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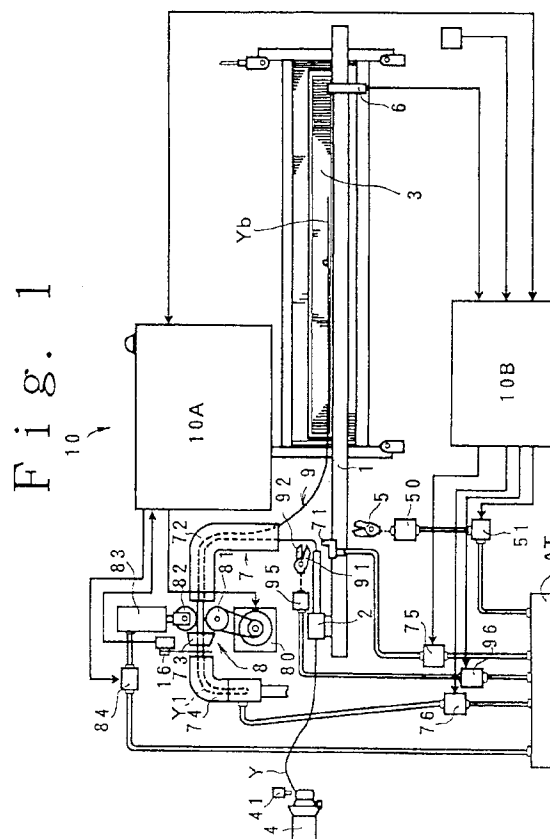
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(54) **Control method and apparatus for disposing a defective weft in a shuttleless loom.**

(57) To prevent a defective weft at the fabric side from being cut, when the defective weft is to be disposed, and to prevent the weft from coming out of the main nozzle and the reserved weft to be measured from being disturbed.

In control method and apparatus for disposing a defective weft in a shuttleless loom, when failure in weft insertion is detected by a weft detecting device (6) which is arranged upon the opposite end of weft insertion, a blow nozzle (71) injects compressed air into a weft guiding duct (72), and guides the defective weft into the duct. Then a nip roller (8) holds the defective, and a cutter (9) cuts the weft. After this, the nip roller (8) pulls out and removes the weft. After the nip roller (8) holds the defective weft, it rotates round preliminarily in the direction according to the kinds of yarns, and controls the condition of the defective weft. Then the cutter (9) cuts the controlled weft.



The present invention relates to control method and apparatus for disposing a defective weft failed in weft insertion in a shuttleless loom and, more particularly, to control method and apparatus for cutting the defect weft after controlling the condition of the defective weft held.

## 5 Prior Art

In the apparatus of the prior art, as disclosed in Japanese Patent Laid-Open No. 184146/1987, when a (not-shown) weft detecting device arranged upon the opposite end of weft insertion detects failure in weft insertion, as shown in Fig. 6, a blow nozzle B arranged in the vicinity of the Injection port of a main nozzle M injects compressed air into a guide G arranged in a direction different from the direction of weft insertion and guides the defective weft Y into the guide G. When take-up means W having a conical projection V is reached by the defective weft Y, it is moved in the direction of arrow to bring its conical projection into abutment against a conical recess V thereby to hold the defective weft Y in a clamped state. After this, the take-up means W rotates to cause the defective weft to be cut in the vicinity of the main nozzle M by a cutter C.

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## Problems to Be Solved by the Invention

In the aforementioned apparatus of the prior art, however, if the defective weft Y is held by the takeup means W, it is cut as it is by the cutter C. As a result, a weft Y1 at the main nozzle side and the defective weft Y2 at the woven fabric side may be entangled as a result of twisting or napping the yarns. In this case, the defective weft Y2 at the fabric side is cut to raise a problem that the defective weft Y2 to be intrinsically removed is left in the fabric.

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In the apparatus of the prior art, moreover, in case the so-called "elastic yarns" such as stretch yarns or core yarns are used as the wefts, their elasticity will cause serious buckling at the cutting time thereby raise a problem that the weft may come out of the main nozzle M or that the reserved yarns to be measured may be disturbed.

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Therefore, we have made various investigations by noting that the condition of a defective weft is controlled by controlling the gripped condition of the defective weft gripped by clamp means, in accordance with the kinds, twist, napping and characteristics of the yarns before the defective weft is cut by a cutter. As a result, we have reached the present invention for preventing the defective weft at the fabric side from being cut at the disposal of the defective weft and for preventing the weft from coming out the main nozzle and the reserved yarns to be measured from being disturbed.

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## Means for Solving the Problems

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According to the present invention (i.e., a first invention as set forth in Claim 1), there is provided a method for disposing a defective weft of a shuttleless loom, in which when failure in weft insertion is detected by a weft detecting device arranged on the opposite end of weft insertion a blow nozzle injects compressed air into a weft guiding duct arranged in a direction different from that of weft insertion, and guides defective weft injected from said main nozzle into said weft guiding duct, in which said defective weft is held, when it reached take-up means, so that the defective weft leading from said main nozzle is cut, and in which the cut defective weft is then pulled out and removed by said take-up means, a control method for disposing a defective weft in a shuttleless loom, comprising: a control step of controlling the condition of the defective weft by rotating said take-up means preliminarily, after the defective weft is held by said take-up means, in the direction according to the kinds of yarns; and a control step of cutting the controlled defective weft.

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According to the present invention (i.e., a second invention as set forth in Claim 2), there is provided in an apparatus for disposing a defective weft of a shuttleless loom, in which when a weft detecting device arranged on the opposite end of weft insertion detects failure in weft insertion a blow nozzle injects compressed air into a weft guiding duct arranged in a direction different from that of weft insertion, and guides defective weft injected from said main nozzle into said weft guiding duct, in which said defective weft is held, when it reached take-up means, so that the defective weft leading from said main nozzle is cut by cutting means, and in which the cut defective weft is then pulled out and removed by said take-up means, a control apparatus for disposing a defective weft in a shuttleless loom, comprising: take-up control means for controlling the condition of the defective weft by rotating said take-up means preliminarily, after the defective weft is held by said take-up means, in the direction designated by a control signal according to the kinds of yarns; and cutting control means for controlling said cutting means so that the defective weft may be cut after controlled.

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## Operations

In the control method thus constructed for disposing a defective weft in a shuttleless loom according to the first invention, when the take-up means holds the defective weft, it rotates preliminarily in the direction according to the kinds of yarns to control the condition of the defective weft in advance. Specifically, a proper tension is applied in case the weft at the main nozzle size and the defective weft at the fabric side are entangled, or the defective weft is cut after the acting tension is lightened, in case the wefts are elastic yarns. In the control apparatus thus constructed for disposing a defective weft in a shuttleless loom according to the second invention, when the take-up means holds the defective weft, the take-up control means designates a rotating direction by a control signal according to the kinds of yarns to rotationally control the take-up means preliminarily thereby to control the condition of the defective weft preliminarily. Specifically, a proper tension is applied to separate the two in case the weft at the main nozzle size and the defective weft at the fabric side are entangled, or a signal is outputted from the cutting control means so that the defective weft is cut by the cutting means, after the acting tension is lightened, in case the wefts are elastic yarns.

## Effects of the Invention

In the control method thus constructed and operated for disposing a defective weft in a shuttleless loom according to the first invention, it rotates preliminarily in the direction according to the kinds of yarns to control the condition of the defective weft in advance. Specifically, a proper tension is applied in case the weft at the main nozzle size and the defective weft at the fabric side are entangled, or the defective weft is cut after the acting tension is lightened, in case the wefts are elastic yarns. As a result, there can be attained effects of preventing the defective weft at the fabric side from being cut and preventing the weft from coming out of the main nozzle due to the buckling and the reserved yarns to be measured from being disturbed.

The control apparatus thus constructed and operated for disposing a defective weft in a shuttleless loom according to the first invention achieves, in addition to the effects similar to those of the aforementioned first embodiment, effects of realizing the aforementioned effects merely by changing the logic of the controller without any change in the mechanism and actuator portion of the defective weft disposing apparatus.

## Embodiment

Next, a control apparatus for disposing a defective weft in a shuttleless loom according to an embodiment of the present invention (or its first and second inventions) will be described in the following with reference to the accompanying drawings. The Figures 1 to 6 show the following:

- Fig. 1 A front elevation showing an apparatus of a first embodiment.
- Fig. 2 A partially enlarged front elevation showing the apparatus of the first embodiment.
- Fig. 3 A system block diagram showing the apparatus of the first embodiment.
- Fig. 4 A flow chart showing the control program of the apparatus of the first embodiment.
- Fig. 5 A diagram for claiming the entangle of a defective weft in the apparatus of the first embodiment.
- Fig. 6 A partially cut-way diagram showing the apparatus of the prior art.

## First Embodiment

A control apparatus for disposing a defective weft in a shuttleless loom according to a first embodiment is realized by applying the present invention to an air jet loom and by controlling take-up control means and cutting control means by means of a computer, as will be described with reference to Figs. 1 to 8.

## Construction of First Embodiment

In a control apparatus for disposing a defective weft in a shuttleless loom according to the first embodiment, as shown in Fig. 1, an air jet loom has its slay 1 rocked along the loom. To the lefthand end of the slay 1, as shown, there is arranged a main nozzle 2 which is composed of six nozzles (although only one is shown as a representative) for multiple colors. At the righthand end of the main nozzle 2, on the other hand, there is arranged a reed 3 which is formed with recesses which are arrayed in the direction of weft insertion to constitute a weft guiding passage, thus constructing a modified reed.

In Fig. 1, a weft Y supplied from a weft measuring reservoir 4 at the lefthand of the main nozzle 2 is guided to the main nozzle 2 and is inserted in synchronism with the weft inserting timing together with a fluid injected from the main nozzle 2 into the weft guiding passage. A cutter 5 for cutting at each weft insertion the weft Y

which is beaten and woven into a fabric and connected to the main nozzle 2 is arranged below the side closer to the main nozzle and positioned to correspond to the cloth fell. A weft detecting device 6 is arranged upon the opposite end of weft insertion. If this weft detecting device 6 detects failure in the weft insertion from the fact that the leading end of the inserted weft fails to reach, an air cylinder 50 communicating with an air tank AT through a solenoid valve 51 is rendered inoperative by closing the solenoid valve 51 so that the cutter 5 may be kept inoperative to hold the state, in which the defective weft Y inserted into the cloth fell of the woven fabric is connected to the main nozzle 2 while being prevented from being cut.

A sucking device 7 is constructed to include: a blow nozzle 71 interposed between the main nozzle 2 and the cutter 5 and directed upward of the main nozzle 2; an inverted J-shaped weft guiding duct 72 opened to face the injection port of the blow nozzle 71; an air guide 73 arranged to face the other opening of the weft guiding duct 72; and an inverted J-shaped sucking duct 74 opened to face the air guide 73. The flow nozzle 71 is connected through a solenoid valve 75 to the air tank AT, and the nozzle opened into the sucking duct 74 is also connected through a solenoid valve 76 to the air tank AT.

A take-up device 8 is constructed of a nip roller, in which a drive roller 81 and a pressure roller 82 are arranged to face each other between the weft guiding duct 72 and the air guide 73. The drive roller 81 is driven by a drive motor 80 which is controlled by a controller 10, and the pressure roller 82 is moved vertically of Fig. 1 by an air cylinder 83, which is connected to the air tank AT through a solenoid valve 84, to take an operative position, in which it is forced to contact with the drive roller 81, and a retracted position, in which it is spaced from the drive roller 81.

Between the air guide 73 and the sucking duct 74, there is interposed a defective weft detecting device 16 for outputting a signal if a defective weft Y1 is sucked to the sucking duct 74.

Just above the injection port of the main nozzle 2, as shown in Fig. 1, there is arranged a cutter 9 which is composed of cutting blades 91 and 92. The defective weft Y1 guided into the weft guiding duct 72 is cut by the cutting blades 91 and 92 before it is taken up by the actions of the two rollers 81 and 82 of the take-up device 8. As shown in Fig. 1, the slay 1 is equipped through a cutter holder 93 with a bracket 94, by which are retained the two cutting blades 91 and 92. The cutting blade 91 is a stationary blade whereas the cutting blade 92 is a movable blade. Between these blades, there is interposed a (not-shown) spring so that the cutting blade 92 acting as the movable blade is pushed and turned against the spring in response to a signal coming from the controller 10 by the action of an air cylinder 95 which is connected through a solenoid valve 96 to the air tank AT, thereby to cut the defective weft Y1.

The controller 10 is constructed, as indicated by two blocks 10A and 10B connected with each other in Fig. 1, of a control computer such as a personal computer which includes: input/output means (I/O) 11 connected with the weft detecting device 6, the defective weft detecting device 16, the solenoid valves 51, 75, 76, 84 and 96 and the drive motor 80; a CPU 12; a ROM 13 stored in advance with a later-described weft disposing program and a control program for controlling the condition of the defective weft; a RAM 14; a keyboard 15 for inputting in advance the kinds of multicolor yarns to be guided into the main nozzle 2 and the nozzle numbers; and a display 17 for displaying the control states and the results.

The ROM 13 in the controller 10 is stored in advance with the weft disposing program and the control program for controlling the condition of the defective weft, as shown in Fig. 4. The ROM 13 is also stored in advance with the optimum values of the direction, angle and speed of the previous rotations, which have been experimentally determined in advance, for controlling the condition, position and tension of the defective weft according to the kinds and characteristics of the yarns.

#### Operations of First Embodiment)

The operations of the apparatus thus constructed according to the first embodiment will be described with reference to the flow chart of Fig. 4. If, during the weft insertion, the leading end Yb of the weft is looped, for example, to fail to reach the position of the weft detecting device 6, as shown in Fig. 6, the weft detecting device 6 inputs the weft insertion failure signal through the input/output means 11 to the control computer 10.

If the weft insertion failure signal is inputted from the weft detecting device 6, the loom rotates as it is and stops at a crank angle of 300 degrees. After this, the loom reverses and stops at a crank angle of 180 degrees to open the opening.

Next, the signal is inputted from the controller 10 to the valve 51 so that the valve 51 stops the supply of compressed air to the air cylinder 50 thereby to render the cutter 5 inoperative.

Moreover, the signal is inputted from the controller 10 to the valves 75 and 76 so that these valves 75 and 76 feed the compressed air to the blow nozzle 71 and the suction duct 74. As a result, the flow nozzle 71 injects to establish a suction flow not only in the weft guiding duct 72 and but also in the suction duct 74 connected through the air guide 73, thereby to suck the defective weft Y1 having failed in the weft insertion. Next, in

response to the signal coming from the controller 10, the compressed air is supplied through the solenoid valve 84 to the air cylinder 83 so that pressure roller 82 is moved downward of Fig. 1 to push the drive roller 81 through the sucked defective weft Y1. Meanwhile, the drive signal is also outputted from the controller 10 to the drive motor 80 so that the defective weft Y1 is wound leftward of Fig. 1.

If the defective weft detecting device 16 arranged between the air guide 73 and the opening of the sucking duct 74 detects the defective weft Y1, it outputs its signal to the controller 10.

If the signal is inputted from the defective weft detecting device 16, the controller 10: decides the kind and characteristics of the weft inserted from the order of the multi-color nozzles 2, which are inputted in advance by the keyboard 15, from the injection signal or the like of the main nozzle; extracts the optimum rotation, angle and speed of the previous rotation according to the decision from the main in the ROM 13; and outputs the previous rotation signal to the drive motor 80. By the rotational drive of the drive motor 80, the nip roller 8 is caused to rotate preliminarily in accordance with the kind and characteristic of the yarns, i.e., in the (forward) direction to apply a proper tension to the entangleable yarns such as the hard twist yarns, the highly napped yarns or the yarns having long fluffs, and reverses (i.e., in the backward direction) to release the buckling thereby to damp the acting tension for the highly elastic yarns such as the stretch yarns or the core yarns, thereby to effect the control within the optimum angular range and to the optimum speed.

After the controls described above, the solenoid valve 96 is opened in response to the signal coming from the controller 10 to supply the compressed air to the air cylinder 95 so that the cutting blade 92 acting as the movable blade is turned to cut the defective weft Y1 in the vicinity of the injection port of the main nozzle 2.

When the defective weft Y1 is cut, the drive motor 80 is driven so that the defective weft Yb woven is wound by the nip roller 8 and removed through the sucking duct 74. Then the loom is restarted after disposal of the weft having failed in the weft insertion.

#### Effects of First Embodiment

In case the weft Y1 is caused to fail in its insertion by the twisting or napping so that it is entangled by the weft retained by the main nozzle 2, as shown in Fig. 5, the apparatus thus constructed and operated according to the first embodiment is based upon the data of the ROM 13 to preliminarily rotate the nip roller 8 quickly forward to 20 degrees (i.e., at the optimum speed and to the optimum angle) so that the two wefts are released from their entangled state into the state shown in Fig. 1 by applying a proper tension to the defective weft Y1 and the weft retained by the main nozzle 2. Then, only the weft retained by the main nozzle 2 is cut to raise an effect that the woven defective weft Yb to be removed can be prevented from being cut.

In case, on the other hand, a failure occurs when the elastic yarns such as the stretch yarns or the core yarns are inserted, the apparatus of the first embodiment is based upon the data of the ROM 13 to preliminarily reverse the nip roller 8 slowly to 40 degrees at the optimum speed and at the optimum angle thereby to sufficiently release the tension acting upon the defective weft. After this, the weft is cut by the cutter 9 to raise an effect of preventing the weft from coming out of the main nozzle 2 and the reserved weft to be measured from being disturbed.

According to the apparatus of the first embodiment, moreover, the conditions (i.e., the direction, angle and speed of the rotation) of each weft inputted in response to the injection signal of the nozzle are determined on the basis of the optimum data stored in advance in the ROM 13 and determined by the experiments if the kinds of the yarns to be fed from the main nozzle 2 from the six multi-color nozzles are inputted in advance from the keyboard 15. As a result, there is achieved an effect of controlling the optimum preliminary rotation and the state of the defective weft in accordance with the yarns.

According to the apparatus of the first embodiment, still moreover, the control system is constructed of a personal computer so that the control contents can be determined according to the control program. As a result, the control system can be easily modified, if necessary, and made flexible. In case a weft composed of highly twisted yarns and elastic yarns is newly used, for example, the control system is enabled to softly cope with even the new weft by inputting the various data of the new weft to the ROM 13 to realize a composite preliminary rotation.

The embodiment thus far described is presented merely as an example for the description, and the present invention should not be limited thereto but can be modified and added without departing from the scope of the Claims.

The foregoing embodiment is exemplified by opening and closing the valve 51 and the valves 75 and 76 after the loom stops and reverses. Despite of this exemplification, the above-specified valves may be opened and closed simultaneously with or prior to the stop and reverse of the loom.

The foregoing embodiment is exemplified by constructing the control apparatus of the personal computer but can be modified by constructing the control apparatus of a hardware having similar functions.

The foregoing embodiment is exemplified by the multi-color loom, but the present invention can naturally be applied to a monochromatic loom having only one main nozzle. The present invention can naturally adopt an embodiment in which the state of a defective weft is controlled by likewise controlling the preliminary rotation in accordance with the kind and characteristic of the weft to be inserted by that single main nozzle.

To prevent a defective weft at the fabric side from being cut, when the defective weft is to be disposed, and to prevent the weft from coming out of the main nozzle and the reserved weft to be measured from being disturbed. In control method and apparatus for disposing a defective weft in a shuttleless loom, when failure in weft insertion is detected by a weft detecting device 6 which is arranged upon the opposite end of weft insertion, a blow nozzle 71 injects compressed air into a weft guiding duct 72, and guides the defective weft into the duct. Then a nip roller 8 holds the defective, and a cutter 9 cuts the weft. After this, the nip roller 8 pulls out and removes the weft. After the nip roller 8 holds the defective weft, it rotates round preliminarily in the direction according to the kinds of yarns, and controls the condition of the defective weft. Then the cutter 9 cuts the controlled weft.

#### [Brief Description of the Drawings]

#### Designation of Reference Numerals

|    |                             |
|----|-----------------------------|
| 1  | Slay                        |
| 2  | Main Nozzle                 |
| 3  | Reed                        |
| 4  | Weft Measuring Reservoir    |
| 5  | Cutter                      |
| 6  | Weft Detecting Device       |
| 7  | Sucking Device              |
| 8  | Take-up Device (Nip Roller) |
| 9  | Cutter                      |
| 10 | Controller                  |
| 71 | Blow Nozzle                 |
| 72 | Weft Guiding Duct           |
| 73 | Guiding Duct                |
| 74 | Sucking Duct                |
| 80 | Drive Motor                 |
| 81 | Drive Roller                |
| 82 | Pressure Roller             |
| 91 | Stationary Blade            |
| 92 | Movable Blade               |

#### Claims

1. In a method for disposing a defective weft (Yb) of a shuttleless loom, in which when failure in weft insertion is detected by a weft detecting device (6) arranged on the opposite end of weft insertion a blow nozzle (2) injects compressed air into a weft guiding duct (72) arranged in a direction different from that of weft insertion, and guides defective weft (Y, Yb) injected from said main nozzle into said weft guiding duct (72), in which said defective weft (Y, Yb) is held, when it reached take-up means (81, 82), so that the defective weft leading from said main nozzle (2) is cut, and in which the cut defective weft (Y, Yb) is then pulled out and removed by said take-up means (81, 82),
  - a control method for disposing a defective weft (Y, Yb) in a shuttleless loom, comprising:
    - a control step of controlling the condition of the defective weft (Yb) by rotating said take-up means (81, 82) preliminarily, after the defective weft is held by said take-up means (81, 82), in the direction according to the kinds of yarns; and
    - a cutting step of cutting the controlled defective weft.
2. In an apparatus for disposing a defective weft (Y, Yb) of a shuttleless loom, in which when a weft detecting device (6) arranged on the opposite end of weft insertion detects failure in weft insertion a blow nozzle (71) injects compressed air into a weft guiding duct (72) arranged in a direction different from that of weft insertion, and guides defective weft (Y, Yb) injected from said main nozzle (2) into said weft guiding duct

(72), in which said defective weft (Y, Yb) is held, when it reached take-up means (81, 82), so that the defective weft (Y, Yb) leading from said main nozzle (2) is cut by cutting means (91), and in which the cut defective weft (Y, Yb) is then pulled out and removed by said take-up means (81, 82), the control apparatus for disposing a defective weft (Y, Yb) in a shuttleless loom, comprising:

take-up control means (10A) for controlling the condition of the defective weft (Yb) by rotating said take-up means (81, 82) preliminarily, after the defective weft is held by said take-up means (81, 82), in the direction designated by a control signal according to the kinds of yarns; and

cutting control means (10B) for controlling said cutting means so that the defective weft (Yb) may be cut after controlled.

3. In a method for disposing a defective weft (Yb) of a shuttleless loom, in which when failure in weft insertion is detected by a weft detecting device (6) arranged on the opposite end of weft insertion a blow nozzle (2) injects compressed air into a weft guiding duct (72) arranged in a direction different from that of weft insertion, and guides defective weft (Y, Yb) injected from said main nozzle into said weft guiding duct (72), in which said defective weft (Y, Yb) is held, when it reaches take-up means (81, 82), and that the defective weft leading from said main nozzle (2) is cut, and in which the cut defective weft (Y, Yb) is then pulled out and removed by said take-up means (81, 82),

the control method for disposing a defective weft (Y, Yb) in a shuttleless loom, comprising:

a control step of controlling the condition of the defective weft (Yb) by rotating said take-up means (81, 82) in a first removing step to stretch that part of the defective weft (Y), that extends from the main nozzle (2) to the take-up means (81, 82), and then to stop; thereafter

a cutting step of cutting the controlled defective weft with the cutting means; and thereafter

and a second removing step of said take-up means (81, 82), for removing said defective weft (Yb) from the weaving shed.

4. In an apparatus for disposing a defective weft (Y, Yb) of a shuttleless loom, in which, when a weft detecting device (6) detects failure in weft insertion, a blow nozzle (71) for injecting compressed air into a weft guiding duct (72) arranged opposite the nozzle (71) and in a direction different from that of weft insertion, said duct (72) guiding defective weft (Y, Yb) injected from said nozzle (72) into take-up means (81, 82), further comprising cutting means (91), for cutting defective weft (Y, Yb) leading from a main nozzle (2) to said take-up means (81, 82) by which the cut defective weft (Y, Yb) is then pulled out and removed;

the control apparatus for disposing a defective weft (Y, Yb) in a shuttleless loom, comprising:

take-up control means (10A) for controlling the condition of the defective weft (Yb) by rotating said take-up means (81, 82) immediately, when the defective weft is held by said take-up means (81, 82), in the direction designated by a control signal according to the kinds of yarns; and

cutting control means (10B) for controlling said cutting means in a way that the defective weft (Yb) leading from the main nozzle is cut when the defective weft (Yb) has reached the take-up means (81, 82) and prior to be removed in total from the weaving shed.

5. A method as claimed in claim 1 or 3, wherein said take-up means include a drive roller (81) and a pressure roller (82).

6. An apparatus as claimed in claim 2 or 4, wherein said take-up means include a drive roller (81) and a pressure roller (82).

7. Loom with a control device working according to a method as claimed in any of claims 1, 3 or 5.

8. Loom including a control device as claimed in any of claims 2, 4 or 6.



Fig. 2

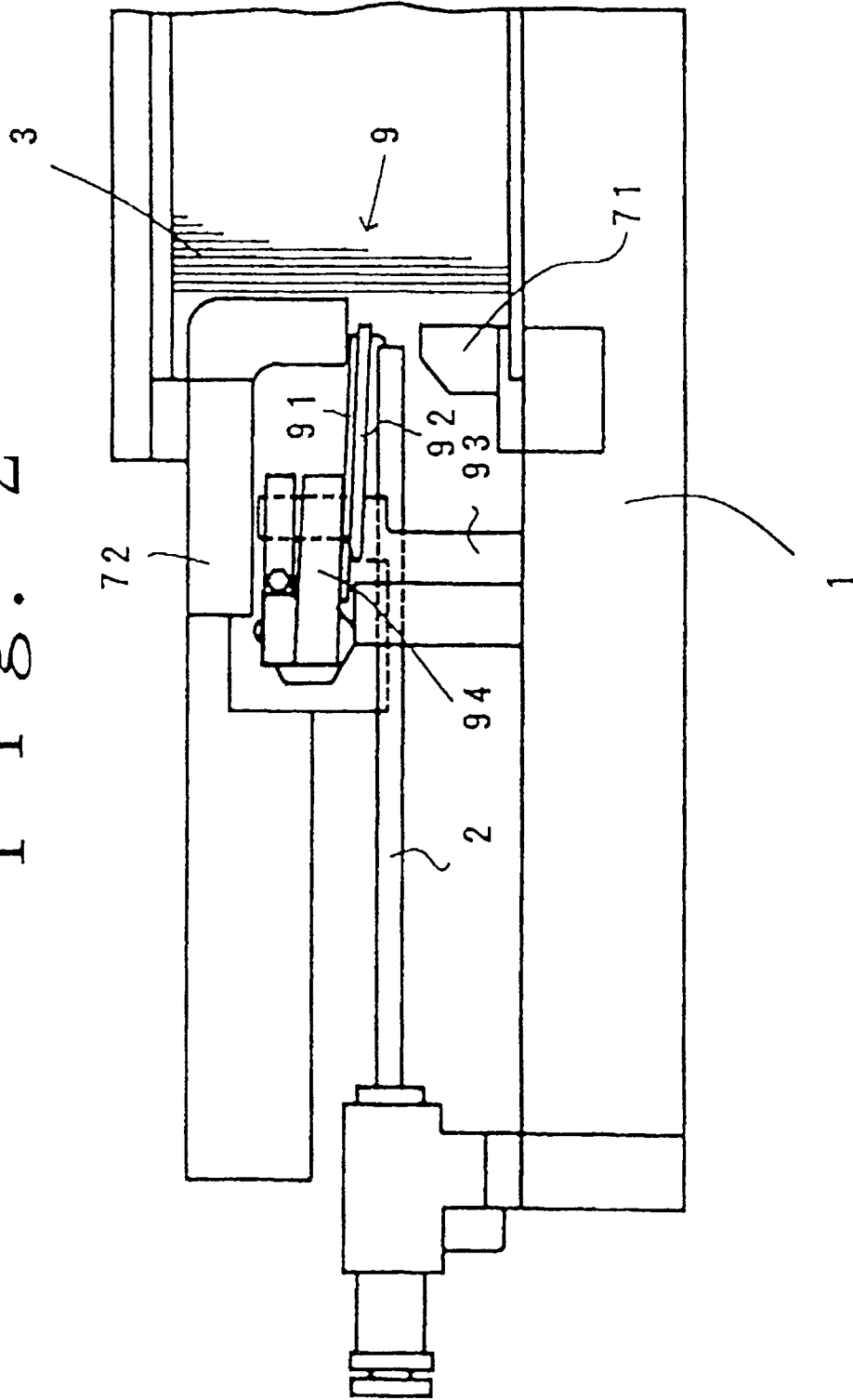


Fig. 3

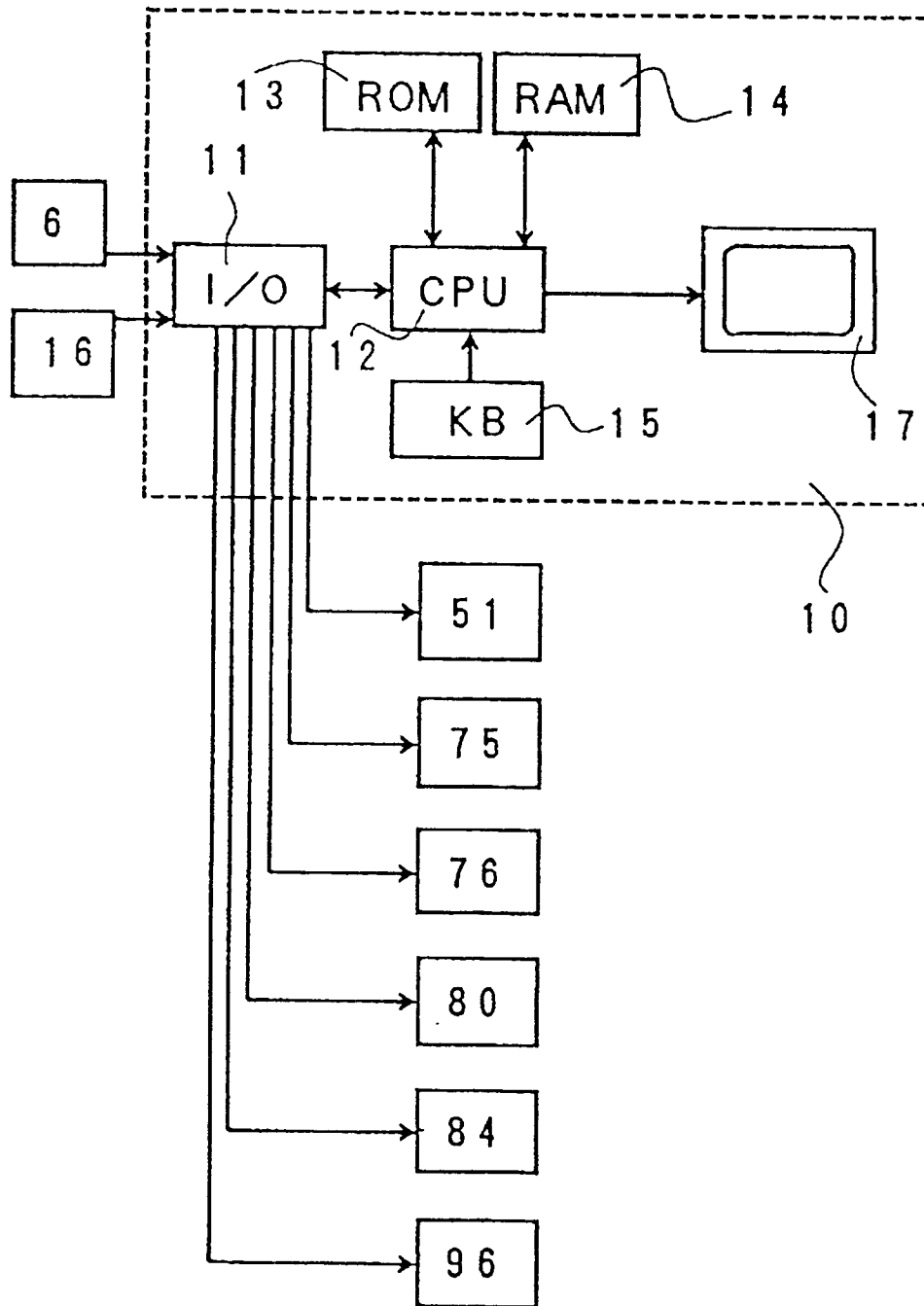
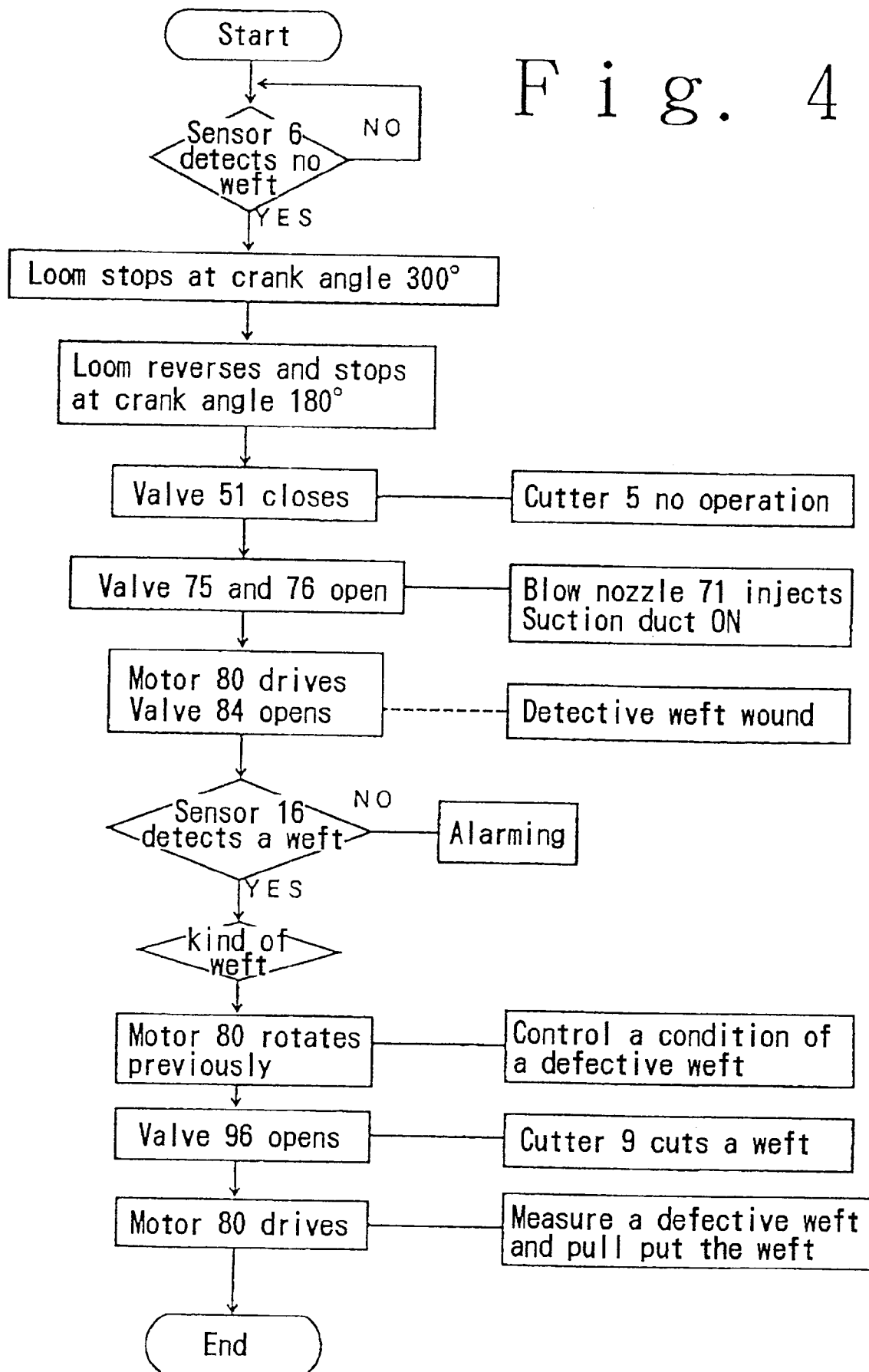
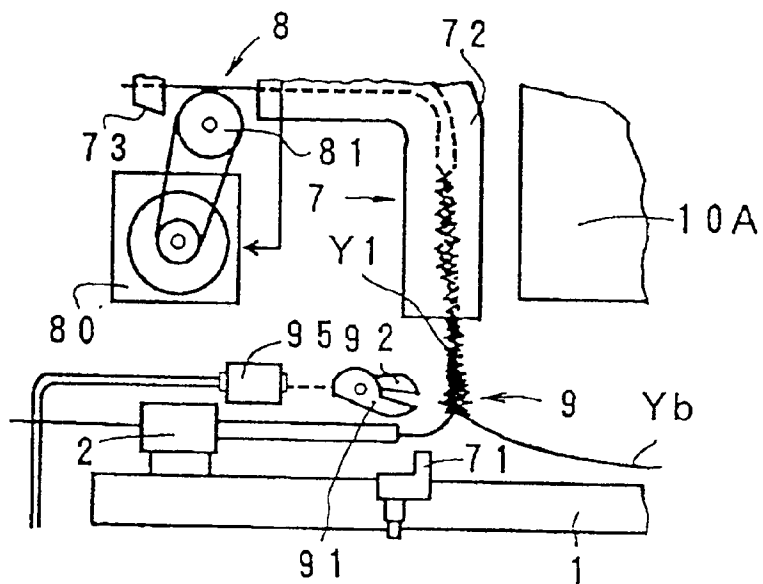


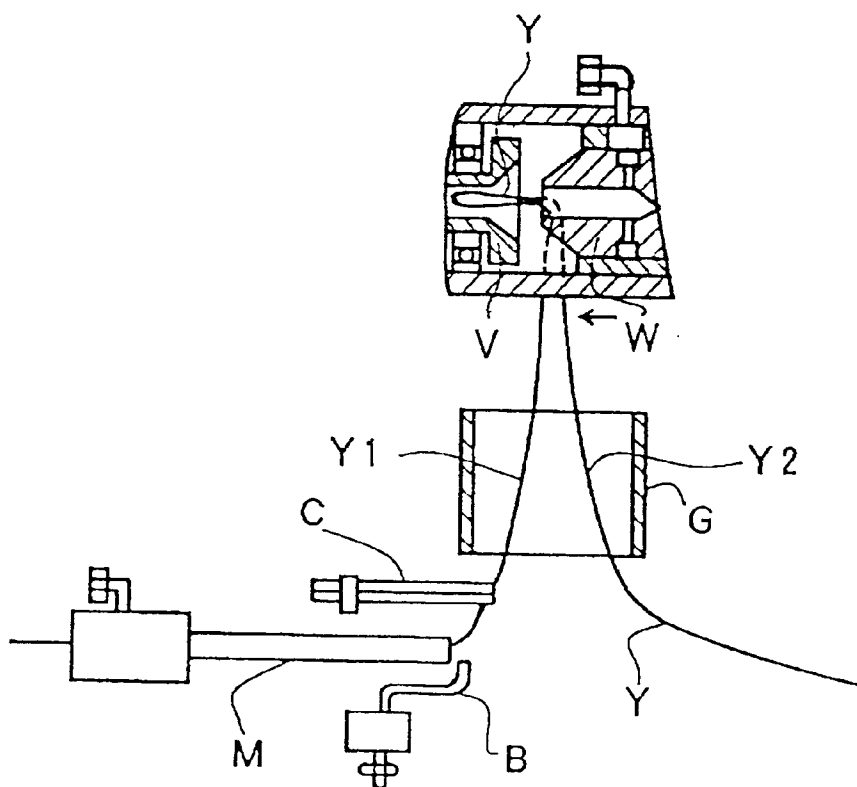
Fig. 4



F i g. 5



F i g. 6





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 92 81 1000

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                       |                                                   |                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Citation of document with indication, where appropriate, of relevant passages                                                                         | Relevant to claim                                 | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| D,A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Section Ch, Week 8738, 12 August 1987<br>Derwent Publications Ltd., London, GB;<br>Class F02, AN A05<br>& JP-A-62 184 146 (TSUDAKOMA)<br>* abstract * | 1-8                                               | D03D47/30                                     |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | EP-A-0 200 168 (TSUDAKOMA CO.)<br>* page 2, column 2, line 24 - line 40;<br>figures 1-15 *                                                            | 1-8                                               |                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US-A-4 890 650 (KINPEI MITSUYA)<br>* column 4, line 16 - column 6, line 30;<br>figures 1-19 *                                                         | 1-8                                               |                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US-A-4 749 006 (OSAMU MIYAMOTO)<br>* column 5, line 11 - line 30; figures 1-9<br>*<br><br>-----                                                       | 1-4                                               |                                               |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                       |                                                   | TECHNICAL FIELDS SEARCHED (Int. Cl.5)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                       |                                                   | D03D                                          |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                       | Date of completion of the search<br>12 MARCH 1993 | Examiner<br>HENNINGSEN O.                     |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>I : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>.....<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                       |                                                   |                                               |

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