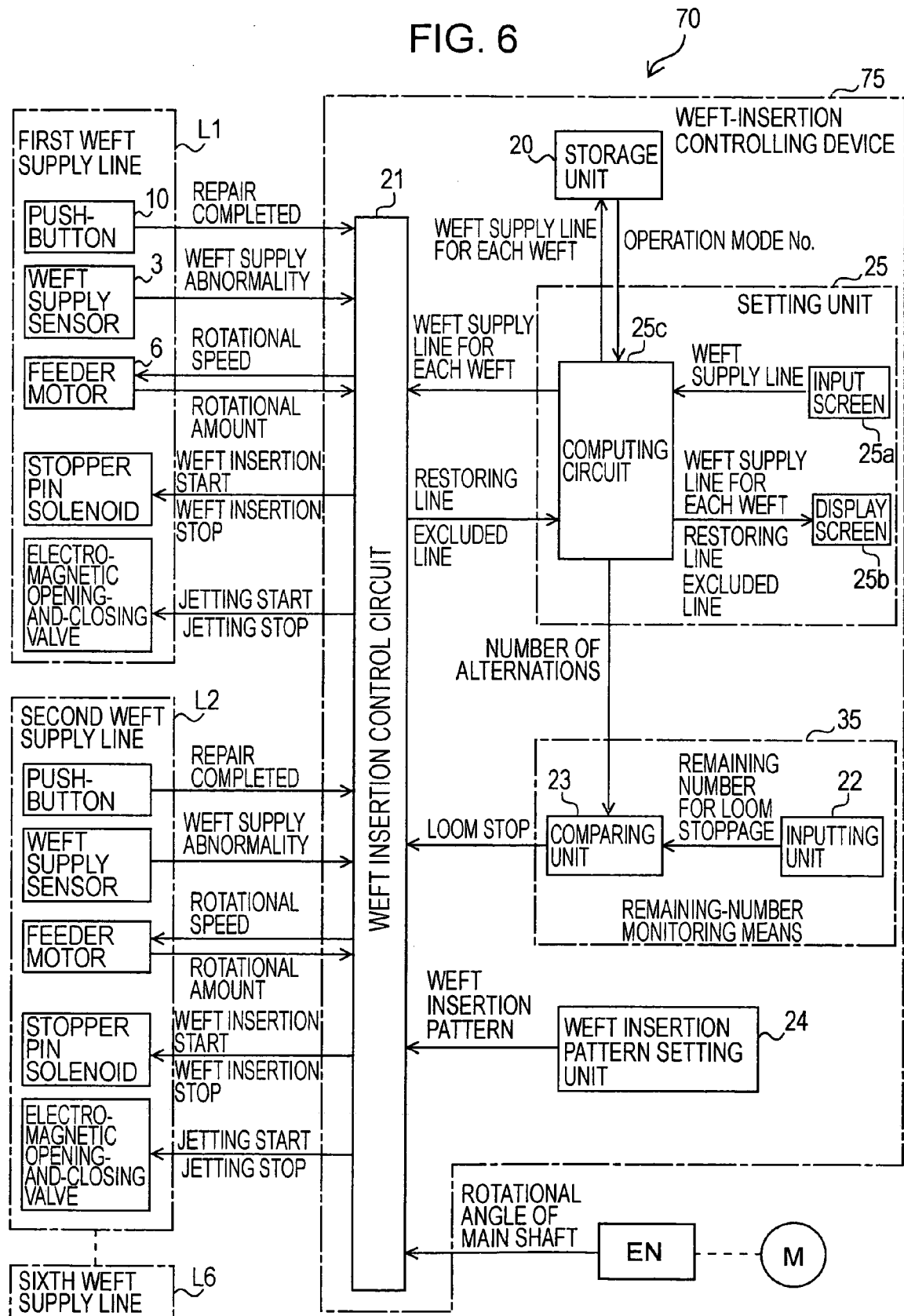


FIG. 7

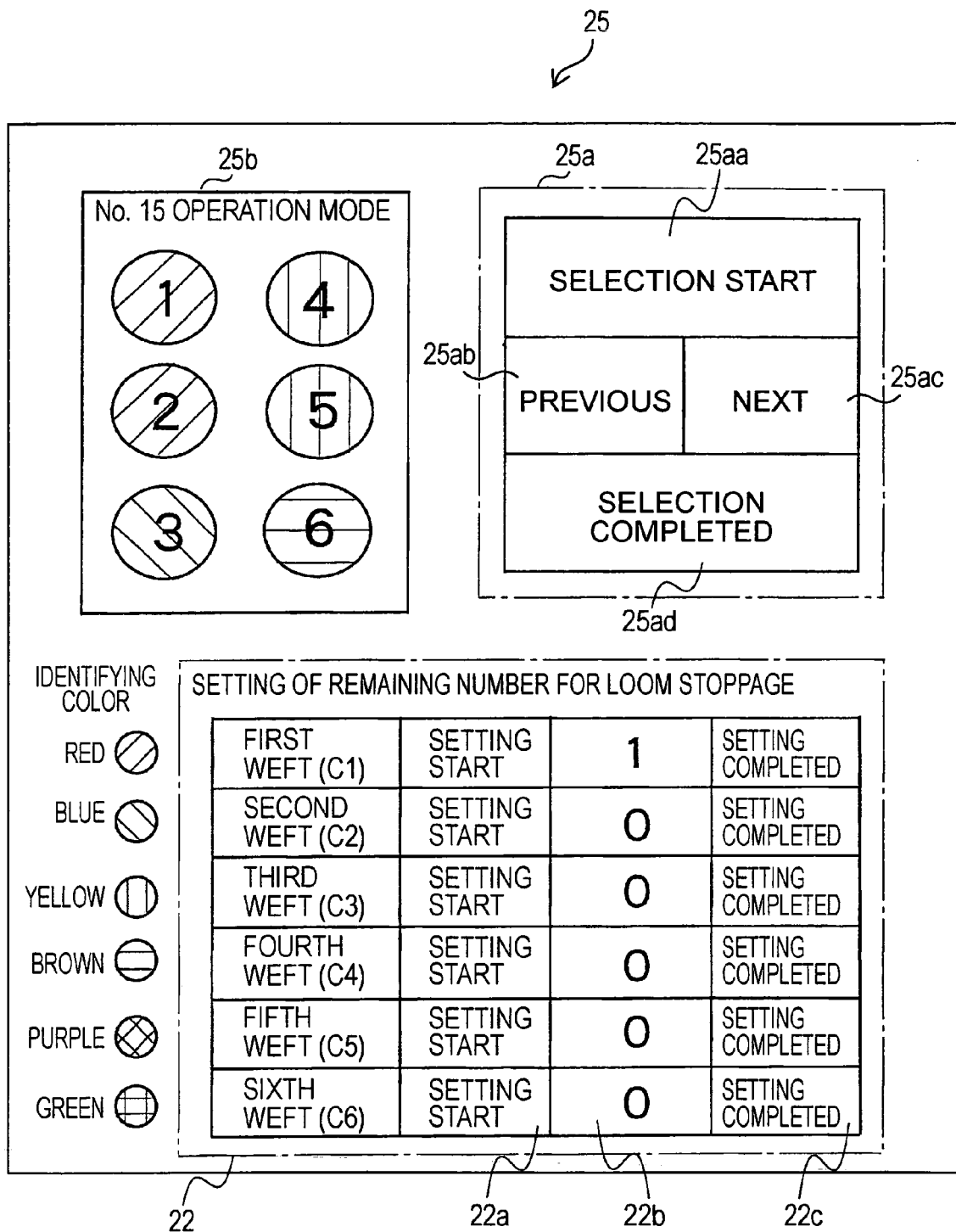
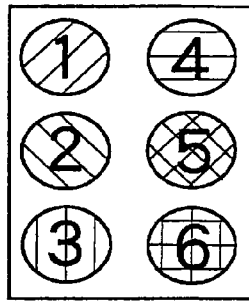
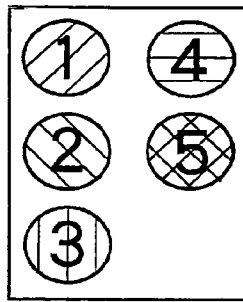


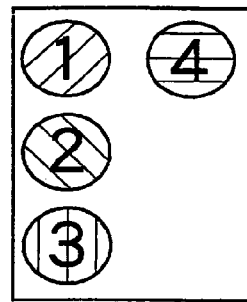
FIG. 8



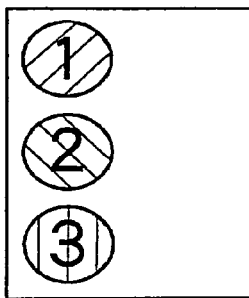
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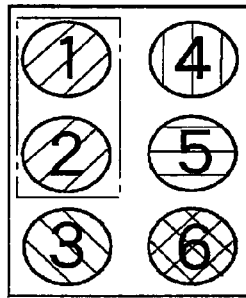
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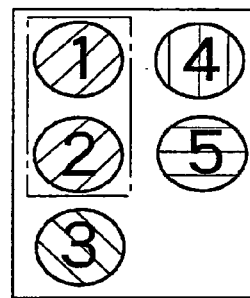
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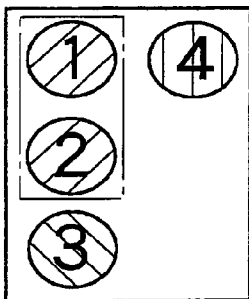
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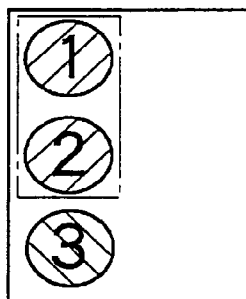
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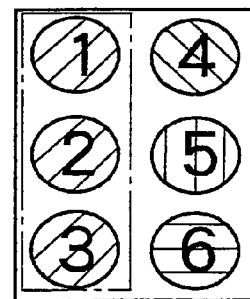
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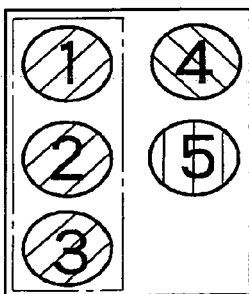
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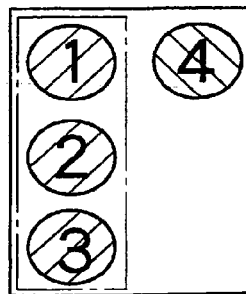
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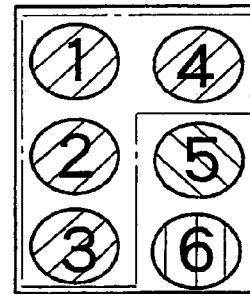
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No. 10

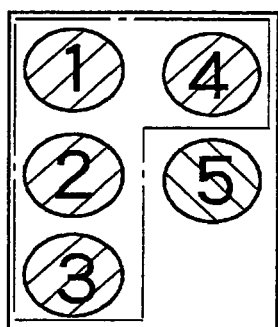


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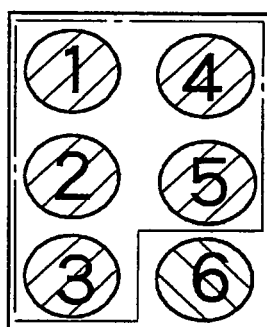


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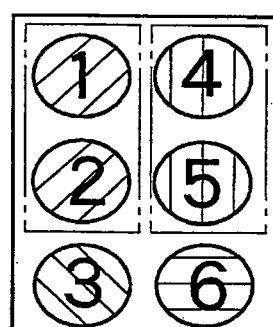
FIG. 9



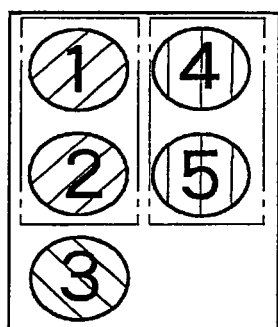
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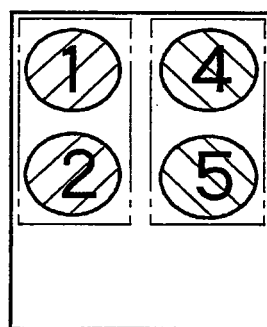
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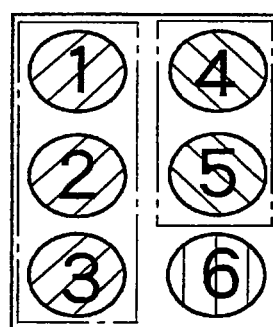
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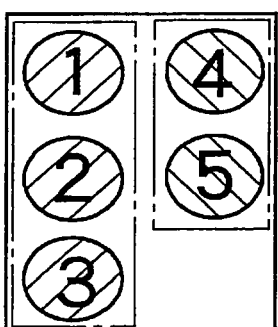
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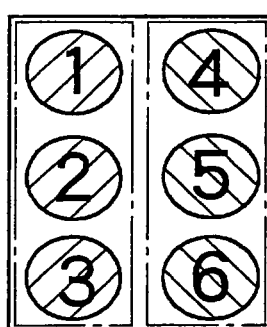
No. 17



No. 18



No. 19



No. 20

REFERENCES CITED IN THE DESCRIPTION

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- JP 2673447 B [0004] [0005]