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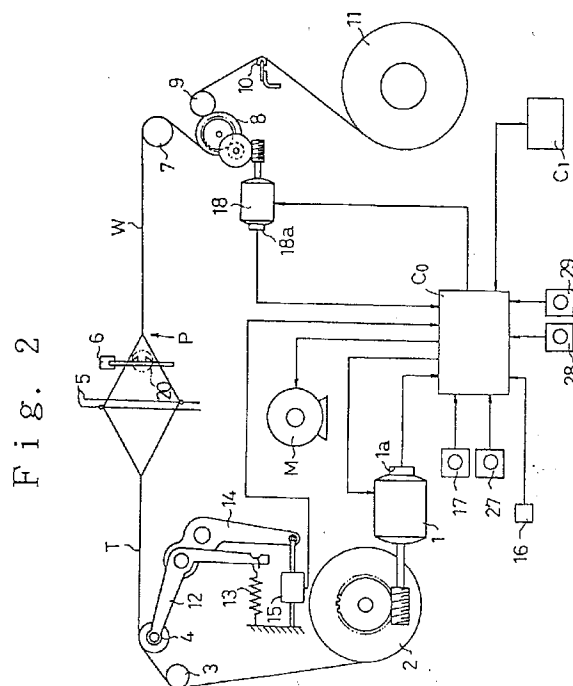
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Apparatus for preventing weaving bar in a loom.

To prevent the weaving bar in a loom, which might otherwise be caused by operating a slow rotation control switch (28, 29) for rotating the loom slowly.

A main control computer C₀, the amount of slow rotation caused by a slow reverse rotation control switch (28) or slow forward rotation control switch (29) and rotates the loom in advance in reverse direction for an amount equal to the stored slow rotation amount before re-starting the weaving operation of the loom. The slow rotation amount is grasped in terms of data of the rotation amount coming from a rotary encoder (16).



The present invention relates to apparatus for preventing weaving bar in a loom, which is caused by the slow forward or reverse rotation of the loom while the weaving operation of the loom is being interrupted.

In case of a failure in a weft insertion, the loom has to be slowly rotated in a reverse rotation to open a shed for pick finding so that it may be released from that failure. By this release, the error weft can be removed from the cloth fell of a woven fabric. The slow rotation for opening the shed for the pick finding to remove the error weft is accomplished either automatically or by turning on a slow inverse rotation control switch.

In a jet loom, a weft is subjected to a fine injection even while the weaving operation is being interrupted, so that it may be prevented from coming out of a weaving main nozzle. Upon occurrence of the weft insertion failure called the "short pick", however, the cut end of the error weft cut off may be brought from the weaving main nozzle into the open shed by the fine injection. In case the slow inverse rotation for opening the shed for the pick finding so as to remove the error weft, the cut end in the open shed is grasped by the warp so that the shed has to be further opened, even after the automatic reverse rotation, for the pick finding by a slower rotation effected by the slow inverse rotation control switch. For this shed opening for the pick finding, the cloth fell of the woven fabric has to be positioned before re-starting the weaving operation of the loom by a slow forward rotation control switch. If, however, the amount of slow forward rotation necessary for positioning the cloth fell of the woven fabric is mistaken, the weaving bar occurs.

The present invention has an object to provide apparatus for preventing the weaving bar in a loom; in which rotation of the loom at a slow rate to open a shed for pick finding and the displacement of the cloth fell of a woven fabric take place synchronously and in which a control switch for the slow rotation of the loom is provided, by positioning the cloth fell of the woven fabric without fail.

According to a first exhibit of the invention, therefore, the apparatus for preventing the weaving bar in the loom comprises: slow rotation control means for controlling the slow rotation of the loom; and slow rotation amount detecting means for detecting the amount of the slow rotation effected by the slow rotation control switch, and the slow rotation control means is given a function of storing the amount of the slow rotation detected by the detecting means and of rotating the loom in advance in reverse direction for an amount equal to the stored slow rotation amount at the time of re-starting the weaving operation of the loom.

According to a second exhibit of the invention, the apparatus for preventing weaving bar in a loom comprises: slow rotation control means for controlling the

slow rotation of the loom; slow rotation amount detecting means for detecting the amount of the slow rotation effected by the slow rotation control switch; and display means for displaying the amount of the slow rotation detected by the slow rotation amount detecting means.

By turning on the slow rotation control switch, the cloth fell of the woven fabric is synchronously displaced by the pitch of the weft for one rotation of the loom. In this first exhibit of the invention, the slow rotation control means is caused to store the amount of the slow rotation effected by the operation of the slow rotation control switch so that the loom is rotated in the reverse direction for an amount equal to the stored amount. By this reverse rotation, the cloth fell of the woven fabric is returned to its original position so that it is accurately positioned.

In the second example of the invention, the cloth fell of the woven fabric is returned to its original position if the reverse rotation is effected for the displayed amount of the slow rotation by turning on the slow rotation control switch.

One embodiment embodying the invention will be described in the following with reference to Figs. 1 to 8. The figures show the following:

Fig. 1 A schematic front elevation showing the weft inserting apparatus.

Fig. 2 A schematic side elevation showing the whole structure of the loom.

Fig. 3 An enlarged, side elevation showing the woven state of an error weft.

Fig. 4 An enlarged side elevation showing the operation of forming the shed for the pick finding so as to release the woven state.

Fig. 5 An enlarged side elevation showing the position of the deformed reed at the time of starting the weaving operation.

Fig. 6 A flow chart illustrating the slow rotation control program.

Fig. 7 A flow chart illustrating the slow rotation control program.

Fig. 8 A schematic front elevation showing another embodiment of the invention.

Fig. 2 is a schematic side elevation showing the whole structure of a loom. Reference letter M designates a loom motor which has its operation subjected to the control of a main control computer C₀. Numeral 1 designates a reversible feed motor which is independent of the loom motor M for driving a warp beam 2. A warp T fed out of the warp beam 2 is guided through a back roller 3 and a tension roller 4 into a deformed reed 6. A woven fabric W is taken up through an expansion bar 7, a surface roller 8, a press roller 9 and a smoothing guide member 10 by a cloth roller 11.

The tension roller 4 is carried at one end portion of a tension lever 12 so that a predetermined tension may be applied to the warp T by a tension spring 13

hooked on the other end portion of the tension lever 12. This tension lever 12 is hinged to one end of a detection lever 14, which has its other end connected to a load cell 15. The warp tension is transmitted through the tension roller 4, the tension lever 12 and the detection lever 14 to the load cell 15 so that the load cell 15 outputs an electric signal according to the warp tension to the main control computer C_0 .

The main control computer C_0 controls the rotational speed of the feed motor 1 on the basis of both the comparison between a predetermined tension and the detected tension grasped by the aforementioned input signal and the warp beam diameter grasped by a detection signal coming from a rotary encoder 16 for detecting the angle of rotation of the loom. Thus, the warp tension in an ordinary operation is controlled to prevent the weaving bar in the loom during the weaving operation.

The main control computer C_0 commands the forward rotation of the feed motor 1 on the basis of an ON signal coming from a start switch 17 to control the rotational speed of the feed motor 1 in a feedback manner on the basis of a rotational speed detecting signal coming from a rotary encoder 1a built in the feed motor 1.

The surface roller 8 is operationally connected to a reversible take-up motor 18 which is independent of the loom motor M. The main control computer C_0 controls the rotational speed of the take-up motor in a feedback manner on the basis of the rotational speed detecting signal coming from a rotary encoder 18a built in the take-up motor 18.

Fig. 1 is a schematic front elevation showing a weft inserting apparatus. Numeral 19 designates a winding type weft metering reservoir. The weft metered and reserved by the weft metering reservoir 19 is inserted and injected from a weft inserting main nozzle 20. At the terminal of the weft insertion, there is arranged a weft detector 21 having a reflection type photoelectric sensor for producing data for judging whether or not the weft insertion fails.

The let-off and stop of the weft from the winding face 19a of the weft metering reservoir 19 are effected by magnetizing and demagnetizing an electromagnetic solenoid 22 for driving a stop pin 22a. The control of the magnetizing and demagnetizing the solenoid 22 is accomplished by a command coming from an auxiliary control computer C_1 . This auxiliary control computer C_1 control the magnetization/demagnetization of the electromagnetic solenoid 22 on the basis of: the detected data of the angle of rotation of the loom obtained from the main control computer C_0 .

In the vicinity of the winding face 19a, there is arranged a weft let-off detector 23 made of a reflection type photoelectric sensor, which detects the weft being let off from the winding face 19a. The auxiliary control computer C_1 commands the demagnetization of

the electromagnetic solenoid 22 when the detected number of let-off from the weft let-off detector 23 reaches a preset value, so that the stop pin 22a comes into engagement with the winding face 19a to block the let-off of the weft.

The weft thus inserted is cut off at each insertion, after it has been beaten, by a cutter 24.

To the inserting main nozzle 20, there are connected in parallel an inserting air supply tube 25 and a breeze tube 26. This breeze tube 26 is supplied at all times with air under a low pressure so that the inserting main nozzle 20 finely injects in the operations other than the inserting injection. This fine injection prevents the weft from coming out from the inserting main nozzle 20, and this prevention is carried out even when the weaving operation is interrupted.

In addition to the start switch 17, a stop switch 27, a slow reverse rotation switch 28 and a slow forward rotation switch 29 are connected with the main control computer C_0 .

Flow charts of Figs. 6 and 7 illustrate a slow rotation control program, on the basis of which the main control computer C_0 executes the slow rotation control in case the weft insertion fails. Upon this failure, the insertion of a succeeding weft is blocked, and the motors M, 1 and 18 have their operations stopped synchronously so that the deformed reed 6 is halted at a position immediately before the beating operation, as indicated by solid lines in Fig. 3. Reference letter Y indicates an error weft.

After the synchronous stops, the motors M, 1 and 18 synchronously rotate at slow rates in reverse directions to bring the deformed reed 6 to the most retracted position of Fig. 4, and the warp T opens the largest shed. The loom makes one and half rotations so that the deformed reed 6 moves to the position, as indicated by chains in Fig. 3, and swings one more reciprocation. A weft Y_2 having been inserted before the error weft Y is shifted by that automatic slow reverse rotation to the normal position P of the cloth fell of the woven fabric, as shown in Fig. 4.

In case the failure in the weft insertion is the short pick, as shown in Fig. 1, the cut end portion Y_1 of the error weft Y by the cutter 24 is subjected to the fine injection of the inserting main nozzle 20. By the action of this fine injection, the cut end portion Y_1 may enter the shed of the warps, while the deformed reed 6 makes one more reciprocal swing from the chained position of Fig. 3, until it may be grasped by the warps T, as shown in Fig. 4. In order to remove this error weft Y, the cut end portion Y_1 has to be extracted at first from the opened warp shed by turning on the slow reverse rotation control switch 28 to rotate the loom once and by pick-finding the cut end portion Y_1 . Next, the loom has to be rotated once more in the reverse direction by turning on the slow reverse rotation control switch 28, or the loom has to be rotated once in the forward direction by turning on the slow forward rota-

tion control switch 29, so that the pick of the error weft Y may be found out.

In case the error weft is to be extracted by the reverse rotation, for example, the main control computer C₀ causes the motors M, 1 and 18 slowly in the synchronous manner in response to the slow reverse command which is produced by turning on the slow reverse rotation control switch 28, and stores the amount R of this slow reverse rotation on the basis of the rotation data coming from the rotary encoder 16. By this synchronous slow reverse rotation, the weft Y₂ is displaced from the normal position P of the cloth fell of the woven fabric to the position of the cut end portion Y₁ of Fig. 4.

If the start switch 17 is turned on after the error weft has been removed, the main control computer C₀ causes the motors M, 1 and 18 to rotate synchronously in the reverse directions; i.e., rotate slowly forward for the stored amount R of the slow reverse rotation. By this slow forward rotation, the deformed reed 6 swings reciprocally twice from the position of Fig. 4 so that the weft Y₂ inserted before the error weft Y is returned to the normal position P of the cloth fell of the woven fabric. Moreover, the main control computer C₀ rotates the loom slowly further for a predetermined amount in the reverse direction from that state. After this slow reverse rotation of the predetermined amount, the deformed reed 6 passes over the normal position P and stops at the position for re-starting the weaving operation immediately before the beating operation of Fig. 5, until the weaving operation is restarted from that state. As a result, the weaving operation is restarted to cause no weaving bar, because the weft Y₂ inserted before the error weft Y removed from the warp shed is in the normal position P of the cloth fell of the woven fabric.

The present invention should not be restricted to the foregoing embodiment only, but could be embodied, as shown in Fig. 8, such that a display unit 30 is connected with a main control computer C₂ so that it may display the amount of slow forward/reverse rotations which are caused by turning of the slow reverse rotation control switch 28 and the slow forward rotation control switch 29. By the main control computer C₂, the display unit 30 is caused to display the accumulated amounts of the slow forward/reverse rotations effected by the slow reverse rotation control switch 28 or the slow forward rotation control switch 29. When these amounts of slow forward and reverse rotations become equal, they are displayed at a value of zero. In order to effect the positioning of the cloth fell of the woven fabric, therefore, the slow reverse rotation control switch 28 or the slow forward rotation control switch 29 may be turned on to display the amounts of the slow forward/reverse rotations at the zero value, thus ensuring the positioning of the cloth fell of the woven fabric.

As has been described in detail hereinbefore, ac-

cording to the first embodiment of the invention, the amount of slow rotation by the slow rotation control switch is reversed for re-starting the weaving operation so that the displacement of the cloth fell of the woven fabric caused by the operation of the slow rotation control switch is absorbed to provide an excellent effect that the positioning of the cloth fell of the woven fabric can be ensured to prevent the weaving bar in the loom.

According to the second example of the invention, the amount of the slow rotation by the operation of the slow rotation control switch is displayed. Thus, if the slow rotation control switch is so operated before the restart of the weaving operation as to display the amount of slow rotation at the value of zero, the displacement of the cloth fell of the woven fabric caused by the operation of the slow rotation control switch is absorbed to provide an excellent effect that the weaving bar in the loom caused by the operation of the slow rotation control switch can be prevented without fail.

To prevent the weaving bar in a loom, which might otherwise be caused by operating a slow rotation control switch for rotating the loom slowly.

A main control computer C₀ the amount of slow rotation caused by a slow reverse rotation control switch 28 or slow forward rotation control switch 29 and rotates the loom in advance in reverse direction for an amount equal to the stored slow rotation amount before re-starting the weaving operation of the loom. The slow rotation amount is grasped in terms of data of the rotation amount coming from a rotary encoder 16.

Designations of Reference Numerals

16 - - - Rotary Encoder Acting as Slow Rotation Amount Detecting Means; 28 - - - Slow Reverse Rotation Control Switch; 29 - - - Slow Forward Rotation Control Switch; 30 - - - Display Unit; C₀ - - - Main Control Computer Acting as Slow Rotation Control Means; and C₂ - - - Main Control Computer Acting as Slow Rotation Control Means.

Claims

1. Apparatus for preventing weaving bar in a loom wherein rotation of the loom at a slow rate to open a shed for pick finding and the displacement of the cloth fell of a woven fabric (Y) take place synchronously and wherein a control switch (28, 29) for said slow rotation of the loom is provided, said apparatus comprising:

slow rotation control means (C₀) for controlling said slow rotation of the loom; and

slow rotation amount detecting means (16) for detecting the amount of said slow rotation effected by said slow rotation control switch (28,

29),

wherein said slow rotation control means (C₀) is given a function of storing the amount of said slow rotation detected by said detecting means (16) and of rotating the loom in advance in reverse direction for an amount equal to the stored slow rotation amount at the time of re-starting the weaving operation of the loom.

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2. Apparatus for preventing weaving bar in a loom wherein rotation of the loom at a slow rate to open a shed for pick finding and the displacement of the cloth fell of a woven fabric (Y) take place synchronously and wherein a control switch (28, 29) for said slow rotation of the loom is provided, said apparatus comprising:
 - slow rotation control means (C₀) for controlling said slow rotation of the loom;
 - slow rotation amount detecting means (16) for detecting the amount of said slow rotation effected by said slow rotation control switch (28, 29); and
 - display means for displaying (C₀) the amount of said slow rotation detected by said slow rotation amount detecting means (28, 29).
3. Apparatus as claimed in claim 1 or claim 2, further including means (4, 12, 14, 15, C₀; 1, 1a; 18, 18a) for measuring and controlling the warp tension.
4. Apparatus as claimed in any of claims 1 to 3, said means for controlling slow reverse and forward rotation including programmable computer means (C₀, C₁).
5. Air jet loom with an apparatus as claimed in any of claims 1 to 4.

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Fig. 1

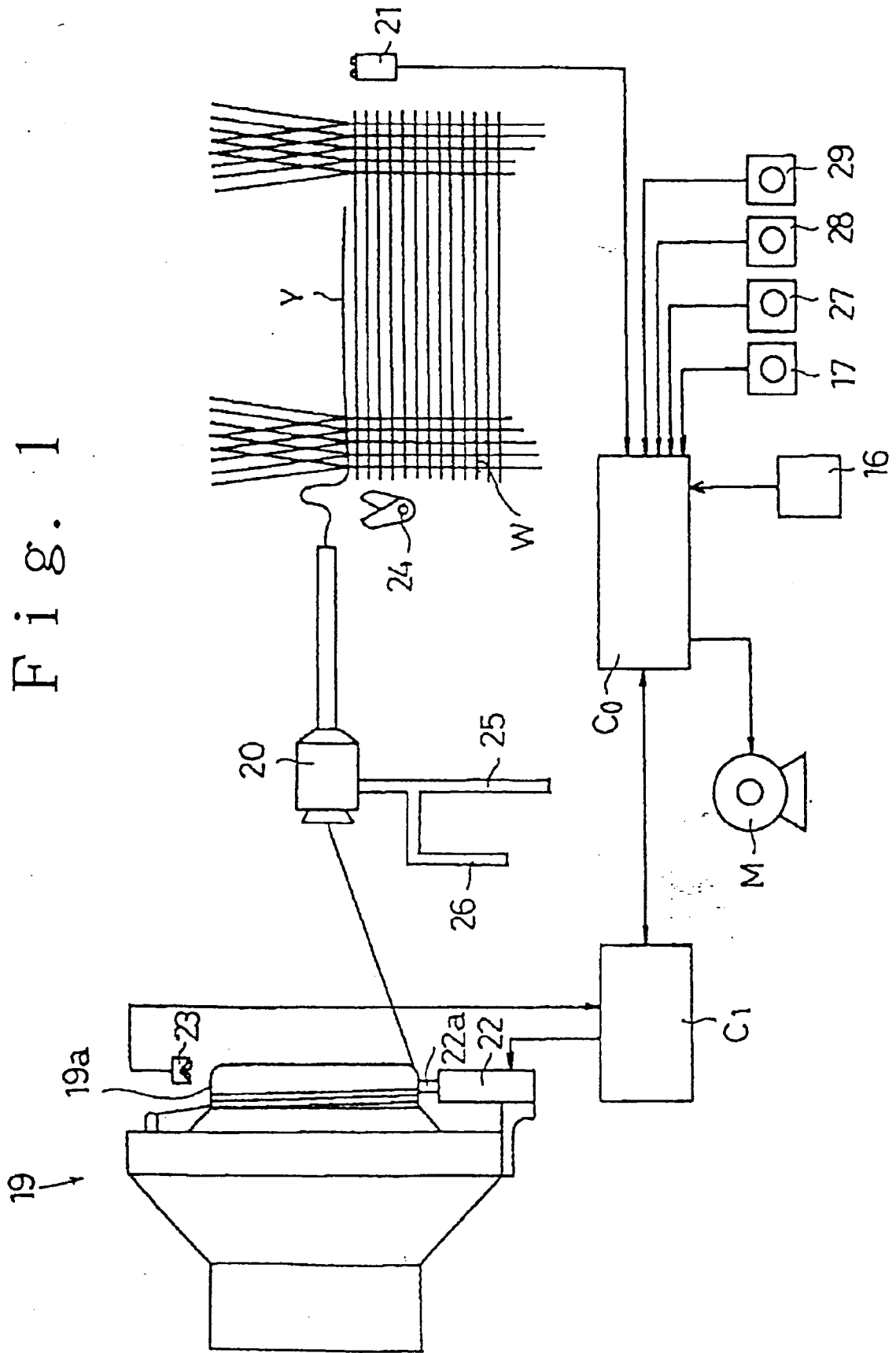


Fig. 2

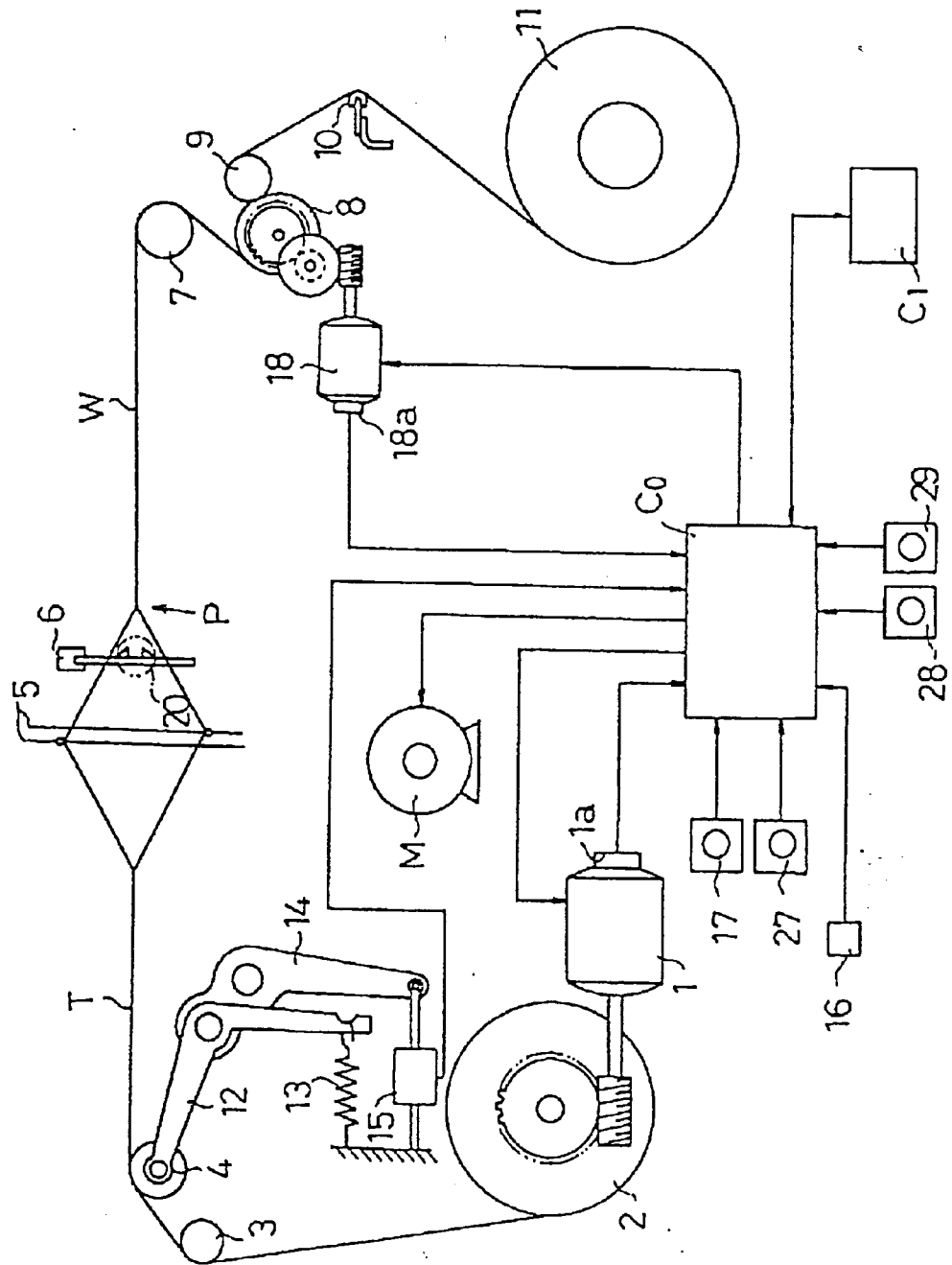


Fig. 3

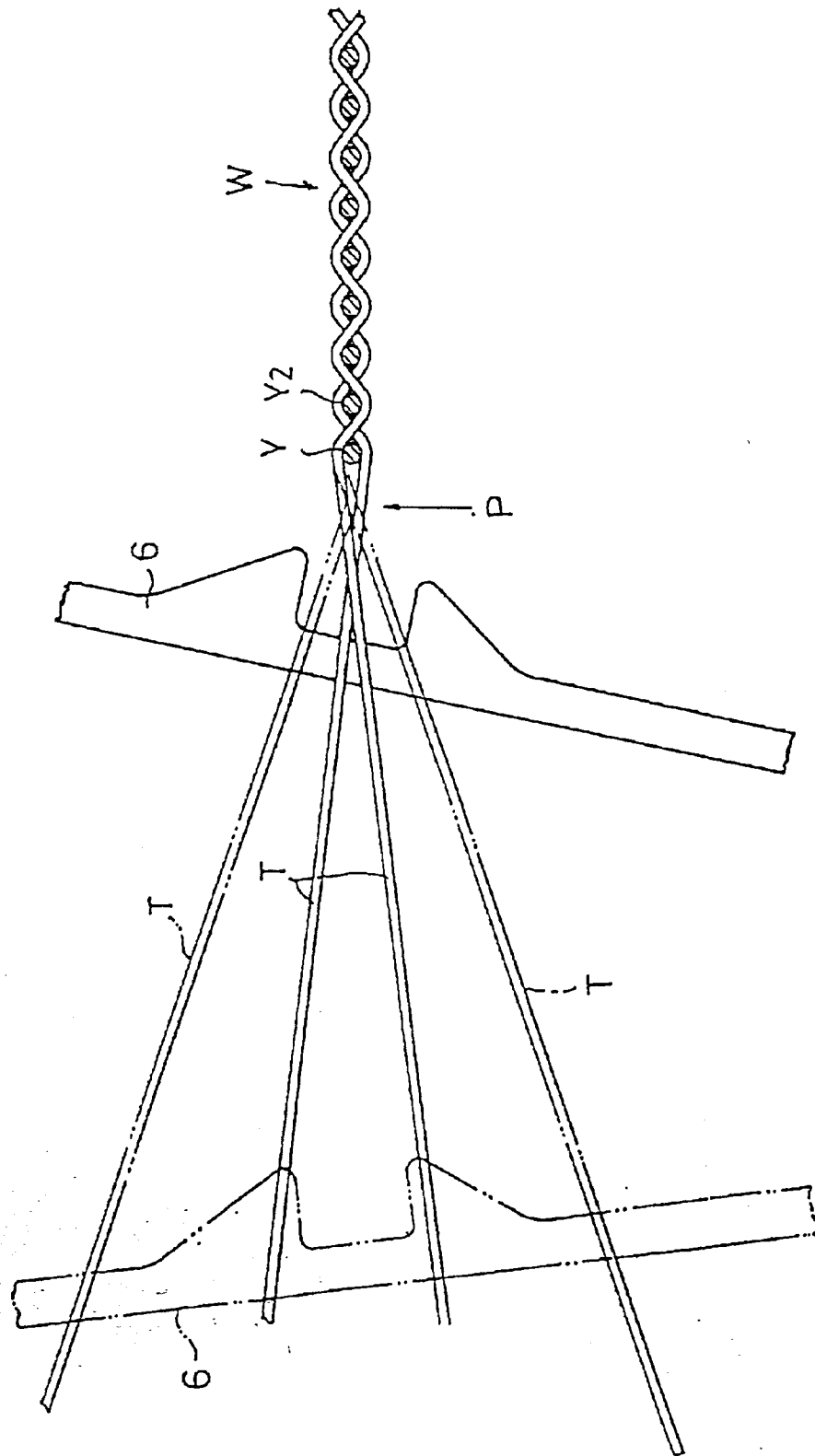


Fig. 4

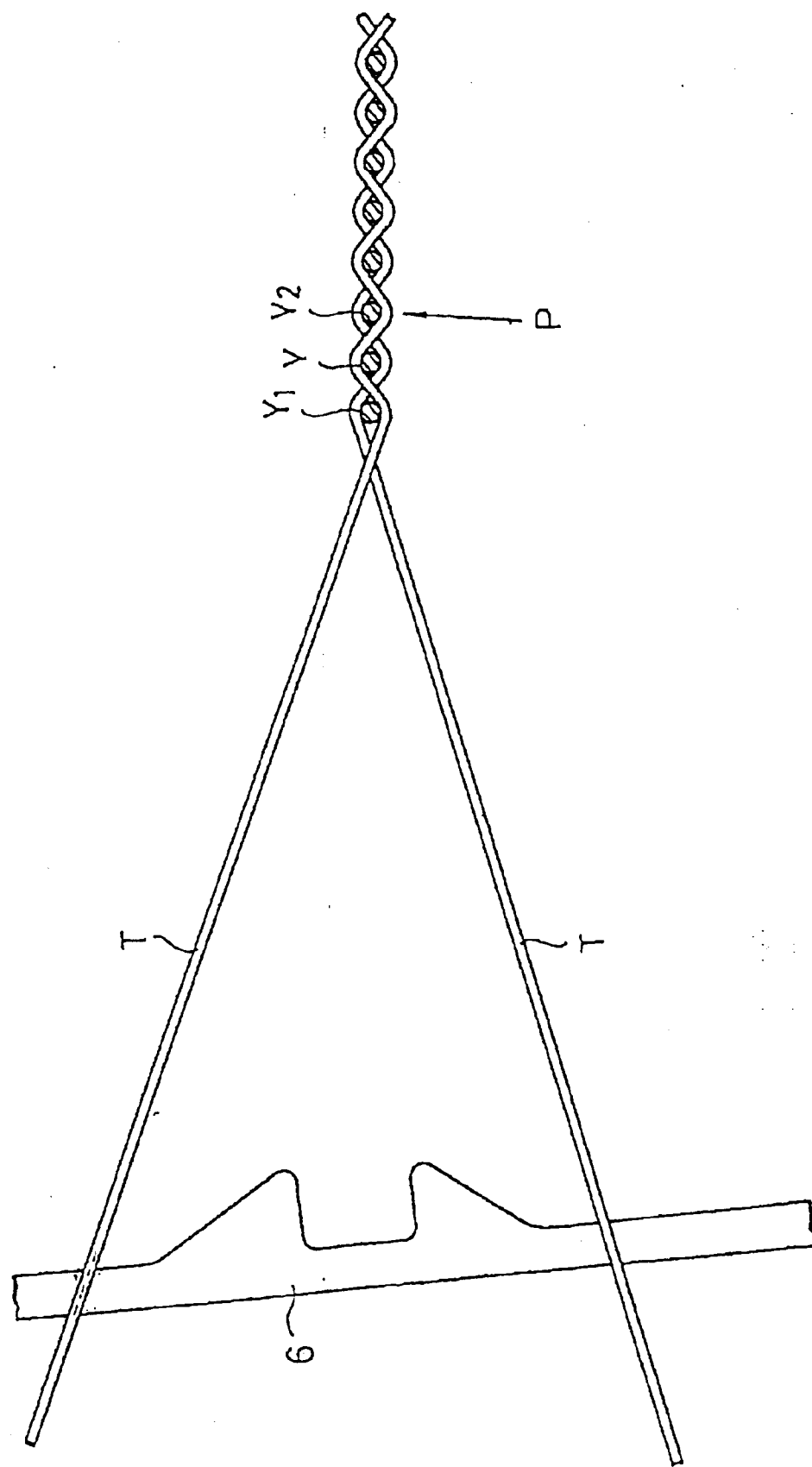
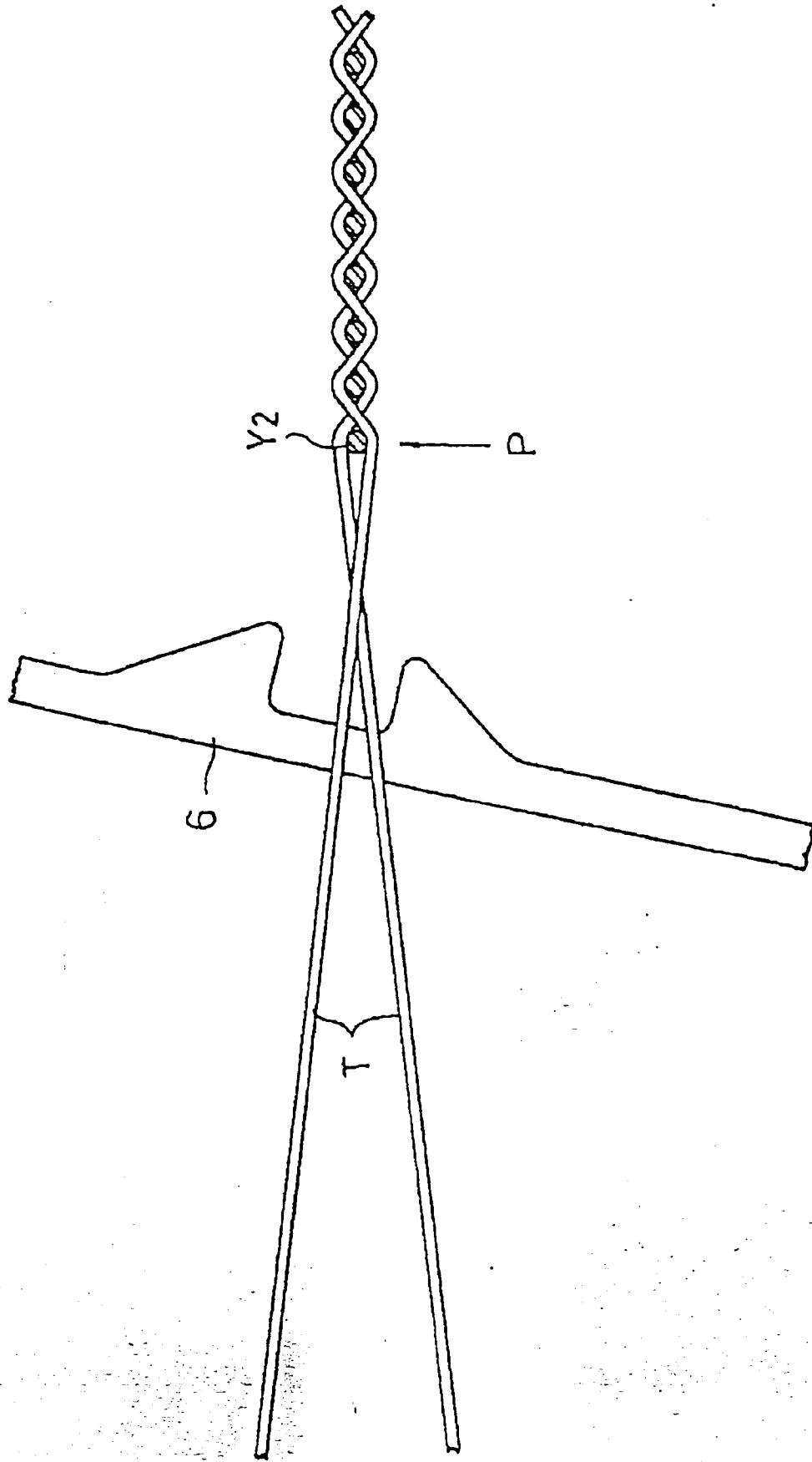


Fig. 5



F i g. 6

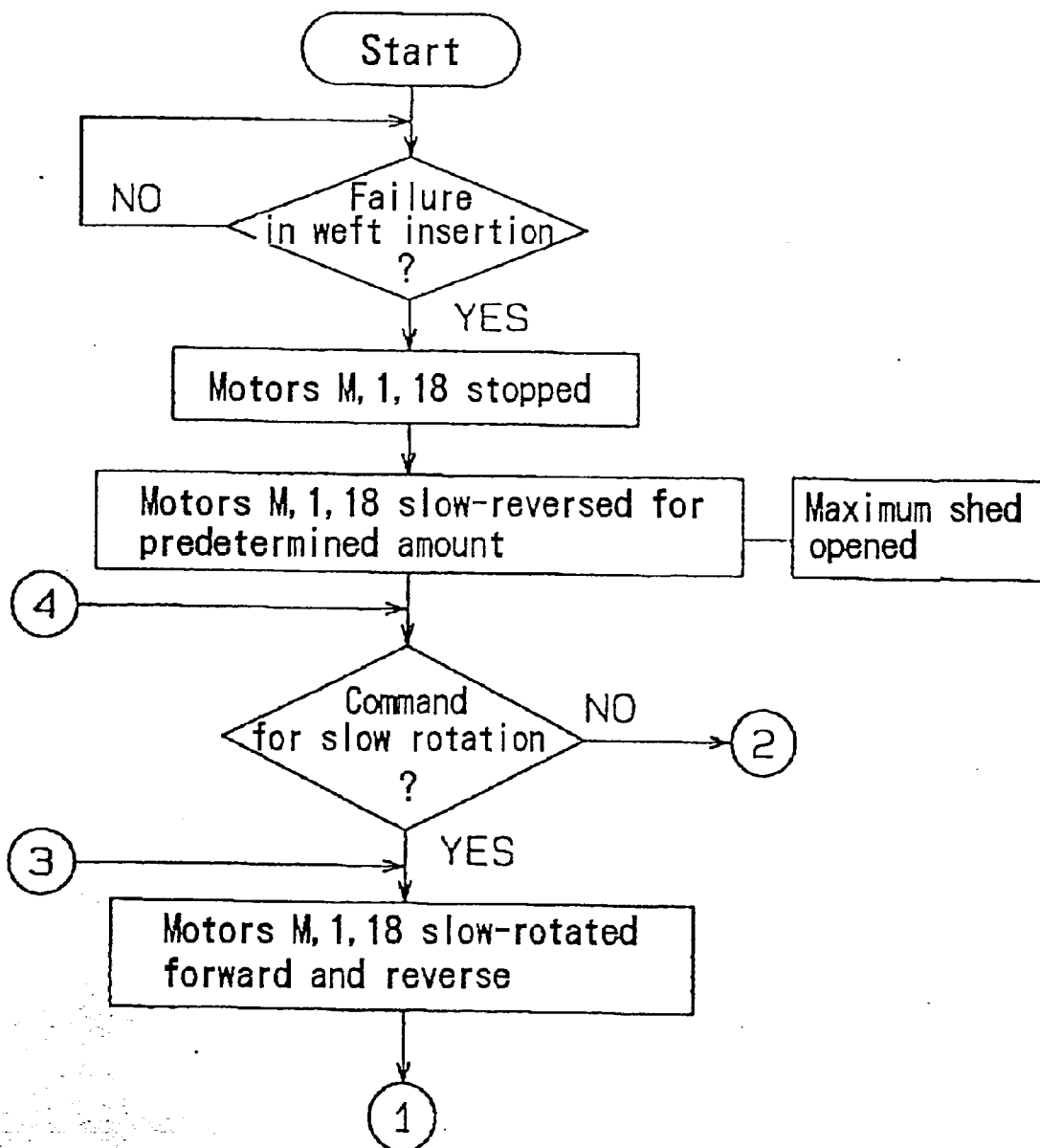


Fig. 7

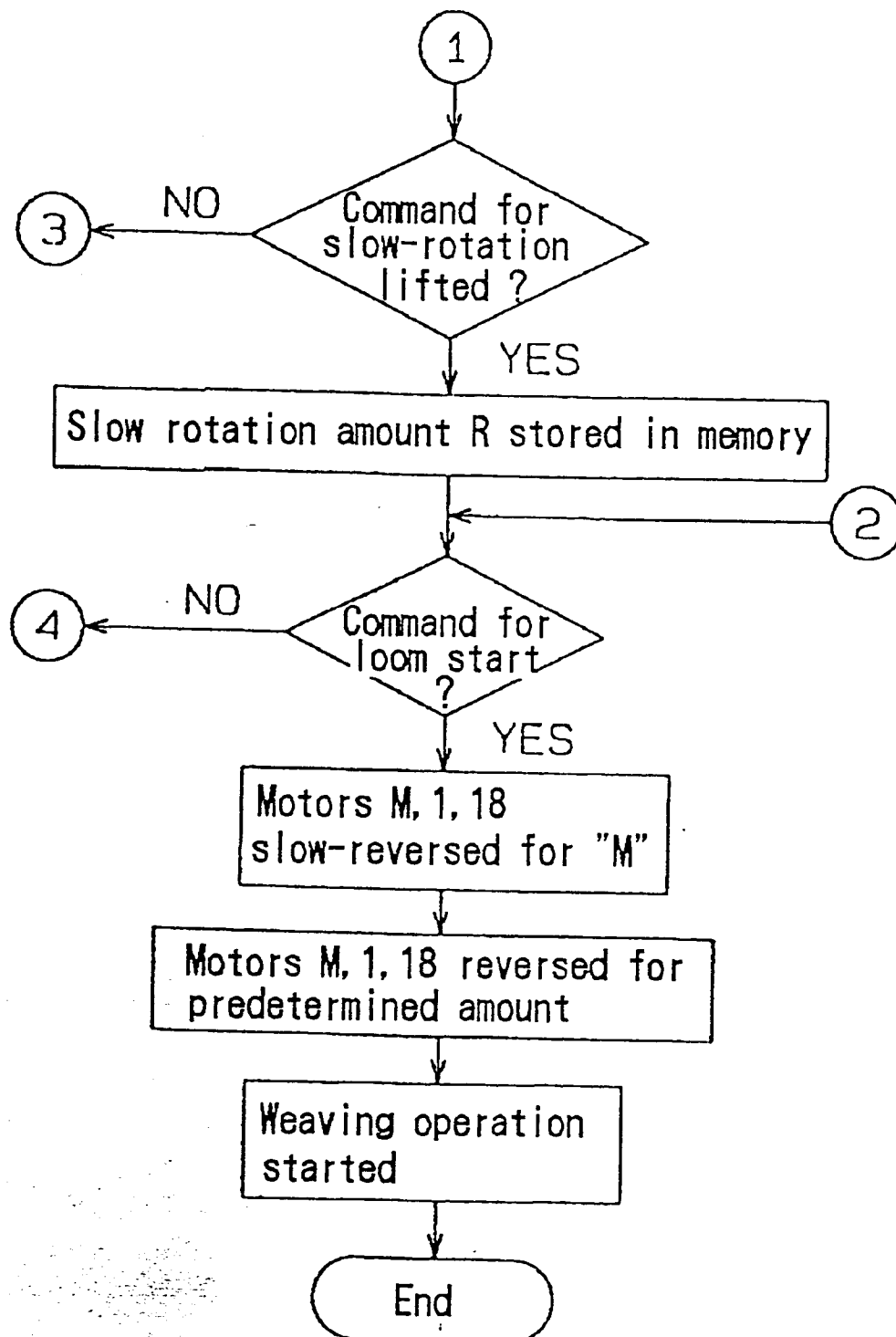
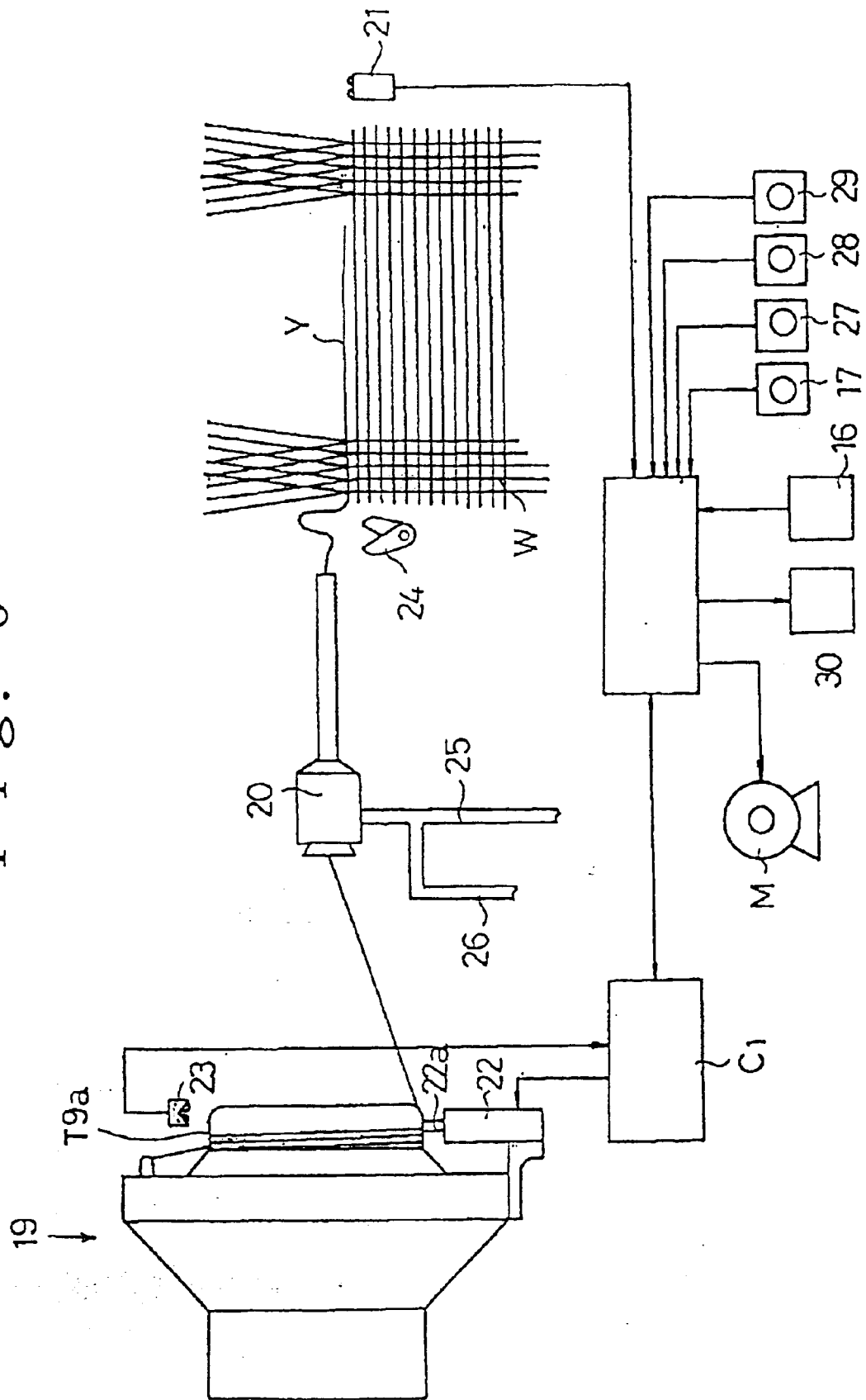


Fig. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 81 0234

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)
A	EP-A-0 184 779 (ERGOTRON S.A.S.) * page 13, line 29 - page 20, line 19; figures 1,2 *	1-5	003D49/10 003D51/00
A	EP-A-0 376 338 (TOYODA JIDOSHOKKI) * page 9, column 15, line 50 - page 10, column 17, line 31; figures 1-11 *	1,3-5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			003D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 JUNE 1992	Examiner HENNINGSEN O.
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