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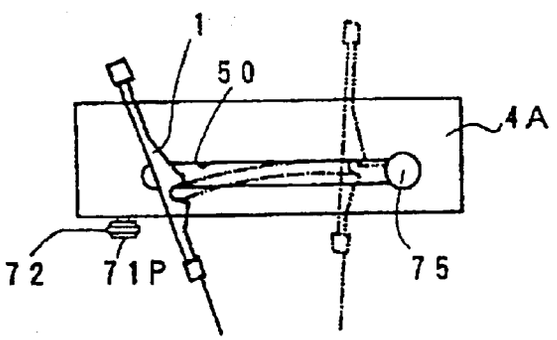
(54) Apparatus for disposing of a cut-off weft piece in a jet loom.

(57) To provide an apparatus in a jet loom that can ensure removal of a cut-off weft piece from a cloth fell without allowing the weft piece held by the apparatus to be released therefrom when the reed is retracted. [STRUCTURE]

The apparatus comprises weft introducing means 1 disposed on a stationary frame 96 of the loom on the opposite side of the reed I with respect to the side from which a weft is inserted and including an elongated hole 50 formed in correspondence with a path described by weft guide passage of the reed 1 when it is swung back and forth, for introducing through said hole 50 a weft piece CY cut off an inserted weft, a waft sensor 6 for detecting the cut-off weft piece, weft removing means 7 including a pair of drive and follower rollers 71 and 73 for withdrawing the cut-off weft piece, and suction means 8 for drawing and discarding the cut-off weft piece by suction.

Fig. 1



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The present invention relates to an apparatus in a jet loom for removing from a cloth fell of woven fabric a weft piece which has been cut off an inserted weft due to a break in the weft and disposing of such cut-off weft piece.

[PRIOR ART]

Publication of unexamined Japanese patent application No. 62-215047 (1987) discloses an apparatus which includes a body B thereof fixedly mounted on a slay, a suction nozzle SN arranged in the body B and a pair of rollers PR disposed downstream of the suction nozzle SN, as shown in FIG. 12. In operation, a cut weft piece CY is introduced into the body B through the suction nozzle SN and then pulled out by the paired rollers PR.

(PROBLEMS THAT THE INVENTION IS TO SOLVE]

In the above apparatus, if a break occurs in an inserted weft, the loom is brought to an automatic stop at a predetermined crank angle, and one end portion of a weft piece CY cut off the inserted weft is held in the apparatus while the other end portion thereof remains on a reed-beaten cloth fell. If the weft piece is short, however, the apparatus is moved together the slay when the loom is reversed to the above crank angle position and, therefore, the weft piece is pulled off the rollers PR in the apparatus before the loom is stopped. Under such a circumstance, the apparatus becomes unable to remove the cut-off, weft piece from the cloth fell.

The present inventor noted that an apparatus for disposing of a cut-off weft piece should be installed not on a movable slay, but on a stationary frame of the loom, that weft introducing means should be provided in facing relation to the entire path of the weft guide passage of the reed, and also that the apparatus should be so arranged as to receive properly a weft piece coming out from a shad a*t any time during weft inserting or beating operation of the loom and to hold the same weft piece securely. The inventor has made the invention by providing.an apparatus which is capable of preventing a cut-off weft piece from being pulled off the apparatus thereby to ensure removal of the cut-off weft piece.

[MEANS SOLVING THE PROBLEM]

In order to. solve the above problem, the present invention (first invention as recited in claim 1) provides an apparatus of disposing of a weft piece in a jet loom, comprising:

weft introducing means disposed on a stationary frame of the loom on the opposite side of a reed with respect to the side from which a weft is inserted and including an opening formed in correspondence with a path described by weft guide passage of the reed when it is swung back and forth, for introducing through said opening a weft piece cut off an inserted weft;

weft detecting means for detecting said cut-off weft piece; and

weft removing means including a pair of drive and follower rollers movable relative to each other and operable in response to an output signal from said weft detecting means to withdraw said cut-off weft piece.

Further, the invention (second invention as recited in claim 2) provides an apparatus according to claim 1, further comprising suction means for drawing into said apparatus said cut-off w eft piece by suction.

[OPERATION OF THE INVENTION]

In the apparatus according to the first invention, a cutoff weft piece coming out at any time during the weft inserting or beating-up operation of the loom is receives and introduces by the weft introducing means into the appartus and, upon detection of the cut-off weft piece by the weft detecting means, the weft piece is held by a pair of rollers of the weft removing means to be pulled out from the cloth fell. Because the apparatus is fixed to a stationary frame of the loom, the relative position between the apparatus and the cutoff weft piece beaten to the cloth fell remains unchanged even when the reed is moved to its retracted position.

In the apparatus according to the second invention, in addition to the above operations in the first invention, the suction means produces an air flow that acts on the cut-off weft piece to draw the same into the apparatus.

[EFFECT OF THE OPERATION]

In apparatus of the first invention, unlike the conventional apparatus in which the position thereof relative to the cut-off weft piece at the cloth fell is changed with retracting movement of the reed, the weft piece held by the apparatus will not be released therefrom during the retracting movement of the reed, so that the weft piece can be removed from the cloth fell with certainty by the paired rollers of the weft removing means.

Addition of the suction means according to the second invention further improves the certainty with which the cut-off weft piece is removed.

(EMBODIMENTS)

The following will describe embodiments of the present invention while having reference to the accompanying drawings.

(First embodiment)

First embodiment which is illustrated in FIGS. 1 to 6. In this embodiment, the weft introducing means generally designated by reference numeral 5 includes an elongated hole 50 which is used also as a guide slot for guiding the movement of a driven roller (or follower roller) 73.

(Structure of the first embodiment)

Referring to FIG. 1 to 3, reference numeral 1 designates a reed having a plurality reed wires each having a weft guide recess forming a weft guide passage of the reed with similar recesses formed in other reed wires. Reference numeral 2 designates a weft feeler disposed in front of the reed 1 and numeral 3 a weft sensor, or double-weft feeler, located down-stream of the weft feeler 2 with respect to the direction in which the weft is moved for insertion. An L-shaped guide member 4, which has a vertical portion 4A providing a guide plate and a horizontal portion 4B. is fixedly mounted on a stationary frame 96 of the loom with the guide plate 4A thereof located slightly downstream of the sensor 3 and in a perpendicular relation to the reed 1. As shown in FIG. 1, the guide plate 4A is formed with a horizontally elongated hole 50 for receiving therethrough a cut-off weft piece CY. The hole 50 has a length which is greater than the distance over which the weft guide passage of the reed 1 is moved by swinging motion of the reed (indicated by phantom lines), and a width which is greater than the opening dimension of the weft guide passage as seen in the cross section.

Reference numeral 7 designates weft removing means which inoludes a drive roller 71 rotatably supported by the horizontal portion 4B of the guide member 4 in alignment with the reed 1 when it is moved to its retracted position. A drive motor 70 is provided at a slight distance from the roller 71, and pulleys 71P and 70P of the roller and the motor are interconnected via a belt '72 so that the roller 71 is driven to rotate by the motor 70.

The weft removing means 7 further includes a driven roller (or follower roller) 73 rotatably supported by one portion 74A of an L-shaped member 74 which is normally located at a position corresponding to the cloth fell of a woven fabric. A guide roller 75 is supported by the L-shaped member 74 and arranged to be slidable along the elongated hole 50. The member 74 is connected to an air cylinder 76 which is operated by air pressure supplied from a solenoid-operated valve 77 so that, when the valve is opened to actuate the air cylinder 76, the member 74 is moved toward the drive roller 71 until the driven roller 73 contacts its associated drive roller 71. The movement of the member 74 is guided by the guide roller 75 sliding linearly along the elongated hole 50.

Reference numeral 8 designates suction means which includes a duct pipe 80 mounted on the other portion 74B of the L-shaped member 74. The duct pipe 80 has an open inlet 81 facing downward an d a blow nozzle 82 connected to the duct pipe for blowing air in the longitudinal direction of the pipe (or downward as seen in FIG. 2) for producing suction adjacent the duct pipe inlet 81 to draw thereinto a cut-off weft piece. The blow nozzle 82 is connected to a solenoid-operated valve 83 for controlling air supply to the blow nozzle. When the valve 83 is opened to blow air under pressure from the blow nozzia 82 into the duct pipe 80, a cut weft piece is drawn into the duct pipe 80 by suction and carried by air flow in the pipe to a trash box (not shown) for disposal of the weft piece.

A weft sensor 6 is provided in the inlet 81 of the duct pipe 80 for detecting a cut-off weft piece passing therethrough.

As indicated in, FIG. 4, operation of the drive motor 7 and solenoid-operated valves 77, 83 is controlled from control signals transmitted from a computer control 9 which is operable by responding to input signals transmitted from the sensors 3, 6. The control 9 includes an I/O (input and output) device 91 connected to the sensors, motor and valves, a CPU 90, a ROM 92 storing therein a control program as shown in FIG. 5, a RAM 93, a keyboard 94 for inputting commands, and a display unit 95 fot displaying relevant information.

(Operation of the first embodiment)

In the above-described first embodiment, if a weft break occurs between a weft measuring drum and a main nozzle (neither shown) or within a woven fabric, part a weft piece CY cut off an inserted weft comes out of a shed and it is detected by the sensor 3 which then generate a weft-detected signal. In response to this signal, the computer control 9 causes the loom to be stopped at crank angle of 300° and then reversed for one and a half turn to crank angle of 180° to provide the maximum opening of warp shed to make possible releasing of the cut-off weft piece from the cloth fell of woven fabric. Before the loom is moved to the above 300° crank angle position, part of the cut-off weft piece is beaten to the cloth fell with the leading end thereof passed through the elongated hole 50, as shown in FIG. 6.

The computer control 9 responding to the above weft-detected signal from the sensor 3 causes the valves 77 and 83 to be opened.

Accordingly, air is blown into the duct pipe 80 from the nozzle 82 and the air cylinder 76 is actuated to move the L-shaped member 74 toward the drive roller 71 together with the duct pipe 80 and the driven roller 73 both carried by the member 74.

During this movement of the L-shaped member 74, the cutoff weft piece CY is drawn into the duct

pipe 80, as shown in FIG. 7, by suction produced adjacent the duct pipe inlet 81 by air flow directed into the duct pipe 80.

As the cut-off weft piece passes CY through the inlet 81, the weft sensor 6 transmits a weft-detected signal to the computer control 9, which in turn causes the motor 70 to rotate. When the driven roller 73 is moved into contact with its paired drive roller 71, the cut-off weft piece CY is nipped between the rollers and pulled out from the cloth fell to be drawn into the duct pipe 80. This pulling of the weft piece by the rollers 71, 73 is continued until the entire weft piece is completely drawn into the duct pipe 80, i.e. until the sensor 6 detects a weft piece no more. If the sensor 6 continues to provide the weft-detected signal for more than a predetermined period of time, an alarm is activated.

When removal of the cut-off weft piece CY is completed, the sensor 6 transmits a weft-absence sllgnal to the control 9, which in turn causes the motor 70 to be stopped and the valves 77 and 83 to be closed thereafter.

The loom is restarted after threading the main nozzle (not shown) with a new weft extending from the weft measuring and storage drum by an automatic threading device (not shown) has been completed.

(Effect of the first embodiment)

In the above-described first embodiment, according to which the elongated hole 50 as the weft introducing means is provided with such a length and a width that cover the whole area over which weft guide passage of the reed 1 is moved by swinging motion of the reed, the cut-off weft piece CY can be introduced through the hole with certainty and it will not be pulled back during movement of the reed. Thus, disposing of a cut-off weft piece can be accomplished with a high degree of success.

Furthermore, because the cut-roff weft piece is pulled out from the cloth fell by the paired rollers 71, 73 which are then positioned adjacent the reed 1 in its retracted position, as shown in FIG. 8, and, therefore, the friction of the cut-off weft piece with warp yarns is reduced, the weft piece can be pulled easily away from the cloth fell.

Additionally, because the apparatus is fixed on a stationary frame of the loom, it is not subjected to harmful shock of impact and, therefore, no particular provision is necessary to ensure strength and durability of the apparatus.

(Second embodiment)

The second embodiment differs from the first embodiment in that part of the control program stored in the ROM 92 is modified as illustrated in FIG. 9. That is, when a weft-break signal is generated by the weft sensor 3, the control 9 causes the valve 83 to be opened thereby to produce air flow in the duct pipe 80 prior to stopping the loom at 300° crank angle position. By so doing, the cut-off weft piece can be drawn into the duct pipe 80 during the stop or the subsequent reverse rotation of the loom. Thus, the weft piece can be prevented more effectively from being released from the apparatus during such motion of the reed.

(Third embodiment)

The third embodiment differs from the first embodiment in that a guide plate having formed therein an elongated hole 51 is added to the arrangement of the first embodiment. As shown in FIGS. 10 and 11, the hole 51 is formed wider and in an arcuate shape conforming t6 the path along which the weft guide passage of the reed 1 is moved by swinging motion of the reed and the inner peripheral surface 52 of the elongated arcuate hole 51 is tapered to be convergent. in the weft introducing direction. This modification of the third embodiment can make it easier for a cut-off weft piece to be introduced through the elongated hole 51. Incidentally, the elongated hole 50 in this embodiment serves mainly as a guide for the L-shaped member 74.

It is to be understood that the above embodiments are described only by way of examples for the purpose of illustration and that the invention is not limited to these embodiments, but it can be practiced in other various ways without departing from the scope of the claims.

Though in the above embodiments the duct pipe inlet 81 is located at the leading end of the L-shaped member 74, an inlet through which a weft piece is drawn by suction may be formed in the leading end of the member 74.

Additionally, though it is so arranged in the above, embodiments that the driven roller 73 is movable by the air cylinder 76 toward the drive roller 71, the arrangement of the two rollers may be changed or the drive roller 71 may be adapted to be movable toward the other roller.

To provide an apparatus in a jet loom that can ensure removal of a cut-off weft piece from a cloth fell without allowing the weft piece held by the apparatus to be released therefrom when the reed is retracted.

[STRUCTURE]

The apparatus comprises weft introducing means 1 disposed on a stationary frame 96 of the loom on the opposite side of the reed I with respect to the side from which a weft is inserted and including an elongated hole 50 formed in correspondence with a path described by weft guide passage of the reed 1 when it is swung back and forth, for introducing through said hole 50 a weft piece CY cut off an inserted weft, a waft sensor 6 for detecting the cut-off weft

piece, weft removing means 7 including a pair of drive and follower rollers 71 and 73 for withdrawing the cut-off weft piece, and suction means 8 for drawing and discarding the cut-off weft piece by suction.

(BRIEF EXPLANATION OF THE DRAWINGS)

FIG. 1 is a side view showing part of the apparatus of the first embodiment;
FIG. 2 is a plan view showing the apparatus of the first embodiment;
FIG. 3 is a side view along the line A-A of FIG. 2;
FIG. 4 is a system block diagram for the apparatus of the first embodiment;
FIG. 5 is a diagram showing flow chart of control program of the first embodiment;
FIG. 6 is a plan view of the apparatus of the first embodiment showing a state in which the cut-off weft piece is introduced into the apparatus;
FIG. 7 is a plan view of the apparatus of the first embodiment showing a state in which the cut-off weft piece is just drawn into the duct pipe;
FIG. 8 is a plan view of the apparatus of the first embodiment showing a state in which the cut-off weft piece is being pulled out from the cloth fell and drawn through the duct pipe;
FIG. 9 is a diagram showing part of flow chart of control program of the second embodiment;
FIG. 10 is a side view showing part.of the apparatus of the third embodiment; and
FIG. 11 is a plan view showing the apparatus of the third embodiment.

(DESIGNATION OF REFERENCE NUMERALS]

I... Reed, 2 Weft feeler, 3 ... Weft sensor (Double-weft feeler), 4 ... Guide member, 5 ... Weft introducing means, 6 ...Weft sensor, 7 ... Weft removing means, 8 ... Suction means, 9 Computer control, 50 ... Elongated hole, 70 ... Drive motor, 71 ... Drive roller, 73 ... Driven roller, 80 ... Duct pipe, 82 ... Blow nozzle, 96 ... Frame.

Claims

1. Apparatus of disposing of a cut-off weft piece in a jet loom comprising:
weft introducing means disposed on a stationary frame of the loom on the opposite side of a reed with respect to the side from which a weft is inserted and including an opening formed in correspondence with a path described by weft guide passage of the reed when it is swung back and forth, for introducing through said opening a weft picice cut off an inserted weft; weft detecting means for detecting said cut-off weft piece; and
weft removing means including a pair of drive and follower rollers movable relative to each other and operable in response to an output signal from said weft detecting means to withdraw said cut-off weft piece.

2. Apparatus of disposing of a out-off weft piece in a jet loom according to claim 1, further comprising suction means for drawing into said apparatus said cut-off weft piece by suction.

Fig. 1

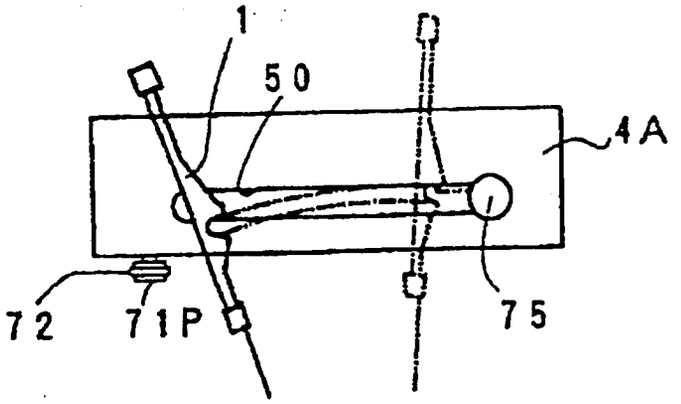

1
50
4A
72
71P
75

Fig. 3

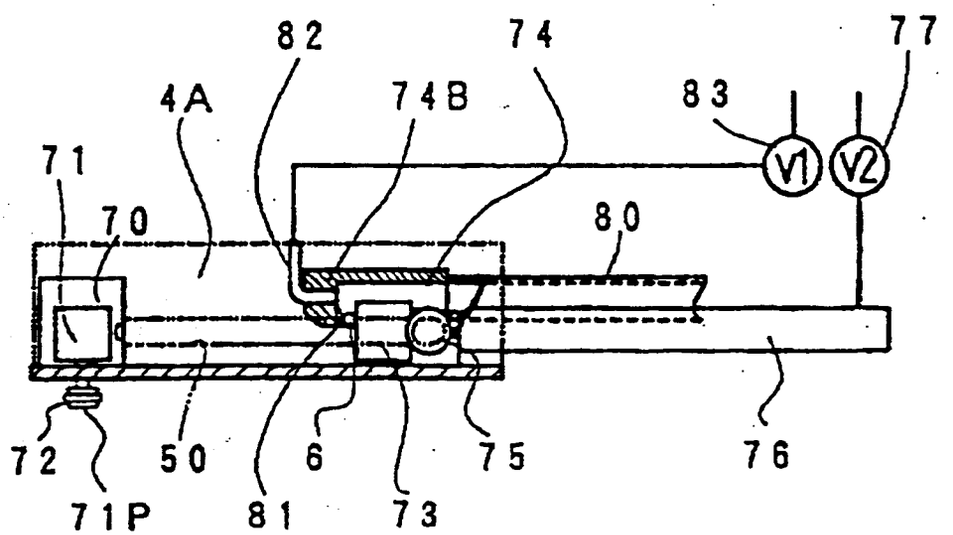

82
74
77
4A
74B
83
V1
V2
71
70
80
72
50
6
75
76
71P
81
73

Fig. 2

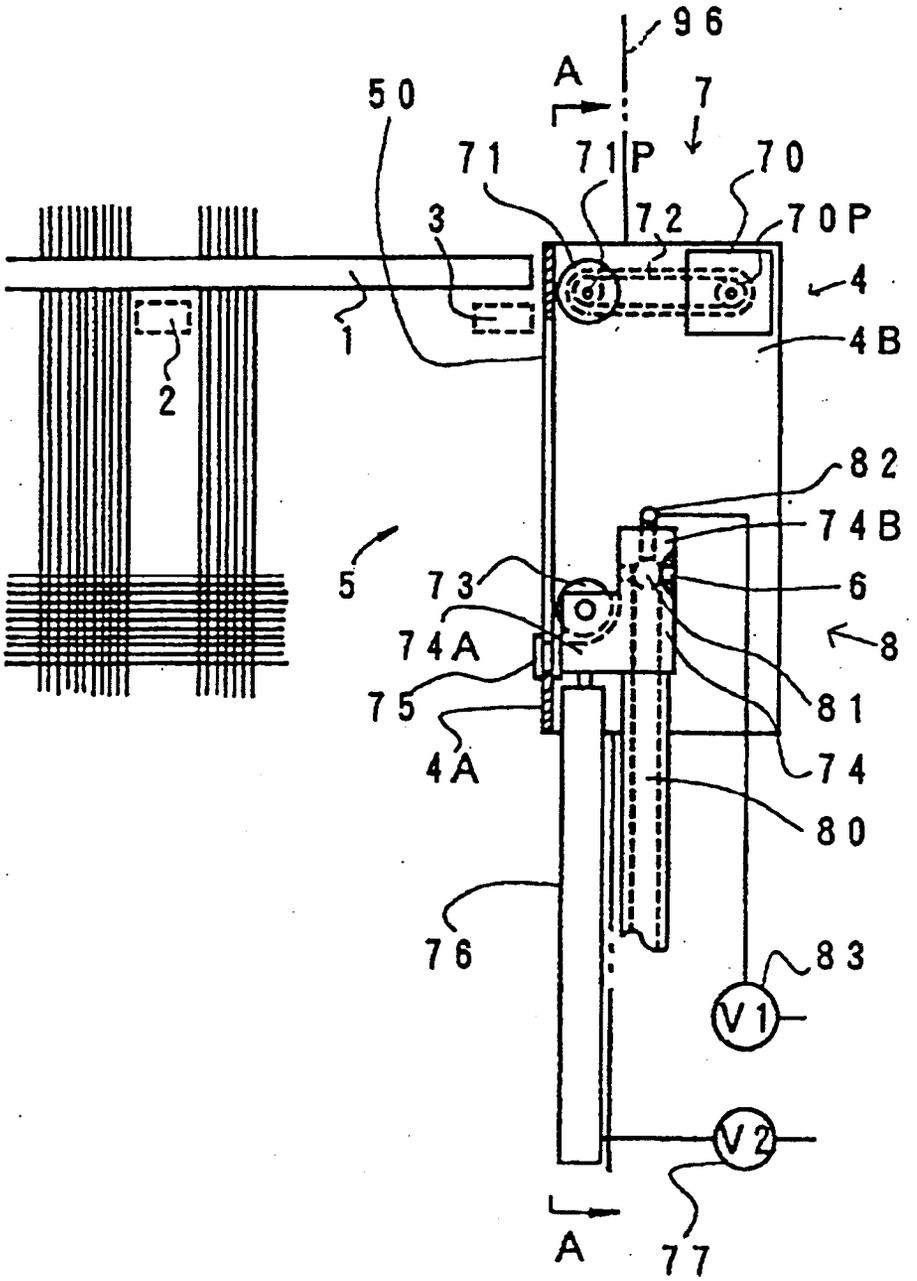

96
A
50
7
71
71P
70
3
72
70P
4
1
4B
2
82
74B
5
73
6
74A
8
75
81
4A
74
80
76
83
V1
V2
A
77

Fig. 4

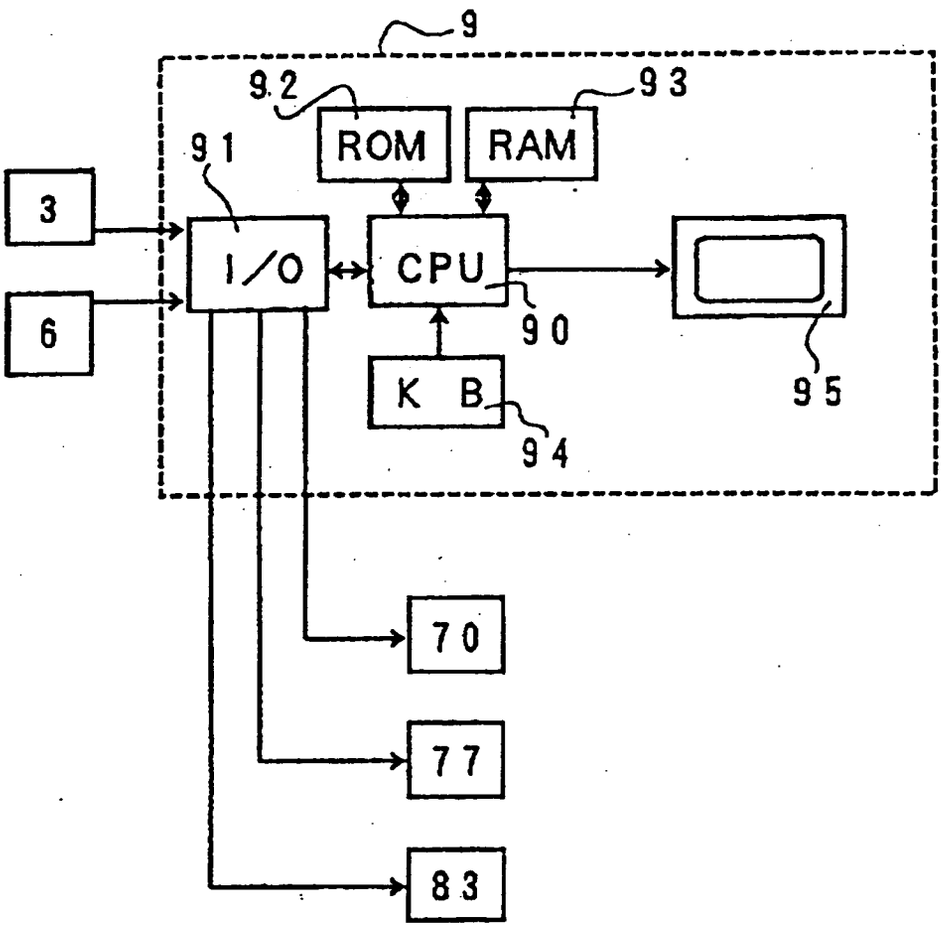


Fig. 5

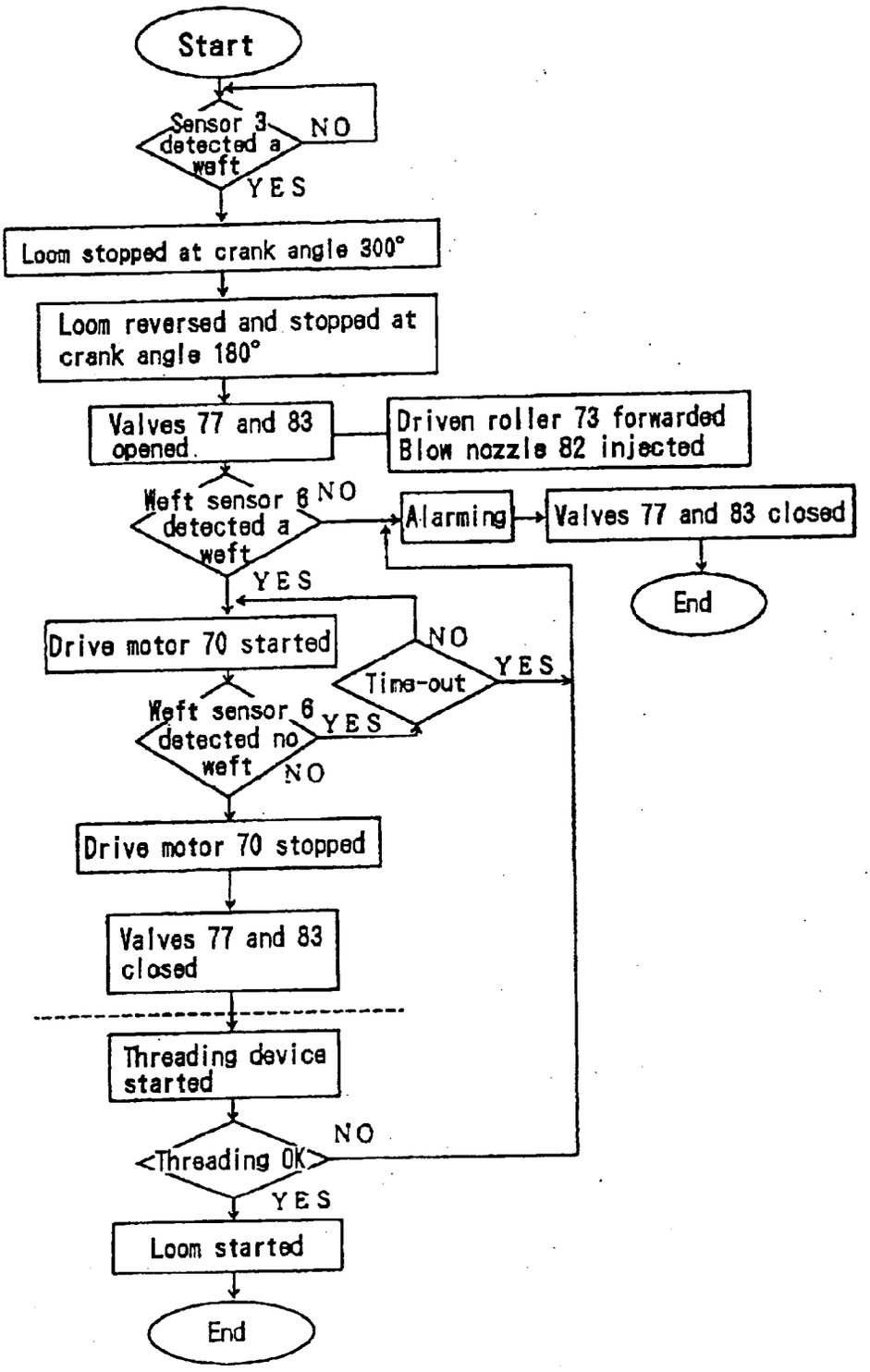

Start
Sensor 3 detected a weft
NO
YES
Loom stopped at crank angle 300°
Loom reversed and stopped at crank angle 180°
Valves 77 and 83 opened
Driven roller 73 forwarded
Blow nozzle 82 injected
Weft sensor 6 detected a weft
NO
Alarming
Valves 77 and 83 closed
End
YES
Drive motor 70 started
NO
Time-out
YES
Weft sensor 6 detected no weft
YES
NO
Drive motor 70 stopped
Valves 77 and 83 closed
Threading device started
<Threading OK>
NO
YES
Loom started
End

Fig. 6

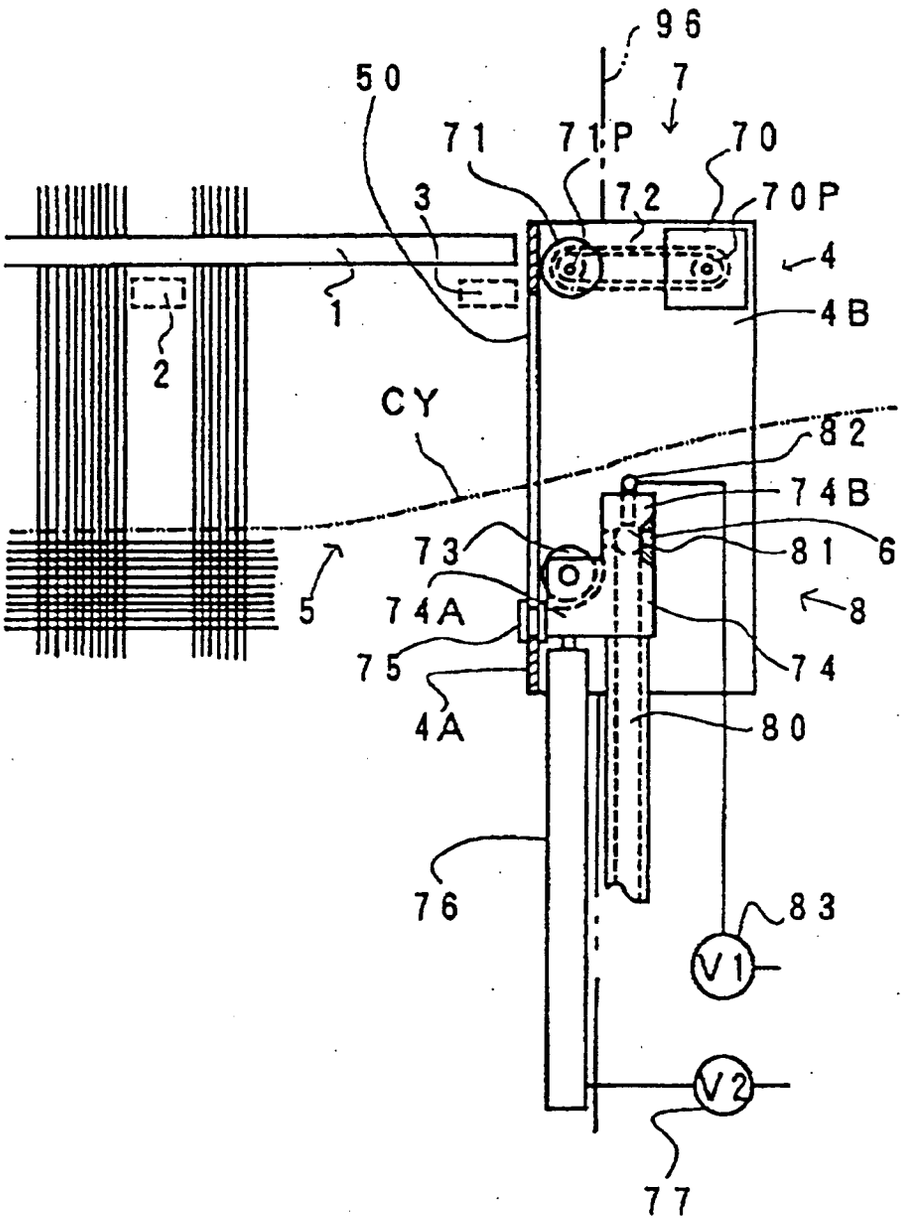

96
7
50
71
71P
70
72
70P
3
4
1
4B
2
CY
82
74B
73
81
6
5
74A
8
75
74
4A
80
76
83
V1
V2
77

Fig. 7

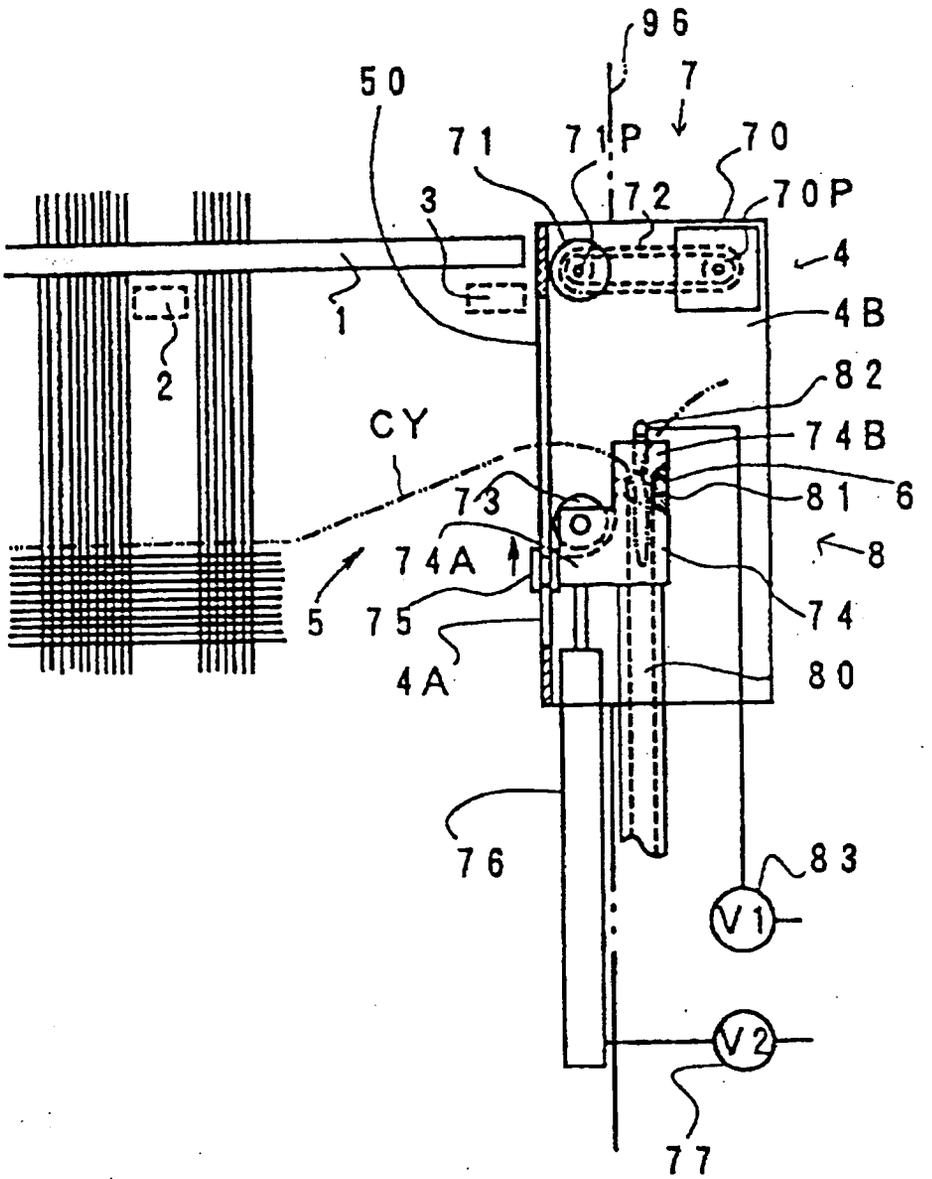

96
7
50
71
71P
70
72
70P
3
4
1
4B
2
82
CY
74B
73
81
6
74A
8
5
75
74
4A
80
76
83
V1
V2
77

Fig. 8

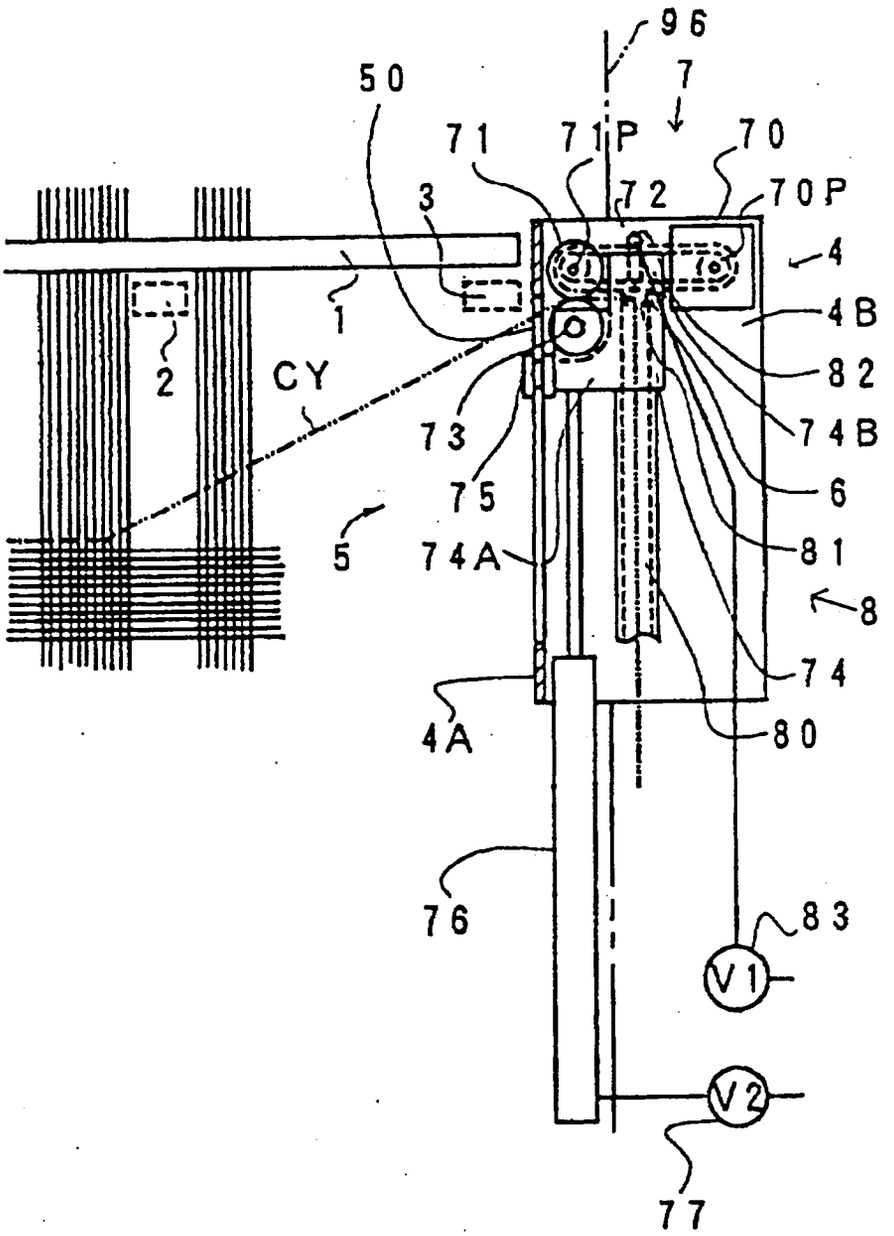

96
7
50
71
71P
70
72
70P
3
4
1
4B
2
CY
82
73
74B
75
6
5
74A
81
8
74
4A
80
76
83
V1
V2
77

Fig. 9

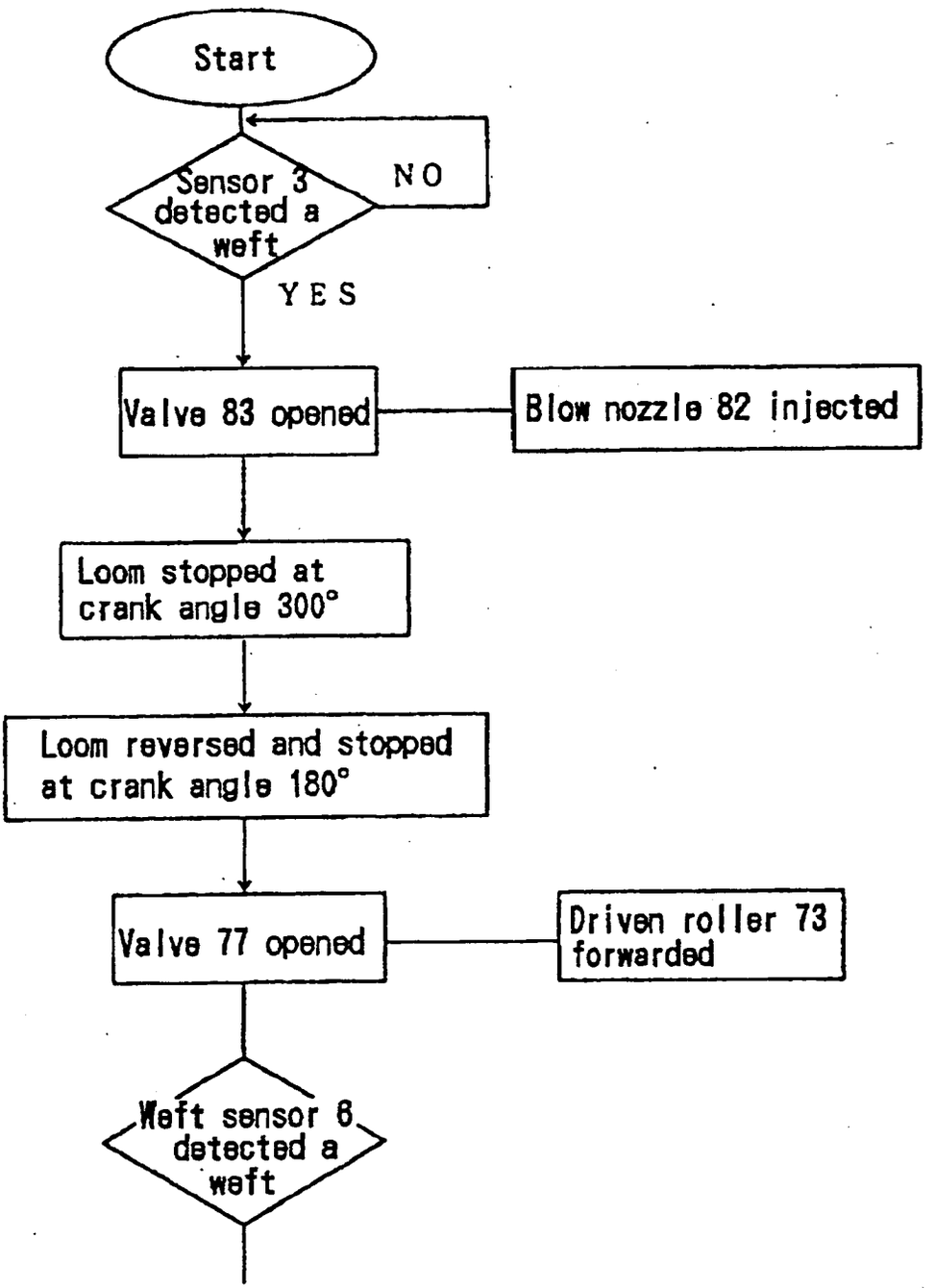

Start
Sensor 3 detected a weft
NO
YES
Valve 83 opened
Blow nozzle 82 injected
Loom stopped at crank angle 300°
Loom reversed and stopped at crank angle 180°
Valve 77 opened
Driven roller 73 forwarded
Weft sensor 6 detected a weft

Fig. 10

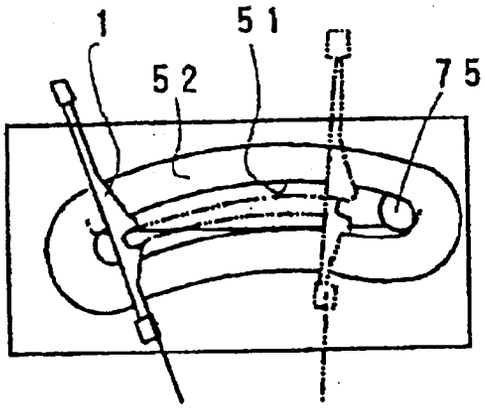


Fig. 11

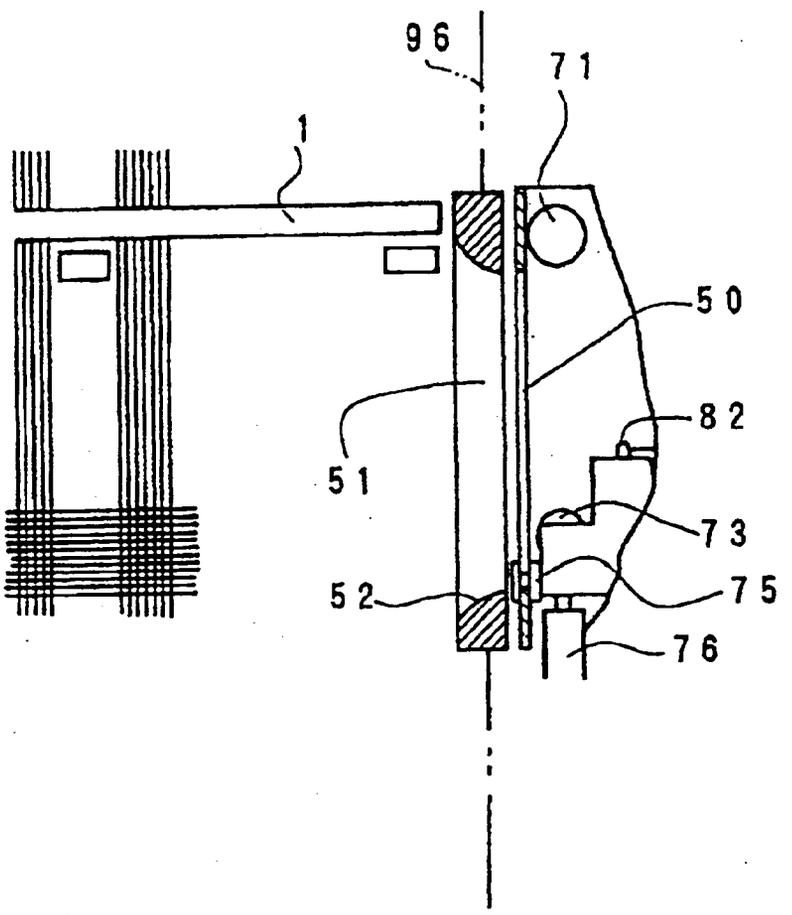
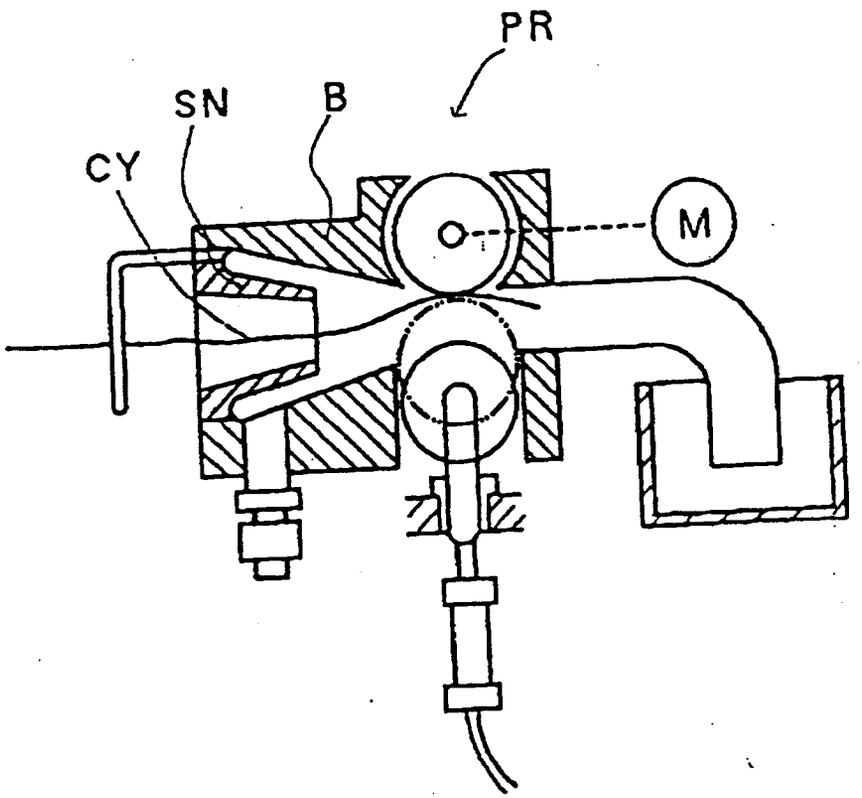


Fig. 12



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 81 0913

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)
X	EP-A-0 332 258 (PICANOL N.V.) * the whole document * ---	1,2	D03D47/30
D,A	EP-A-0 236 597 (TSUDAKOMA CO.) * page 4, line 12 - line 26; figures 7A,7B * ---	1,2	
A	EP-A-0 421 511 (PICANOL N.V.) * page 4, column 5, line 36 - column 6, line 4; figures 1-11 * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08 MARCH 1993	HENNINGSEN O.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)