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(54) **Weft handling apparatus in a jet loom and air jet loom with such a weft handling apparatus.**

(57) The controlled weft handling apparatus includes means for (20, 15c, 18, 40, 41, 42, 43, 39, 38) for removing at least part of the weft yarn (Y) to a waste area (19) and is placed downstream a yarn feeder (8) but upstream the main nozzle (13) of the loom. The yarn is removed from upstream (8) and or downstream (13) the removing means. The weft handling includes further preferably pneumatically operated means (15b, 16) for transporting the weft yarn (Y) to the main nozzle (13). Preferably the weft handling system includes further controlled means (4, 5, 6, V_1, 14, 10, 11, 12, V_2) for transferring the weft yarn (Y) from a weft yarn package (3) to the weft feeder (8). Further the weft yarn handling apparatus may include an other, preferrably pneumatically operated arrangement (25, 26, 26a, 31, 32, 33, 34, 27, 29, 30, V_8, V_{10}) for transferring weft yarn (Y) to a waste area, the another arrangement being placed downstream the main picking nozzle (13) and at the entering side of the weaving shed.

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Fig. 2

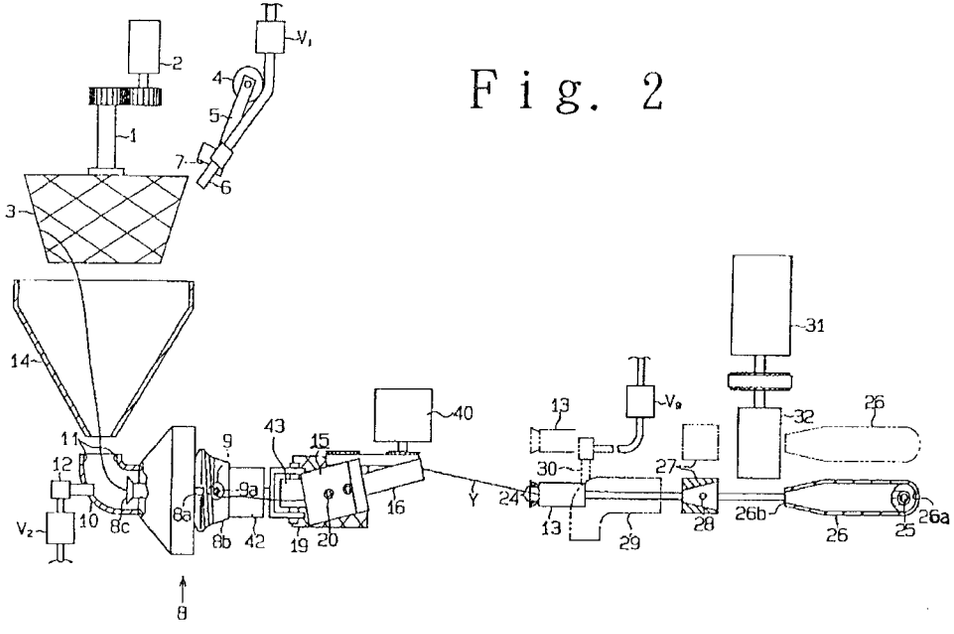
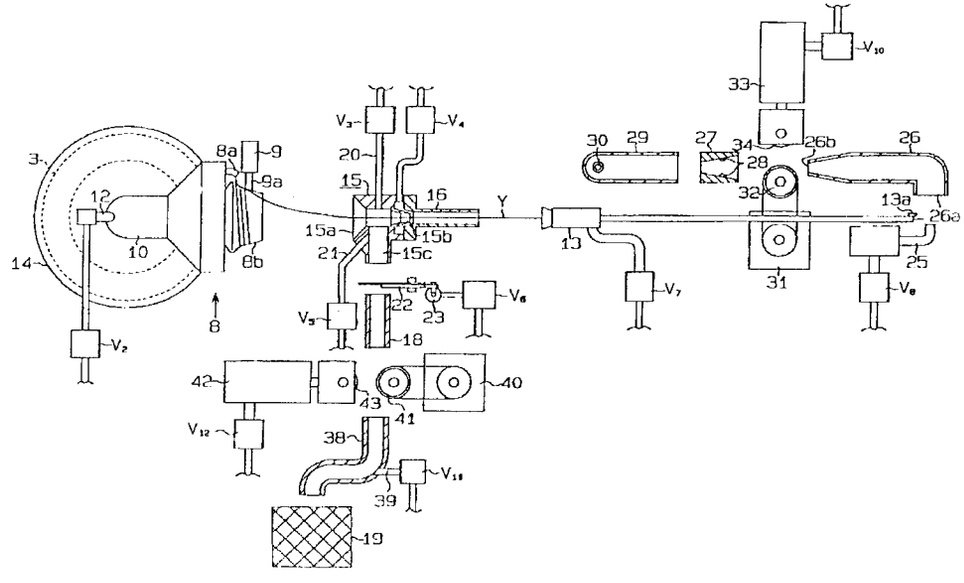

V1
2
4
5
1
7
6
3
14
31
40
13
V9
32
26
11
9
43
15
12
30
27
Y
24
10
8c
8a
9a
8b
42
19
20
16
13
29
28
26b
26
25
26a
V2
8

Fig. 1


V10
33
V3
V4
30
29
27
34
26b
26
28
32
13a
26a
3
8a
9
20
15
16
Y
12
9a
15a
15b
13
25
14
10
8b
21
15c
31
V8
V7
22
23
V6
V5
18
8
V2
42
40
43
41
V12
38
V11
39
19

The present invention relates to a weft handling apparatus in a jet loom for conducting the leading end of a weft to main picking nozzle of the loom in changing weft cheese i.e. a weft yarn package or when a break has occurred in the weft between the weft cheese and the main picking nozzle. The invention is further relatet to an air jet loom with such a weft handling apparatus.

Conventional apparatuses for the above purpose are disclosed, for example, in the Japanese Patent Application No. 60-2749, in the Japanese Utility Model Application No. 1-62375 or in the Japanese Patent Application No. 1-213437.

In the conventional apparatus according to JP No. 60-2749, a weft guide nozzle is disposed between weft measuring and storage device of winding type and main weft picking nozzle, and a weft guide suction tube is provided adjacently to weft winding surface of the weft measuring and storage device so that residual windings of weft may be sucked into the guide suction tube and then introduced into the guide nozzle.

In the conventional apparatuses according to the Publications JP No. 1-62375 and JP No. 1-213437, on the other hand, a weft feed nozzle is disposed between weft measuring and storage device of winding type and main weft picking nozzle, and a guide pipe, which is shiftable between its operative guiding position and inoperative retracted position, is provided between the weft measuring and storage device and the weft feed nozzle so that leading end of a weft coming out from weft winding tube of the measuring and storage device may be introduced by air jet into the guide pipe which is then positioned in its operative guiding position. It is so arranged in these apparatuses that residual windings of weft, if present on the weft winding surface, are pulled back from the weft measuring and storage device by a weft removing means provided on the upstream side of the measuring and storage device, while rotating the weft winding tube in reverse direction, and the leading end of the weft thus pulled back is cut at a predetermined position end and then blown out through the weft winding tube to be introduced into the weft feed nozzle.

In order to pull the residual weft on the winding surface with use of the apparatus of the Publication No. JP 60-2749, the guide suction tube must be moved close to the weft winding surface of the weft measuring and storage device, but it is difficult to pull the weft on the winding surface by suction of the guide suction tube. Furthermore, because the residual weft is introduced as it is into the weft feed tube, it may be moved from the feed nozzle toward the main picking nozzle in an entangled state, which causes a failure in introducing the weft through the main picking nozzle.

With the conventional apparatuses of JP No. 1-62375 and JP No. 1-213437, wherein even a weft with its leading end already passed through the feed nozzle must be pulled back, a long time is unavoidably spent for handling of the weft. Furthermore, pulling back a weft from the measuring and storage device and then guiding the weft to the same device will increase the probability of failure in properly handling of weft. Additionally, provision of the weft removing means on upstream side of the measuring and storage device will make the apparatus complicated in structure, and the resistance in pulling windings of weft from the weft winding surface is so noticeable that weft pulling by air stream cannot be accomplished with reliability.

Either of the above-mentioned conventional apparatuses are also disadvantageous in that they are unable to cope with possible failure in weft feeding caused by blockage of the weft feed nozzle or main picking nozzle with foreign matters such as fly.

Therefore, an object of the present invention is to provide a weft handling apparatus in a jet loom which is simplified in construction, reduces the time for weft handling, and also is capable of coping with failure in weft feeding by nozzles clogged with foreign matters.

A weft handling system according the invention is chracterized by the teaching of claims 1 or 2. A loom according to the invention is characterized by the teaching of claim 6. The depending claims are related to particularly favourable improvements of the invention.

In order to solve the above problems, the weft handling apparatus according to the present invention comprises means disposed on downstream side of the weft measuring and storage device in respect of weft feeding direction for holding part of the weft, mechanical means disposed on downstream side of the weft measuring and storage device for withdrawing part of the weft, means for transferring part the weft from the weft measuring and storage device to the withdrawing means, means for cutting the weft which is held by the holding means or which has been transferred to the withdrawing means by the transferring means, at a predetermined position, and weft guide means for guiding and inserting the cut leading end of the weft the main picking nozzle. By so arranging the apparatus, in the event of a weft break occurring at any position, the residual winding of weft on the weft winding surface of the winding and storage device is transferred to a weft holding region defined by the weft holding means and the wft held by the holding means is cut at a predetermined position by the cutting means. Thus, the residual weft can be discarded rapidly and reliably and, simultaneously, feeding and inserting of the cut weft leading end into the main weft picking nozzle can be accomplished with high degree of success. Even in the event of failure in weft picking caused by fly clogging the nozzle, the apparatus is capable of removing the fly and permitting smooth feeding and inserting of the weft end into

the main picking nozzle.

In order to solve the above problems, the weft handling apparatus according to the present invention comprises means disposed on downstream side of the weft measuring and storage device in respect of weft feeding direction for holding part of the weft, mechanical means disposed on downstream side of the weft measuring and storage device for withdrawing part of the weft, means for transferring part the weft from the weft measuring and storage device to the withdrawing means, means for cutting the weft which is held by the holding means or which has been transferred to the withdrawing means by the transferring means, at a predetermined position, and weft guide means for guiding and inserting the cut leading end of the weft the main picking nozzle.

In the event of failure in proper weft feeding due to foreign matter such as fly clogging the main weft picking nozzle, the weft transferring means and weft withdrawing means are operated to transfer the weft to a withdrawing region defined by the weft withdrawing means which then pulls back or withdraws the weft to move it out through the main picking nozzle. The fly clogging the main picking nozzle is removed or pulled out therefrom together with the weft being withdrawn by the withdrawing means. The weft withdrawn from the picking nozzle is cut by the cutting means at the predetermined position. The cut leading end of the weft is guided and inserted into the main weft picking nozzle by the weft guide means.

In the event of a weft break at any position between the weft measuring and storage device and the main weft picking nozzle, the weft holding means is operated and the residual winding of weft on the weft winding surface of the winding and storage device is transferred to a weft holding region defined by the weft holding means. The weft held by the holding means is cut at the predetermined position by the cutting means and the cut leading end of the weft is guided and inserted into the main weft picking nozzle by the weft guide means.

The following will describe an embodiment of the invention by way of an example with reference to the accompanying drawings. Fig. 1 through 11 show schematically an embodiment of weft handling apparatus in a jet loom according to the present invention and details thereof;

Fig. 1 is a side view partially in section showing normal condition of weft feeding through the apparatus during normal weaving operation of the loom;

Fig. 2 is a plan view partially in section showing the same condition as illustrated in Fig. 1;

Fig. 3 is a side view partially in section showing a condition of removing residual weft in the event of failure in weft picking due to fly clogging a nozzle;

Fig. 4 is a side view partially in section showing a condition in which the paired withdrawing rollers are in contact engagement;

Fig. 5 is a side view partially in section showing a condition in which an improperly picked weft has been withdrawn;

Fig. 6 is a side view partially in section showing a condition in which winding of reserve weft is being formed;

Fig. 7 is a side view partially in section showing a condition in which a weft has been cut;

Fig. 8 is a side view partially in section showing a condition in which a weft extends up to the paired rollers between which the weft is nipped therebetween;

Fig. 9 is a side view partially in section showing the condition of weft cutting performed in the event of occurrence of a weft break between the cheese and the wft measuring and storage device;

Fig. 10 is a block diagram illustrating the weft handling apparatus;

Fig. 11 a - e are flow charts showing the control program for handling weft according to the invention.

There is provided a rotatably supported bracket 1, which carries at its distal end a weft cheese 3 and has at its opposite proximal end a weft unwinding motor 2 connected thereto through gears for driving the weft cheese 3 to rotate in its unwinding or weft releasing direction.

A motor 4 is disposed adjacent to the periphery of the weft cheese 3 on its large-diameter side and it is operatively connected to a support arm 5 which supports thereon a weft releasing blow nozzle 6 and a sensor 7 of photoelectric transmission type for detecting the current wound diameter of the weft cheese 3. The blow nozzle 6 is connected via a solenoid-operated two-way valve V1 to an air supply source (not shown) and oriented so as to direct its air jet toward the cheese periphery on its large-diameter side at such angle with respect to the cheese periphery that the weft on the cheese 3 may be released therefrom smoothly in weft feeding direction by the air jet from the blow nozzle 6. Thus, the air jet from the blow nozzle 6 sweeps the cheese peripheral surface from the large-diameter side of the cheese 3 toward the opposite small-diameter side.

A weft measuring and storage device 8 of a known winding type is arranged on the downstream side of the weft cheese 3 in respect of the weft feeding direction. The weft measuring and storage device 8 has a weft winding tube 8a driven to rotate by a motor M (indicated in Fig. 10) for winding a predetermined length of reserve weft on weft winding surface 8b of the measuring and storrage device 8. The motor M is operable independently from a main loom drive motor (not shown). The winding of reserve weft stored on the weft winding surface 8b can be released when a stop pin 9a, whose reciprocating motion is controlled by an

electromagnetic solenoid 9, is moved out of engagement with the weft winding surface 8b.

The weft measuring and storage device 8 has further a weft inlet 8c which is in communication with the weft winding tube 8a and a weft introducing duct 10 is mounted so as to enclose the weft inlet 8c. A weft-break sensor 11 of photo-electric transmission type is provided within the weft introducing duct 10 adjacently to its inlet port. A blow nozzle 12 is connected to the weft introducing duct 10 so as to direct its air jet toward the weft inlet 8c. Operation of the blow nozzle 12 is controlled by a solenoid-operated two-way valve V2. Air jet from the blow nozzle 12 passes through the weft inlet 8c and weft winding tube 8a and directed toward a main weft picking nozzle 13 which is fixedly mounted an a slay (not shown) of the loom.

A convergently-shaped guide tube 14 is disposed between the weft cheese 3 and the weft measuring and storage device 8, with its large end facing the weft cheese 3 and the opposite small end in confrontation with the inlet of the weft introducing duct 10. By so arranging, substantially all of the air flow from the weft releasing blow nozzle 6 can be collected by the guide tube 14 and then introduced into the duct 10.

On the downstream side of the weft measuring and storage device 8 are disposed a nozzle block 15 and a weft guide nozzle 16 combined integrally to the nozzle block. The nozzle block 15 and weft guide nozzle 16 are located so as to receive therein a weft Y which has been released from the weft winding surface 8b and to guide the same weft therethrough toward the main weft picking nozzle 13. As shown in Fig. 2, the weft guide nozzle 16 is directed toward the inlet of the main weft picking nozzle 13 moved to its most retracted position as indicated by phantom line in Fig. 2.

The nozzle block 15 is fromed at its bottom with an integral rejecting pipe 15c extending downward therefrom. Immediately below and in alignment with the rejecting pipe 15c of the nozzle block 15 is disposed a dust pipe 18, just below which is located a crank-shaped suction pipe 38. A waste box or dust box 19 is arranged adjacently to the downstream end of the suction pipe 38. A blow nozzle 39 is mounted in the suction pipe 38 at its bent portion so that air jet from the nozzle creates vacuum in the pipe 38. The blow nozzle 39 is connected to the air supply source (not shown) by way of a solenoid-operated two-way valve V11.

There is provided a pair of cooperating withdrawing rollers between the dust pipe 18 and suction pipe 38, i.e. a drive roller 41 which is positively driven by a motor 40 and a driven roller 43 which is rotatably supported by an air cylinder 42 in facing relation to the above drive roller 41. It is so arranged that prodruding operation of the air cylinder 42 causes the roller 43 to be brought into contact engagement with its associated drive roller 41 in the region between the dust pipe 18 and suction pie 38. The air cylinder 42 is connected to the air supply source (not shown) by way of a solenoid-operated three-way valve V12.

The nozzle block 15 has at its top a blow nozzle 20 arranged in facing relation to the rejecting pipe 15c for deflecting or transferring the weft Y into the rejecting pipe 15c. The blow nozzle 20 is connected to the air supply source (not shown) by way of a solenoid-operated two-way valve V3.

The nozzle block 15 has a weft inlet 15a which is formed with a large-diameter opening and tapered in convergent configuration in weft feeding direction. The end of the weft winding tube 8a is bent so as to be directed toward the weft inlet 16a of the nozzle block 15. The nozzle block 15 has a weft exit 15b which is formed with a small-diameter opening and tapered in convergent confirguration in weft feeding direction. The guide nozzle 16 is fixed to the nozzle block 15 with a small space formed between the outer periphery of the weft exit 15b and the inner periphery of the guide nozzle 16. The guide nozzle 16 is connected to the air supply source (not shown) by way of a solenoid-operated two-way valve V4. A blow nozzle 21 is mounted in the rejecting pipe 15c with such a direction that air jet from the blow nozzle 21 is passed through a region defined by and between the blow nozzle 20 and rejecting pipe 15c and directs toward the exit 15b of the nozzle block 15. The blow nozzle 21 is connected ot the air supply source (not shown) by way of a solenoid-operated two-way valve V5.

There is provided a cutter 22 between the rejecting pipe 15c and dust pipe 18. The cutter 22 is adapted to make a cutting stroke by operation of an air cylinder 23 which is connected to the air supply source (not shown) by way of a solenoid-operated three-way valve V6.

A weft-break sensor 24 of photoelectric transmission type is located within the inlet of the main weft picking nozzle 13 and a stationary cutter 13a is attached on top of the opposite exit end of the main weft picking nozzle 13 with part of the cutter 13a projecting beyond the exit end of the nozzle 13.

A blow nozzle 25 is disposed immediately below the main weft picking nozzle 13 such that air jet from the blow nozzle 25 intersects air jet from the picking nozzle 13. Immediately above the main weft picking nozzle 13 is located a weft introducing duct 26 having its inlet 26a positioned in facing relation to the exit of the blow nozzle 25. The weft introducing duct 26 has its exit 26b directed oppositely to the direction of weft picking by the main weft picking nozzle 13.

An air guide 27 and its associated suction pipe 29 are located adjacently to the exit 26b of the air duct 26. A weft sensor 28 of photoelectric transmission type is provided within the air guide 27. As shown in Fig. 2, the suction pipe 29 is bent and directed at its exit toward a waste box or dust box (not shown). The suction pipe 29 has at its bent portion a blow nozzle

30 which produces air jet toward the dust box (not shown).

The main weft picking nozzle 13, blow nozzle 25, weft introducing duct 26, air guide 27 and suction pipe 29 are all mounted on a slay of the weaving loom for movement therewith. Behind the swinging area of these parts 13, 25, 26, 27, 29 are provided a motor 31 and an air cylinder 33. A drive roller 32 is operatively connected to the motor 31 to be driven thereby, while a driven roller 34 is mounted to the air cylinder 30 so that protruding operation of the cylinder causes the roller 34 to be brought into contact engagement with its associated roller 32 in the region between the weft introducing duct 26 and the air guide 27.

The main weft picking nozzle 13 and blow nozzle 25, 30 are connected to the air supply source (not shown) via solenoid-operated two-way valve V7, V8 and V9, respectively. The air cylinder 33 is connected to the air supply source via a solenoid-operated three-way valve V10. As indicated in Fig. 10, the operation of the solenoid-operated valves V1 through V12, motors 2, 3, 31, 40, M, and solenoid 9 are all controlled by a computer control C shich is provided independently from a main control appartus for the weaving loom. The control C is adapted to control the operation of the solenoids and motors on the basis of signals which are transmitted from the weftbreak sensor 11, 24, weft sensor 28, and cheese wound diameter sensor 7.

Diagrams (a) through (e) ofFig. 11 show a flow chart of control program for handling a weft in the event of a weft break between the weft supply cheese 3 and the main weft picking nozzle 13 and also the event of a failure in proper weft picking due to clogging of the main weft picking nozzle 13 or weft guide nozzle 16 with foreign matter such as fly. The following will describe the operation of the above-described apparatus also with reference to the flow chart.

Figs. 1 and 2 show a state in which a weft Y unwound from the cheese 3 is being fed and picked during normal weaving operation of the loom. If a failure in weft feeding takes place, or if a break occurs in the weft Y at any position between the cheese 3 and the main weft picking nozzle 13, this break is detected by the weft-break sensor 11 or 24, which then transmits to the computer control C a signal representative of such failure in weft feeding. In response to this signal, the control C commands a loom stop to the loom's main control, which then causes the loom to stop its weaving operation with the main picking nozzle 13 on the slay positioned adjacent to the cloth fell of woven fabric. After the loom has been thus stopped, it is rotated reverse for a predetermined amount and the weft picking nozzle 13 is swung accordingly to its most retracted position (or threading position), as indicated by phantom line in Fig. 2. After such a reverse rotation of the loom, the control C causes the solenoids for valves V3, V11 and also the solenoid 9 to be energized (or turned on) thereby to open the blow nozzle 20, 39 and to move the stop pin 9a away from the weft winding surface 8a.

If the above weft break has occurred between the weft measuring and storage device 8 and the main weft picking nozzle 13, the control C responds to a signal from the weftbreak sensor 11, which signal is representative of presence of weft in the weft introducing duct 10. Accordingly, the solenoid for valve V2 is energized for a predetermined period of time to open the blow nozzle 12 for the same predetermined time period, with the blow nozzle 20, 39 then opened and the stop pin 9a disengagend from the weft winding surface 8b.

In the event that the weft break has occurred specifically between the weft guide nozzle 16 and the main weft picking nozzle 13, the leading end of the weft Y is blown into the rejecting pipe 15c by air jet from the blow nozzle 20 and introduced further through the dust pipe 18 and suction pipe 38. With the stop pin 9a positioned away from engagement with the weft winding surface 8b and the blow nozzle 12 opened for the predetermined time period, residual winding of weft on the winding surface 8b is blown toward the nozzle block 15 by air jet from the blow nozzle 12. Because the exit of the weft winding tube 8a is directed toward the block 15, substantially all of the air jet from the blow nozzle 12 through this winding tube 8a is flown toward this block 15. The residual weft coming out of the winding tube 8a is blown into the nozzle block 15 and then introduced as far as into the suction pipe 38 through the rejecting pipe 15a and dust pipe 18 by air jet from the blow nozzle 20 and also by suction created by the blow nozzle 29. Thus, the weft is transferred to weft holding position which is made up by parts including the rejecting pipe 15c, dust pipe 18 and suction pipe 38.

Also in the event that the weft break has occurred between the weft measuring and storage device 8 and the weft guide nozzle 16, the solenoids for valves V3, V11 are energized, the solenoid 9 energized, and the solenoid for valve V2 energized for the predetermined period of time, with the result that the residual winding of weft on the weft winding surface 8b is introduced as far as into the suction pipe 38 to be held in the weft holding position.

When the blow nozzle 12 has completed air injection for the above predetermined time period, the control C causes the solenoid 9 to be deenergized (or turned off), thereby moving the stop pin 9a into engagement with the weft sinding surface 8b. The control C then causes the motor M to be rotated for a predetermined amount, rotating the weft winding tube 8a for a predetermined number of turns to from reserve weft Y2 with the predetermined number of windings round the weft winding surface 8b.

After such reserve weft winding, the control C turns onand then off the solenoid for valve V6, activat-

ing the cutter 22 to make a complete cutting stroke. Thus, the weft which is held by air jet from the blow nozzle 20 and suction in the suction pipe 38, as shown in Fig. 9, can be cut at a predetermined position between the rejecting pipe 15c and the dust pipe 18, with the result that leading end Y1 of weft cut to a predetermined length as measured from the measuring and storage device 8 is available. This length of weft leading end is of such length that can permit smooth weft feeding into the weft picking nozzle 13. Thus, the blow nozzle 20 and suction pipe 38 constitute means for holding a weft in handling thereof in the event of occurrence of a weft break.

After the above weft cutting by the cutter 22, the control C turns off the solenoids for valves V3, V11 thereby to close the blow nozzles 20, 39. Subsequently, the control C also deenergizes the solenoid 9 to move the stop pin 9a away from the weft winding surface 8b. In this state, the control C actuates the solenoids for valves V8, V9 to open the blow nozzles 25, 30, respectively, so that air flow is produced which is directed from the blow nozzle 25 toward the inlet 26a of the wft introducing duct 26, moving across the air jet to be issued from the main weft picking nozzle 13, and, simultaneously, air flow is generated in the suction pipe 29 which creates a vacuum in the same pipe.

Subsequently, the control C energizes the solenoids for valves V7, V4, V5 thereby to open the main weft picking nozzle 13, weft guide nozzle 16 and blow nozzle 21, respectively. The blow nozzle 21 issues air jet which intersects the region between the blow nozzle 20 and the rejecting pipe 15c and also directs toward the exit 15b of the nozzle block 15. Therefore, the air jet from this blow nozzle 21 forces the cut weft end Y1 to come out of the rejecting pipe 15c and directs it into the outlet 15b, so as to place the weft end Y1 under the influence of air jet from the guide nozzle 16. The air jet from the guide nozzle 16 conveys the leading end Y1 of the weft toward the inlet of the main weft picking nozzle 13. Because the weft end Y1 has been cut previously to a predetermined length, threading the picking nozzle 13, or insertion of the weft end Y1 through the picking nozzle 13, can be accomplished with smoothness.

Reverse winding of weft Y2 stored on the weft winding surface 8b is pulled out by air injection from the blow nozzle 21 and guide nozzle 16, and the leading end Y1 of weft conveyed to the weft picking nozzle 13 is flown out therefrom. The air jet from the picking nozzle 13 meets with the air jet from the blow nozzle 25 and enters into the weft introducing duct 26, so the weft coming out from the picking nozzle 13 is deflected to enter into the duct 26 without being picked into a shed. As shown in Fig. 8, the cut leading end Y1 of weft is moved past the region between the rollers 32, 34 and reaches the weft sensor 28.

If the weft has failed to be fed to the main weft picking nozzle 13, it also fails to reach the weft sensor 28 to be detected thereby. If the control C fails to receive a weft-detected signal from the sensor 28 for a predetermined period of time and also if the number of such failures in weft feeding to the picking nozzle 13 has not yet counted "M" times, the control C deenergizes the solenoids for valves V4, V5, V7, V8, V9 and the solenoid 9, thereby closing the weft picking nozzle 13, guide nozzle 16 and blow nozzles 21, 25, 30 and also moving the stop pin 9a into engagement with the weft winding surface 8b. It is noted that the weft is passed through the nozzle block 15 even if the weft feeding to the picking nozzle 13 has failed. Subsequent to the deenergization of the above solenoids, the control C actuates the solenoid for valve V3 to open the blow nozzle 20 and activates the motor M to be rotated for a predetermined amount. By so doing, the weft is held in the dust pipe 18 and reserve winding of weft is formed on the weft winding surface 8b. Thereafter, a series of operations necessary for feeding weft through the main weft picking nozzle 13 is carried out in the same manner as described earlier, which series of operations include cutting of weft by the cutter 22, releasing of the stop pin 9a, air injection by the blow nozzles 25, 30, and air injection by the main weft picking nozzle 13, guide nozzle 16 and blow nozzle 21. If weft feeding to the main weft picking nozzle 13 has failed for as many as "M" times, the control C causes the alarming device 35 (Fig. 10) to be actuated.

If the weft feeding is successful, the control C responding to a weft-detected signal from the weft sensor 28 causes deenergizes the solenoids for valves V4, V5, V7, V8 and also the solenoid 9 to close the main weft picking nozzle 13, guide nozzle 16 and blow nozzle 21, 15 and also to move the stop pin 9a into engagement with the weft winding surface 8b. The control C then energizes the solenoid for valve V10 to operate the cylinder 33 in projecting direction, which causes the driven roller 34 to be brought into contact engagement with its associated drive roller 32 thereby nipping the weft therebetween as shown in Fig. 8. Subsequently, the control C activates the motor M to rotate the weft winding tube 8a for a predetermined amount for forming reserve winding of weft on the weft winding surface 8b.

After this reserve weft winding, the control C causes the motor 31 to be rotated. By so doing, the weft is pulled by the rotating rollers 32, 34, and the weft tensioned by such pulling is cut the stationary cutter 13 on the main weft picking nozzle 13. The end cut off the weft is pulled by the rollers 32, 34 and discarded by the blow nozzle 30 into the dust box (not shown).

When the entire cut end of weft has moved past the air guide 27, a signal is generated by the sensor 28 which is representative of no weft being detected. in response to this signal, the control C causes the motor 31 to be stopped and the solenoid for valve V10

to be energized, so the air cylinder 33 is operated in its retracting direction and the roller 34 is moved away from its associated roller 32. The control C then actuates the solenoid for calve V9 to close the blow nozzle 30. Thereafter, the loom is resumed to its starting position ready for restarting.

If the weft break has occurred between the weft cheese 3 and the measuring and storage device 8, the control C responds to a weft-broken signal from the weft-break sensor 11 and, in rsponse thereto, transmits a loom-stop signal to the lomm's main control, which in response thereto causes the loom to stop tis operation and then rotated reverse for a predetermined amount. Upon such reverse rotation of the loom, the control C energizes the solenoids for valves V3, V11 and the solenoid 9, and also actuates the solenoid for valve V2 for a predetermined period of time, in the same manner as in the above-described previous cases. By the above energization of solenoids, the residual winding of weft on the weft winding surface 8b can be discharged into the dust box 19. Thereafter, the control C executes a control program which is different from that executed in the previous cases.

After the energization of the solenoid for valve V2, the control C responds to the information on the current wound diameter of the cheese 3 detected by the sensor 7 and actuates the motor 4 accordingly so as to move the weft releasing nozzle 6 to a position spaced from the periphery of the cheese 3 at a distance suitable for weft releasing from the cheese 3. Then, the control C energizes the solenoids for valves V2, V2 to open the blow nozzles 6, 12, respectively. Subsequently, the control C activates the motor 2. The weft cheese 3 is rotated in weft releasing direction while being subjected to air jet from the blow nozzle 6, so that the leading end of weft on the cheese 3 is removed from its periphery and blown into the convergent guide tube 14 by air jet issued from the blow nozzle 6. Air flow from the blow nozzle 6 is directed toward the inlet of the introducing duct 10 by the air collecting action of the convergently-shaped guide tube 14, so the weft leading end is guided and introduced into the duct 10. The weft end is blown out of the weft winding tube 8a by air jet from the blow nozzle 12 and then placed under the influence of air jet from the blow nozzle 20 and suction in the suction pipe 38 to be held in the weft holding position.

In the event of failure in feeding weft through the measuring and storage devie 8, the weft end fails to reach the dust pipe 18. If the control C fails to receive a weft-detected signal from the weft-break sensor 11 in a predetermined period of time, the control C causes the solenoid 9 to be deenergized, the motor 2 to be stopped, and the solenoids for valves V1, V2, V3, V11 to be deenergized and, simultaneously actuates the alarming device 35 for alarming.

When the control C receives the weft-detected signal properly from the sensor 11, the control C causes the solenoid 9 to be deenergized to move the stop pin 9a into engagement with the weft winding surface 8b, the motor 2 to be stopped, and the solenoids for valves V1, V2 to be deenergized to close the blow nozzles 6, 12, respectively. Then, the motor M is driven to rotate for a predetermined amount to form reserve winding of weft on the weft winding surface 8b. Thereafter, the same operations as described with reference to the previous cases are performed for weft feeding to the main weft picking nozzle 13.

As it is apparent from the foregoing description, no matter where a weft break takes place, the resulting residual winding of weft on the weft winding surface 8b can be discarded through the rejecting pipe 15c, dust pipe 18 and suction pipe 38. That is, discarding of residual weft winding is accomplished by a series of operations, which include air blowing by the blow nozzle 20, releasing the stop pin 9a from the weft winding surface 8b, and air blowing by the blow nozzle 12 for a predetermined period of time to place the weft under the influence of air flow by the blow nozzle 20 for holding the weft. Thus, the control program for weft handling in the event of a weft breakt can be simplified in comparison with programs which are designed to handle the weft differently for each different condition of weft breakt and, therefore, those weft sensors which are necessary for such different conditions of weft break are unnecessary. Furthermore, because residual winding of weft does not have to be pulled back towards the cheese 3 and also such residual weft will not be discarded through the main picking nozzle 13, the probability of failure in weft feeding due to repetitive weft conducting through the weft measuring and storage device 8 or through the main picking nozzle 13 can be reduced.

Since residual weft to be discarded to the dust box 19 is cut by the cutter 22 at a predetermined position, weft conducting through the main weft picking nozzle 13 can be performed easily with higher degree of success.

The above has described the operation of the weft handling apparatus in the event of failure in weft feeding due to a weft break at any position between the cheese 3 and the main picking nozzle 13. The following will describe the operation of the apparatus in the event of failure in weft picking due to clogging of the main weft picking nozzle 13 or of the inlet of the wft guide nozzle 16 with foreign matter such as fly.

Failure in normal weft picking is detected by a weft sensor (not shown) which is provided at the terminating end of weft picking passage. If the control C receives a signal representative of weft picking failure from such a weft sensor, it causes the solenoid for valve V8 to be energized for a predetermined period of time to open the blow nozzle 25 for the predetermined time period and the loom operation is stopped. Weft portion Y5 (shown in Fig. 3) which failed to be picked during the stopping motion of the loom and its

succeeding weft portion Y4 are exteded integrally as shown without being broken. The succeeding weft portion Y4 is blown into the duct 26 and reaches the suction pipe 29. The weft sensor 28 detects this weft portion Y4 and provides a weft-dtected signal to the control C. In response to this signal, the control C energizes the solenoids for valves V9, V10 to open the blow nozzle 30 and actuate the cylinder 33, respectively, and also activates the motor 31. By so doing, the weft portion Y4 is pulled by the paired rollers 32, 34 and the weft being subjected to tension by such pulling is cut by the stationary cutter 13a. The weft portion Y5 woven at cloth fell is pulled out therefrom by the weft portion Y4 which is being pulled by the rollers 32, 34. When the entire weft portion Y5 has moved past the weft sensor 28, the control C receives from the sensor 28 a signal representative of the absence of weft at the sensor. In response to this signal, the control C deenergizes the solenoids for valves V9, V10 to close the blow nozzle 30 and operate the cylinder 33 in its retracting direction, respectively, and also stops the operation of the motor 31. Thus, disposing of a improperly picked weft is completed.

If the main weft picking nozzle 13 or the inlet of the guide nozzle 16 is clogged with fly, it will result in failure in weft pickint through the picking nozzle 13 and this failure can be detected by the above sensor. In response to a signal representative of such failure from the sensor, the solenoid for valve V8 is energized to open the blow nozzle 25. If the weft sensor 28 in the air guide 27 has failed to detect the presence of a weft within a predetermined period of time in spite of the wft picking failure and the blowing by the blow nozzle 25, the control C is operated to perform the procedure of weft handling including removal of fly, as will be described in the following.

Firstly, the control C is operated to energize the solenoids for valves V11, V3 to open the blow nozzles 39, 20, respectively, and also the solenoid 9 thereby to move the stop pin 9a away from the weft winding surface 8b. After this stop pin movement, the solenoid for valve V2 is energized for a predetermined period of time, allowing the blow nozzle 12 to be opened for the same period of time, accordingly. Thus, residual winding of weft Y3 on the weft winding surface 8b is blown out therefrom and introduced into the nozzle block 15. Then, the residual weft portion Y3 is held in the weft holding position, as shown in Fig. 3, by the combined action of air jet from the blow nozzle 20 and suction created in the suction pipe 38. In this state, the wfet portion Y4 succeeding to the weft portion Y5, which has failed to be picked properly, is kept seized by the main weft picking nozzle 13 because of its clogging with fly. After the residual weft portion Y3 is held in position, the solenoid for valve V3 is deenergized to close the blow nozzle 20.

Subsequently, the solenoid for valve V12 is energized to actuate the cylinder, thus moving the withdrawing roller 41 into contact engagement with its associated roller 43 for nipping the weft portion Y3 therebetween. Then, the motor 40 is activated to drive the withdrawing rollers 41, 43 in the direction to pull the weft portion Y3 toward the dust pipe 18. Simultaneously, the weft portion Y4 extending beyond the nozzle block 15 is also withdrawn or pulled back toward the dust pipe 18 by the pulling action of the withdrawing rollers 41, 43.

The weft portion Y5 extending beyond the weft portion Y4 and beaten up at the cloth fell of woven fabric in an improperly picked condition is hard to be withdrawn from the cloth fell even by attempting to pull its succeeding weft portion Y4 by the combined action of air jet of the blow nozzle 25 and suction in the suction pipe 38. However, the weft portion Y5 beaten up at the cloth fell can be withdrawn easily by pulling pack the weft portion Y4. Additionally, the pulling back of the weft portion Y4 can serve to remove the fly clogging the nozzle because the fly entangled round the weft portion Y4 is moved together with the weft portion.

When the leading end of the weft portion Y5 has just moved past the weft sensor 24 in the main weft picking nozzle 13, as shown in Fig. 5, the control C in response to a signal from the weft sensor 24, which signal being representative of the absence of a weft, causes the motor 40 to stop its rotation. The stop pin 9a is moved into engagement with the weft winding surface 8b and, simultaneously, the motor M is rotated for a predetermined amount to form reserve winding of weft Y6 round the surface 8b, as shown in Fig. 6.

If the motor 40 is stopped in response to the above signal from the sensor 24 before it is rotated for a predetermined number "N" of turns, the control C deenergizes the solenoid for valve V11 to close the blow nozzle 39 with simultaneous alarming by the alarming device 35. The number "N" represents the length of weft portion Y5 to be withdrawn from the cloth fell of woven fabric. That is, if the withdrawing length of weft portion Y5 is short, it can be considered that part of the leading end of weft portion Y5 may have been cut off during the picking and the cut piece may be present at the cloth fell. Therefore, the numer "N" is set at a value corresponding to the possibly largest length of the wft portion Y5 with possibility of having a cut piece left at the cloth fell. By so setting the number "N", an alarm can be constitued if the motor 40 is stopped before it is rotated for "N" turns.

When the motor 40 ist rotated for "N" or more turns, the solenoid for valve V6 is turned on and off to cause the cutter 22 to make a cutting stroke. Thus, the weft portion leading from the reserve winding of weft on the weft winding surface 8b is cut to a predetermined length, as shown in Fig. 7. Thereafter, the same operations as described with reference to the previous cases are performed for weft feeding to the main weft picking nozzle 13.

It is to be understood that the present invention is not limited to the above-described embodiment, but may be practiced in other various ways. For example, the blow nozzle 20 issuing air jet for transferring the weft to the weft holding region in the above embodiment may be substituted with any suitable mechanical means. The weft guide nozzle 16 may be replaced with any other suitable mechanical means adapted to transfer and guide the weft into the main weft picking nozzle 13.

According to the present invention, the paired withdrawing rollers 41, 43 may be located between the nozzle block 15 and the weft measuring and storage device 8.

Furthermore, for distinguishing a weft break occurring between the weft measuring and storage device 8 and the guide nozzle 16 and a weft break between the guide nozzle 16 and the main weft picking nozzle 13, an additional weft sensor may be arranged at the inlet 15a of the nozzle block 15 so that a weft-detected signal transmitted by the additional weft sensor is judged by the control C as a weft break occurring between the guide nozzle 16 and the main weft picking nozzle 13 and air jet only from the blow nozzle 20 is utilized.

The controlled weft handling apparatus includes means for (20, 15c, 18, 40, 41, 42, 43, 39, 38) for removing at least part of the weft yarn (Y) to a waste area (19) and is placed downstream a yarn feeder (8) but upstream the main nozzle (13) of the loom. The yarn is removed from upstream (8) and or downstream (13) the removing means. The weft handling includes further preferably pneumatically operated means (15b, 16) for transporting the weft yarn (Y) to the main nozzle (13). Preferably the weft handling system includes further controlled means (4, 5, 6, V_1, 14, 10, 11, 12, V_2) for transferring the weft yarn (Y) from a weft yarn package (3) to the weft feeder (8). Further the weft yarn handling apparatus may include an other, preferrably pneumatically operated arrangement (25, 26, 26a, 31, 32, 33, 34, 27, 29, 30, V_8, V_{10}) for transferring weft yarn (Y) to a waste area, the another arrangement being placed downstream the main picking nozzle (13) and at the entering side of the weaving shed.

Claims

1. A weft handling apparatus in a jet loom wherein a length of weft unwound from a weft supply cheese (3) is measured and reserved by a weft measuring and storage device (8) of winding type and the weft (Y) thus measured and reserved is then inserted through a shed by fluid jet injected from a main picking nozzle (13), said weft handling apparatus comprising:

   means (15, 16, 21) disposed on downstream side of said weft measuring and storage device (8) in respect of weft feeding direction for holding part of the weft (Y);

   mechanical means (40, 41, 43) disposed on downstream side of said weft measuring and storage device (8) for withdrawing part of the weft (Y);

   means (20, 15c, 18) for transferring part the weft (Y) from said weft measuring and storage device (8) to said withdrawing means (40, 41, 42, 43);

   means (22) for cutting the weft (Y) which is held by said holding means or which has been transferred to said withdrawing means (40, 41, 42, 43) by said transferring means, at a predetermined position; and

   weft guide means (16) for guiding and inserting the leading end of the weft (Y) cut by said cutting means (22) into said main picking nozzle (13).

2. A weft handling apparatus for a jet loom, wherein a length of weft (Y) unwound from a weft yarn package (3) is measured and reserved by a weft measuring and storage device (8) and the weft (Y) thus measured and reserved is then inserted through a shed by fluid jet injected from a main picking nozzle (13), said weft handling apparatus comprising means (20, 15c, 18, 40, 41, 42, 43, 39, 38) for removing at least part of the weft yarn to a waste area (19) and being placed between said weft measuring and storing deviced (8) and said main picking nozzle (13), further including control means (C, V3, V_6, V_{11}, V_{12},) for controlling the weft handling apparatus.

3. A weft handling apparatus as claimed in claim 2, further comprising means (4, 5, 6, V_1, 14, 10, 11, 12, V_2) for transferring the weft yarn (Y) from said weft yarn package (3) to said weft measuring and storing means (8).

4. A weft handling apparatus as claimed in claim 2 or claim 3, further comprising means (25, 26, 26a, 31, 32, 33, 34, 27, 29, 30, V_8, V_{10}) for transferring the weft yarn (Y) to a waste area and being placed downstream the main picking nozzle (13) and at the entering side of the weaving shed.

5. A weft handling apparatus as claimed in one of the claims 1 to 2, wherein the means (6, 10, 12; 16, 20, 21; 25, 26) for transferring the weft yarn are at least least partly pneumatically operated.

6. An air jet loom with a weft handling apparatus according to any of the claims 1 to 5.

Fig. 1

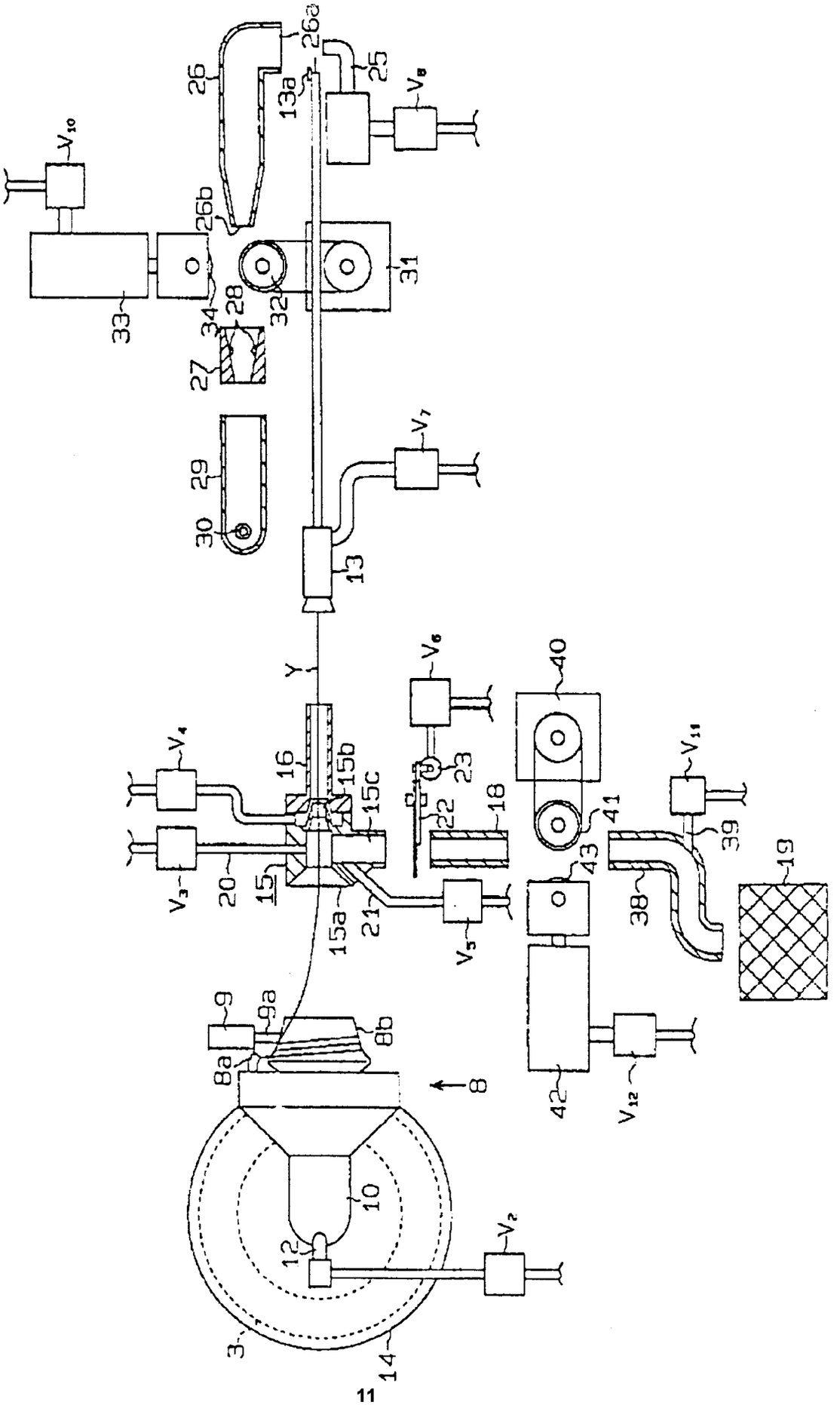

26a
25
V_8
13a
26
V_{10}
26b
31
33
34
28
32
27
29
V_7
30
13
Y
V_6
40
V_4
16
15b
15c
23
22
18
41
V_{11}
V_3
20
15
43
39
38
19
15a
21
V_5
9
9a
8b
8a
8
42
V_{12}
10
12
V_2
3
14

Fig. 2

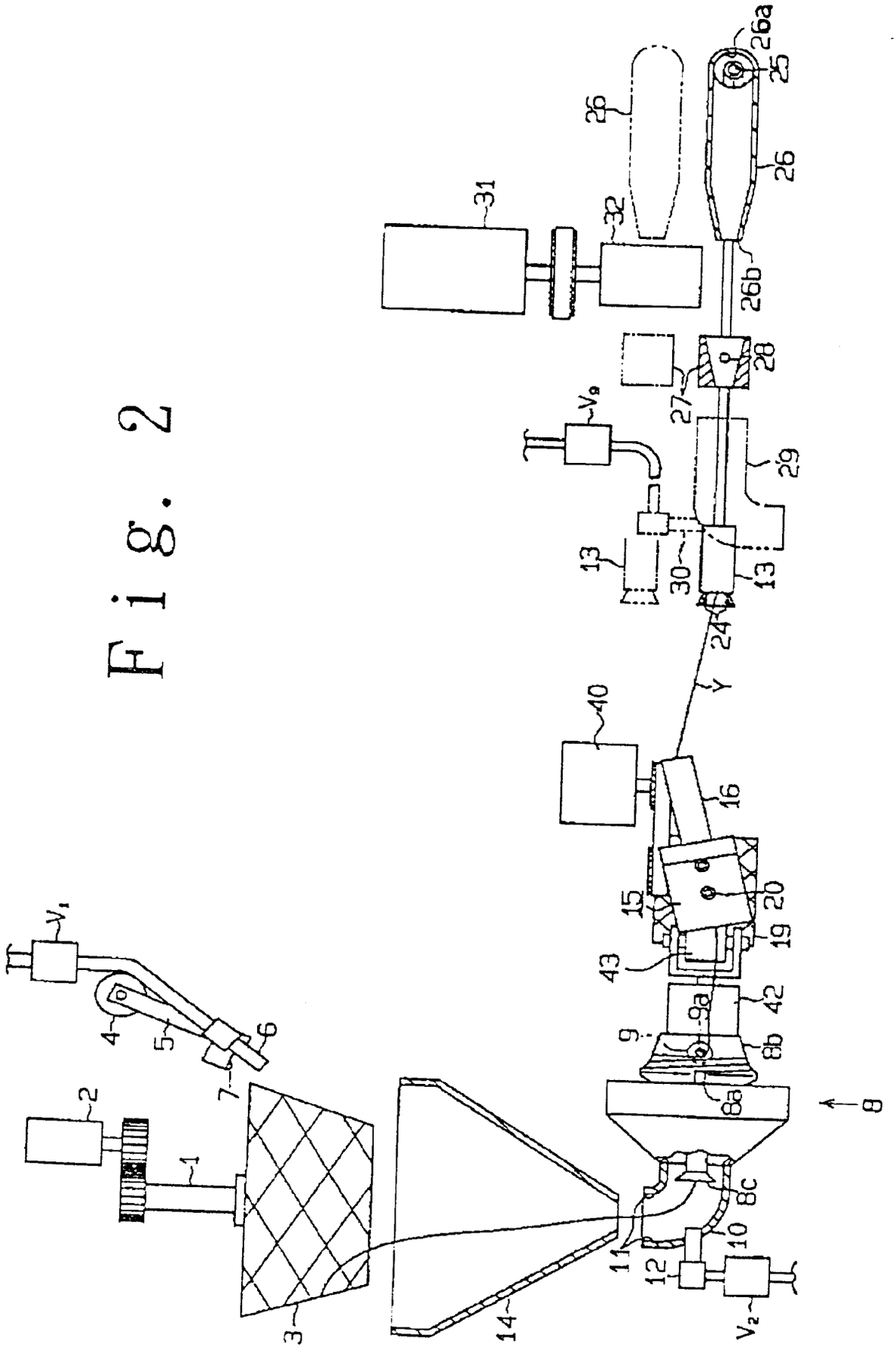

26a
25
26
26
31
32
26b
28
27
V_0
29
13
30
13
24
Y
40
16
15
20
19
43
42
9a
9
8b
8a
B
8c
10
11
12
V_2
14
3
2
1
7
6
5
4
V_1

Fig. 3

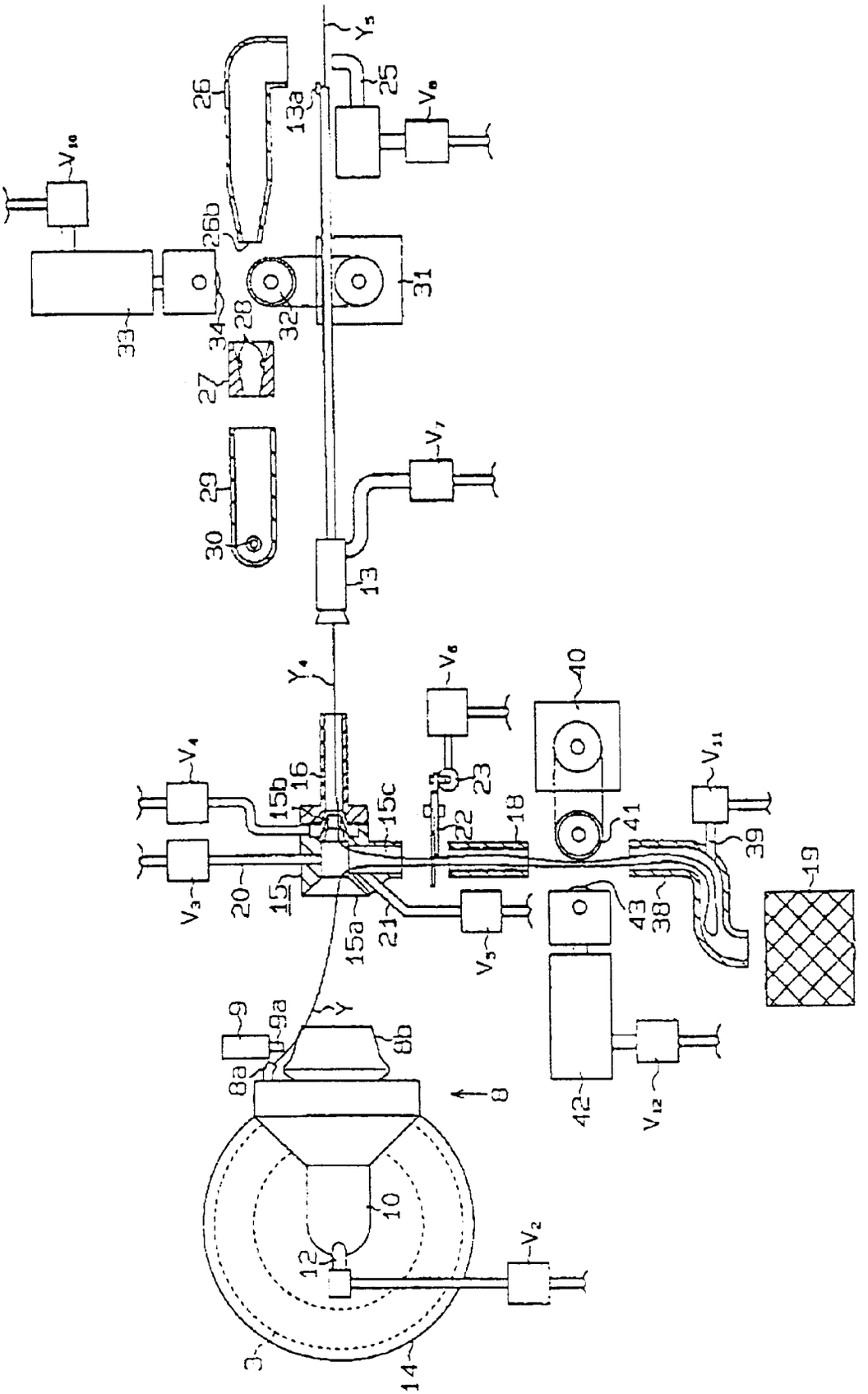

Y5
25
V8
26
13a
V10
26b
31
33
34
28
32
27
29
V7
30
13
Y4
V6
10
V4
15b
16
15c
23
22
18
41
V11
39
V3
20
15
15a
21
V5
43
38
19
Y
9
9a
8b
8a
8
42
V12
12
V2
3
14

Fig. 4

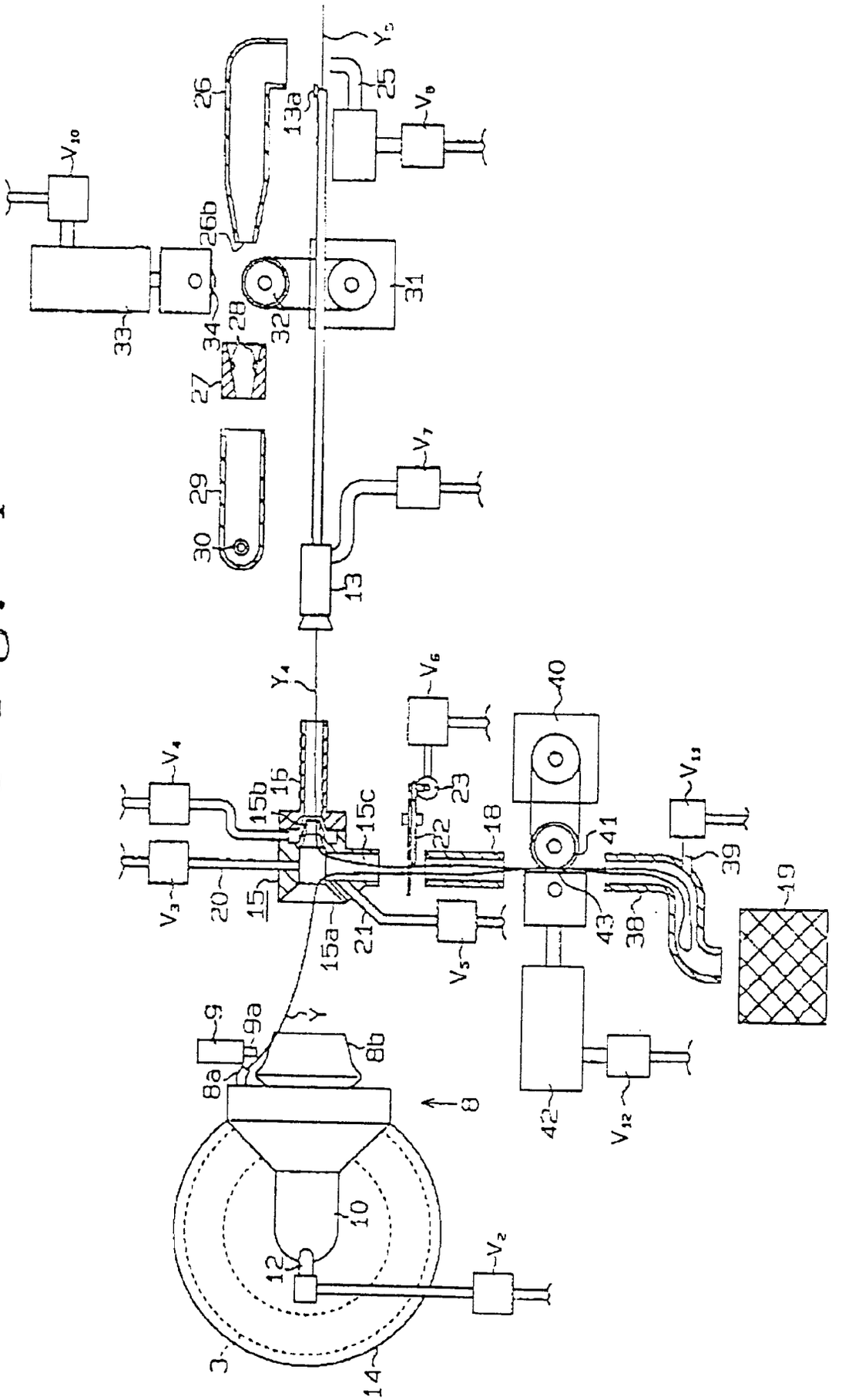

V10
26
13a
Y5
25
V6
26b
31
33
34
28
32
27
29
V7
30
13
Y4
V6
40
V4
15b
16
23
15c
22
18
41
V13
V3
20
15
15a
21
V5
43
38
39
19
9
9a
Y
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 5

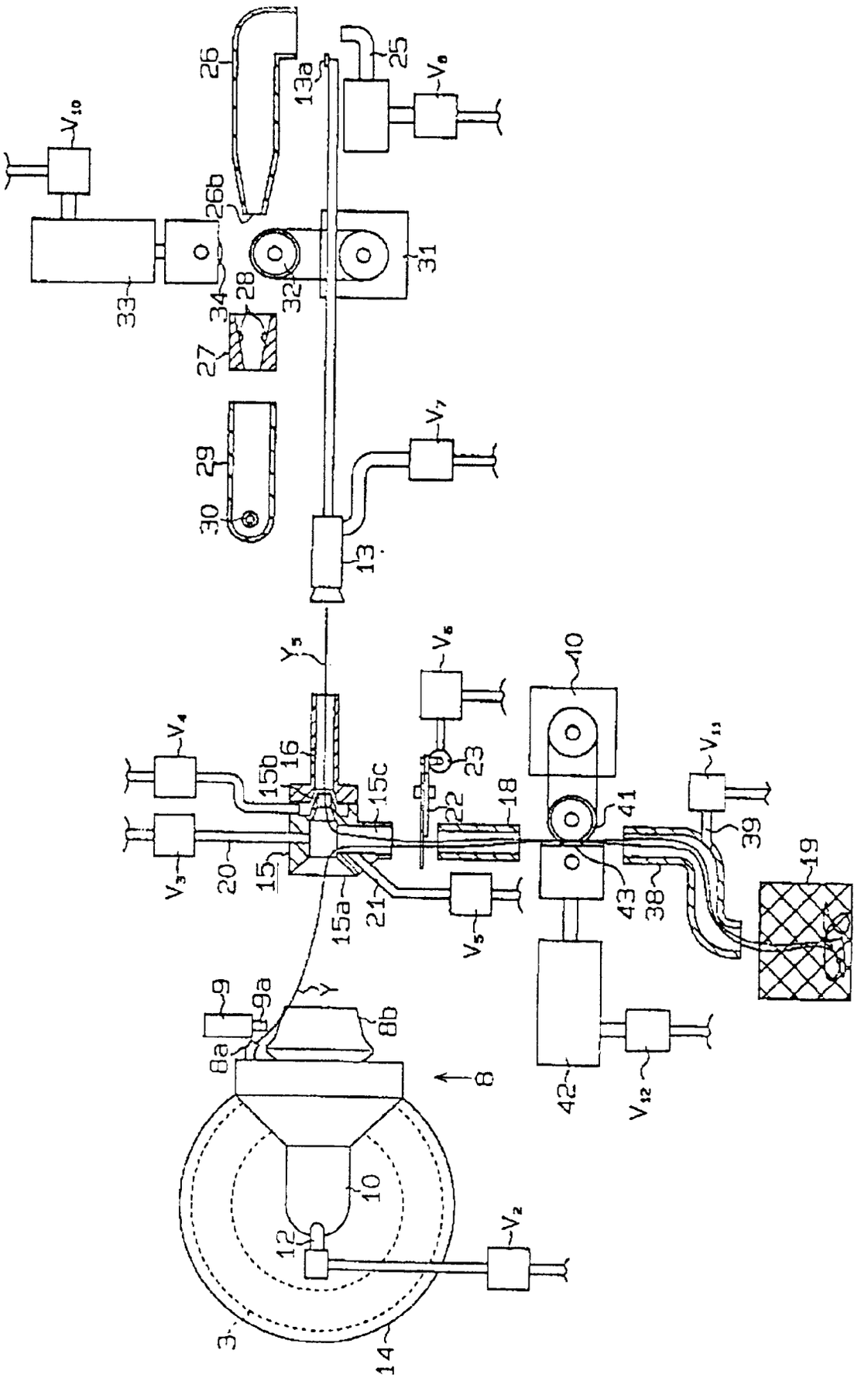

V10
26
25
V6
13a
26b
31
33
34
28
32
27
29
V7
30
13
Y5
V6
10
V4
16
15b
23
15c
22
18
41
V11
39
V3
20
15
21
V5
43
38
19
15a
9
9a
Y
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 6

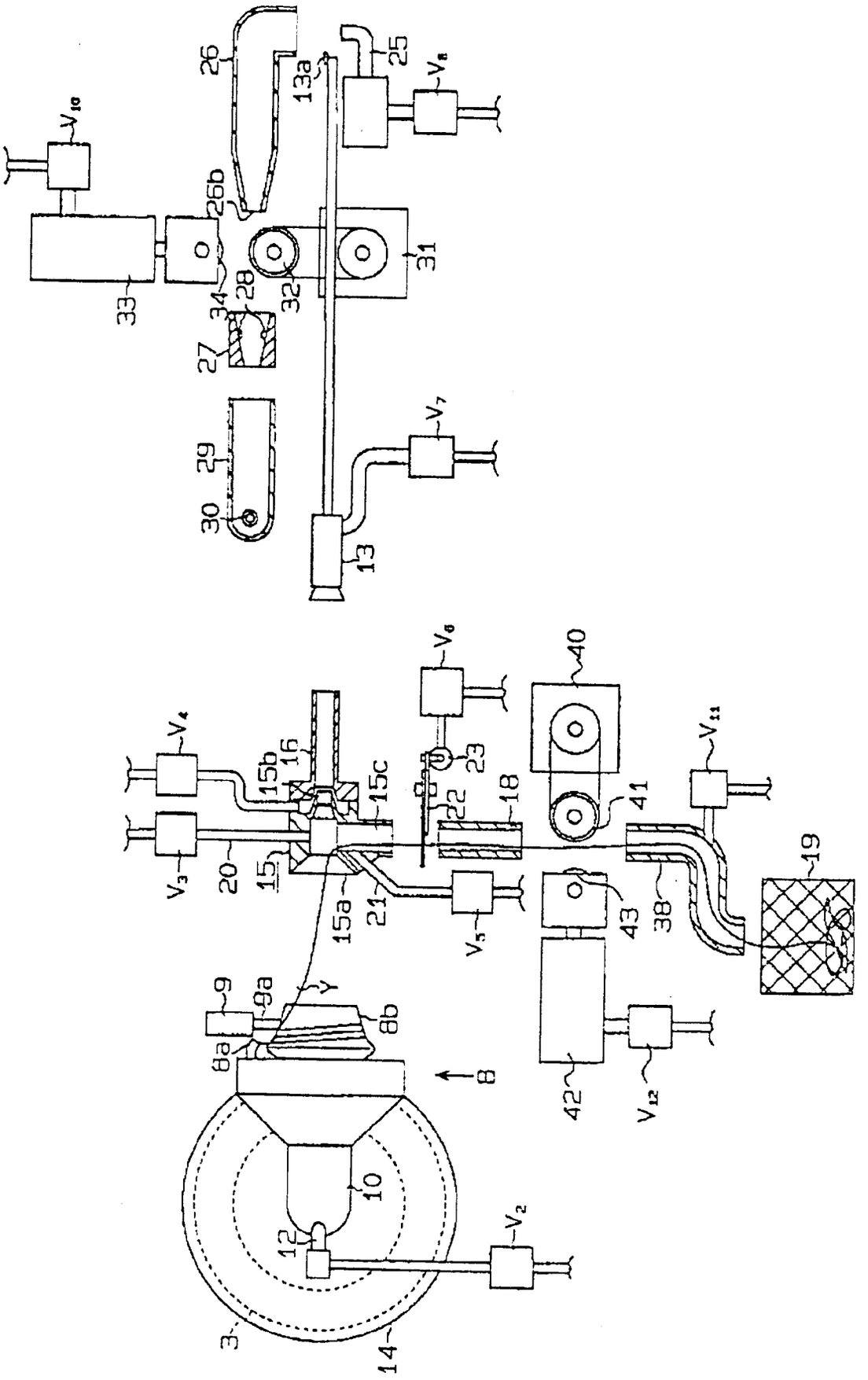

V10
26
13a
25
V8
26b
31
33
34
28
32
27
29
V7
30
13
V6
40
V4
15b
16
15c
23
22
18
41
V11
V3
20
15
15a
21
V5
43
38
19
9
9a
Y
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 7

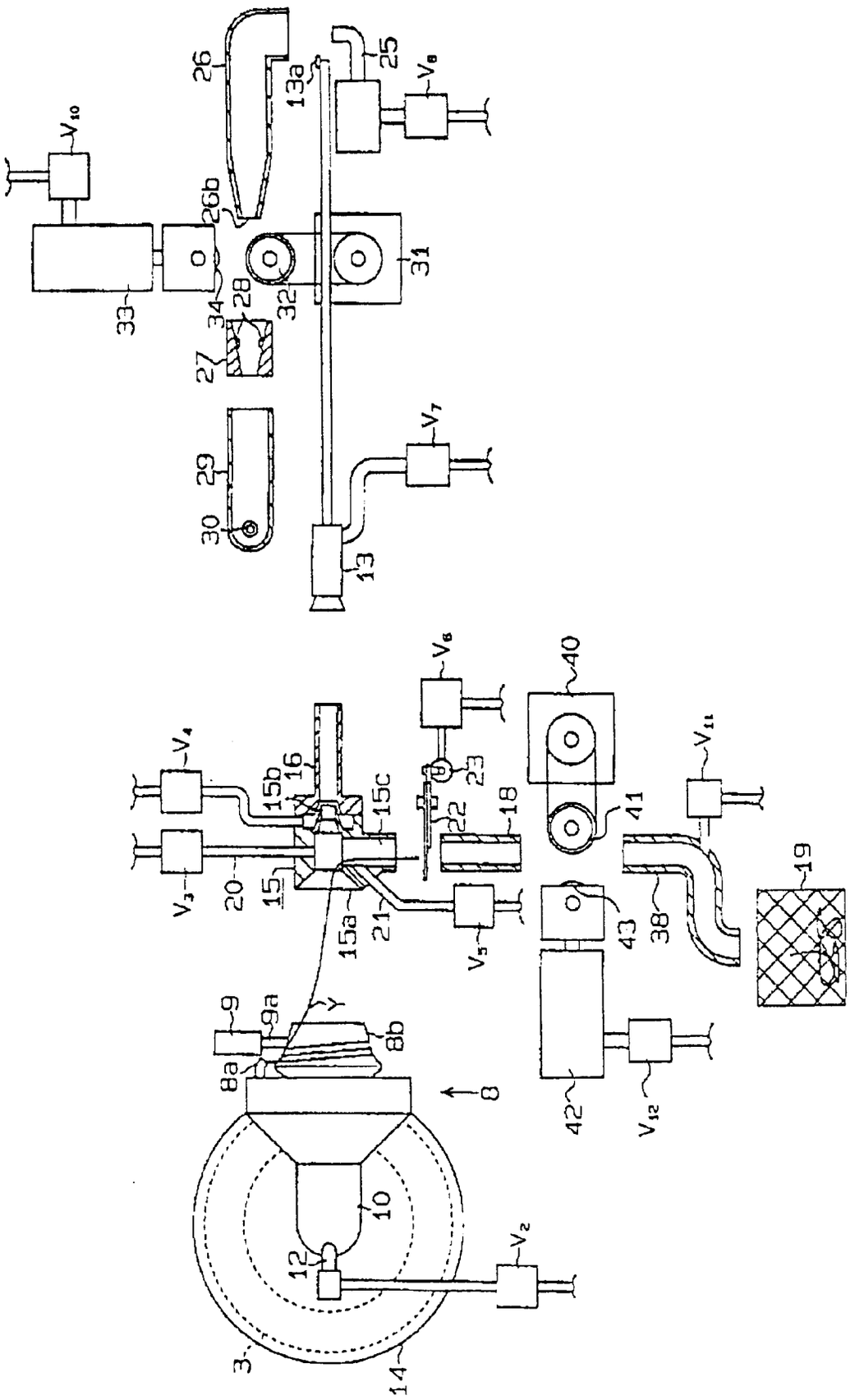

V10
26
13a
25
V8
26b
31
33
34
28
32
27
29
V7
30
13
V6
40
V4
15b
16
15c
23
22
18
41
V11
V3
20
15
15a
21
V5
43
38
19
9
9a
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 8

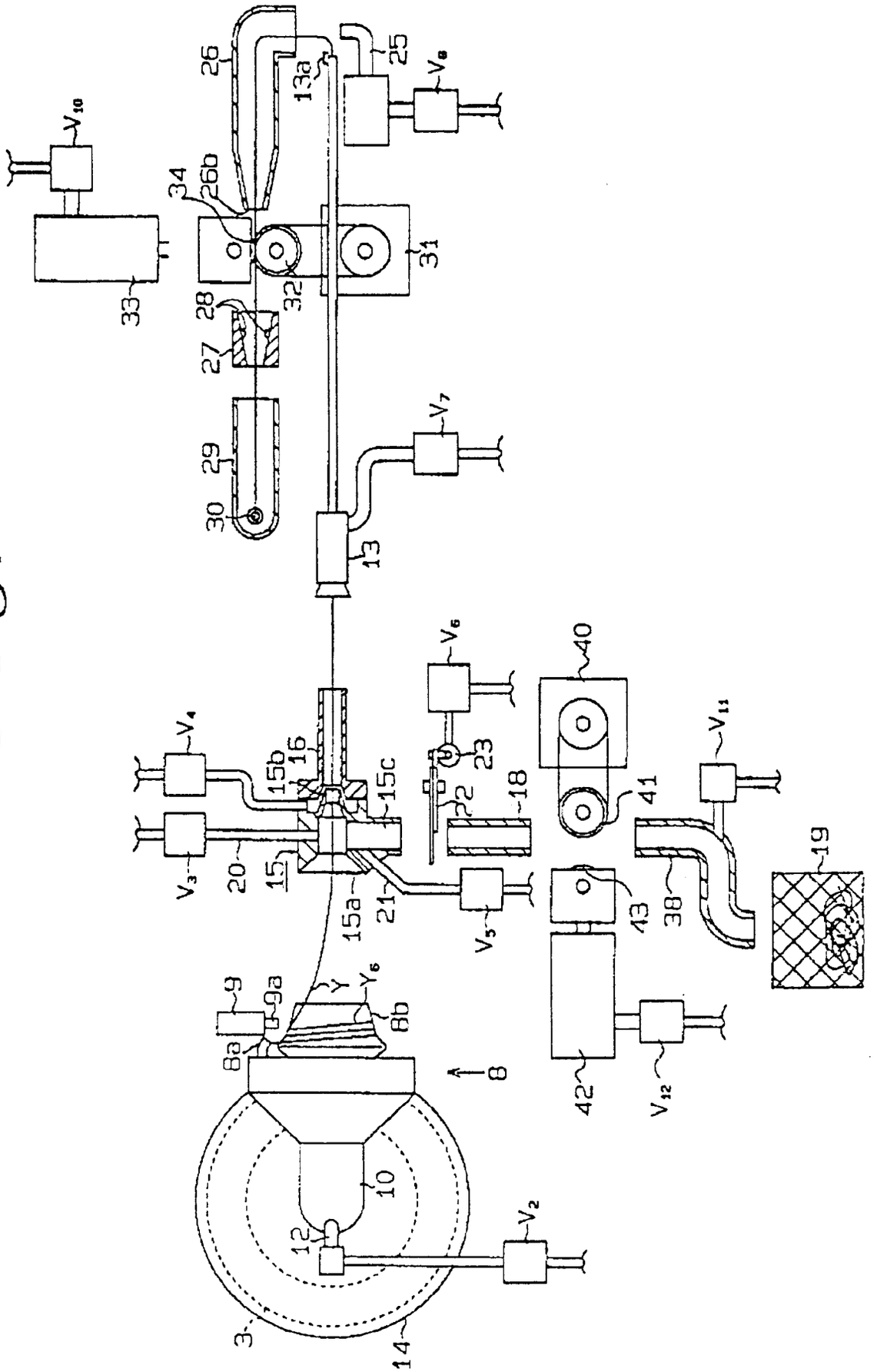

V10
11
33
34
26b
26
13a
25
V8
31
32
28
27
29
30
V7
13
V6
23
22
18
40
41
V11
V4
15b
16
15c
V3
20
15
15a
21
V5
13
38
19
9
9a
Y
Y6
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 9

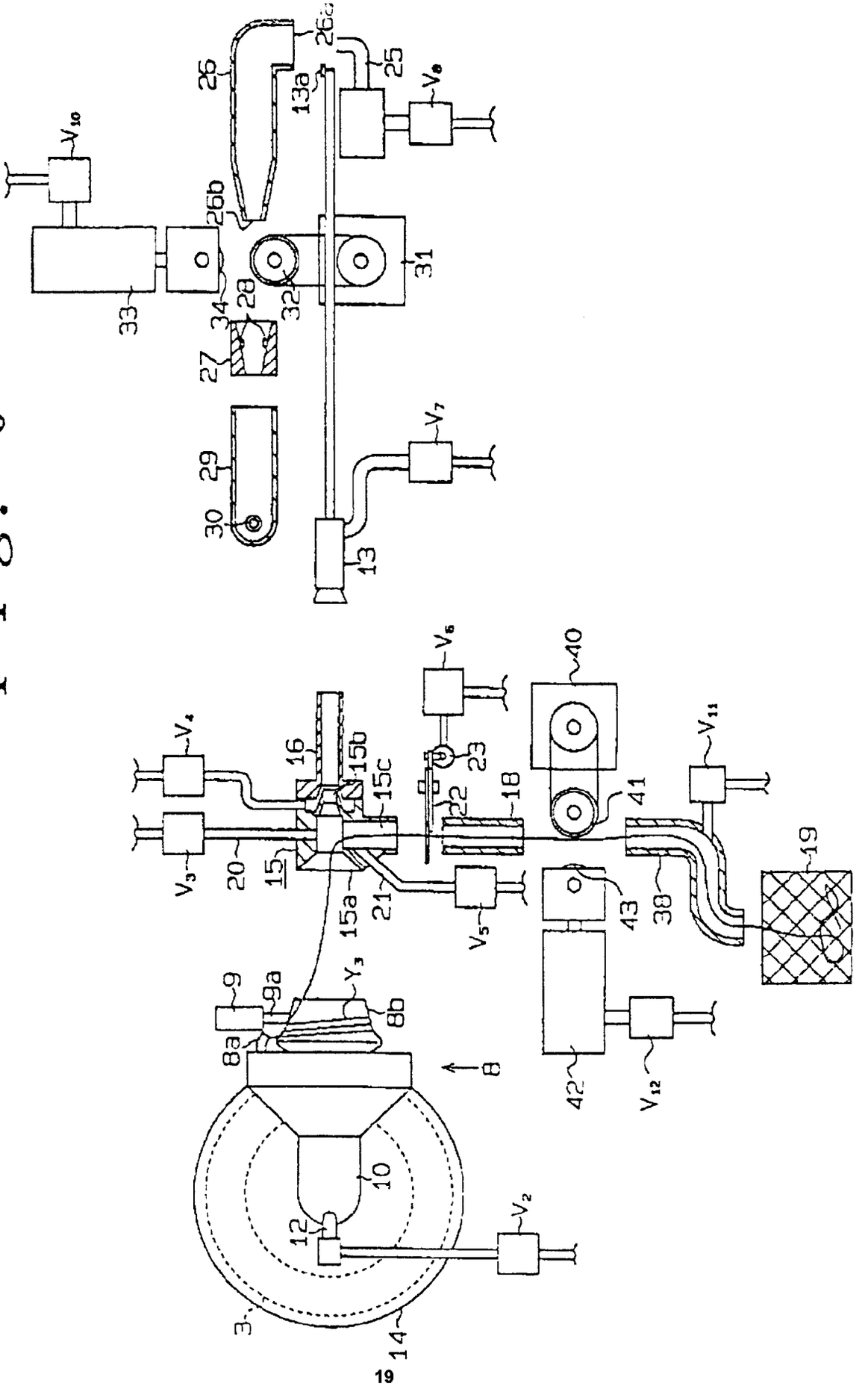

V10
26
26a
25
V8
13a
26b
31
33
34
28
32
27
29
30
V7
13
V6
40
V4
16
15b
15c
23
22
18
41
V11
V3
20
15
15a
21
V5
43
38
19
9
9a
Y3
8b
8a
8
42
V12
10
12
V2
3
14

Fig. 10

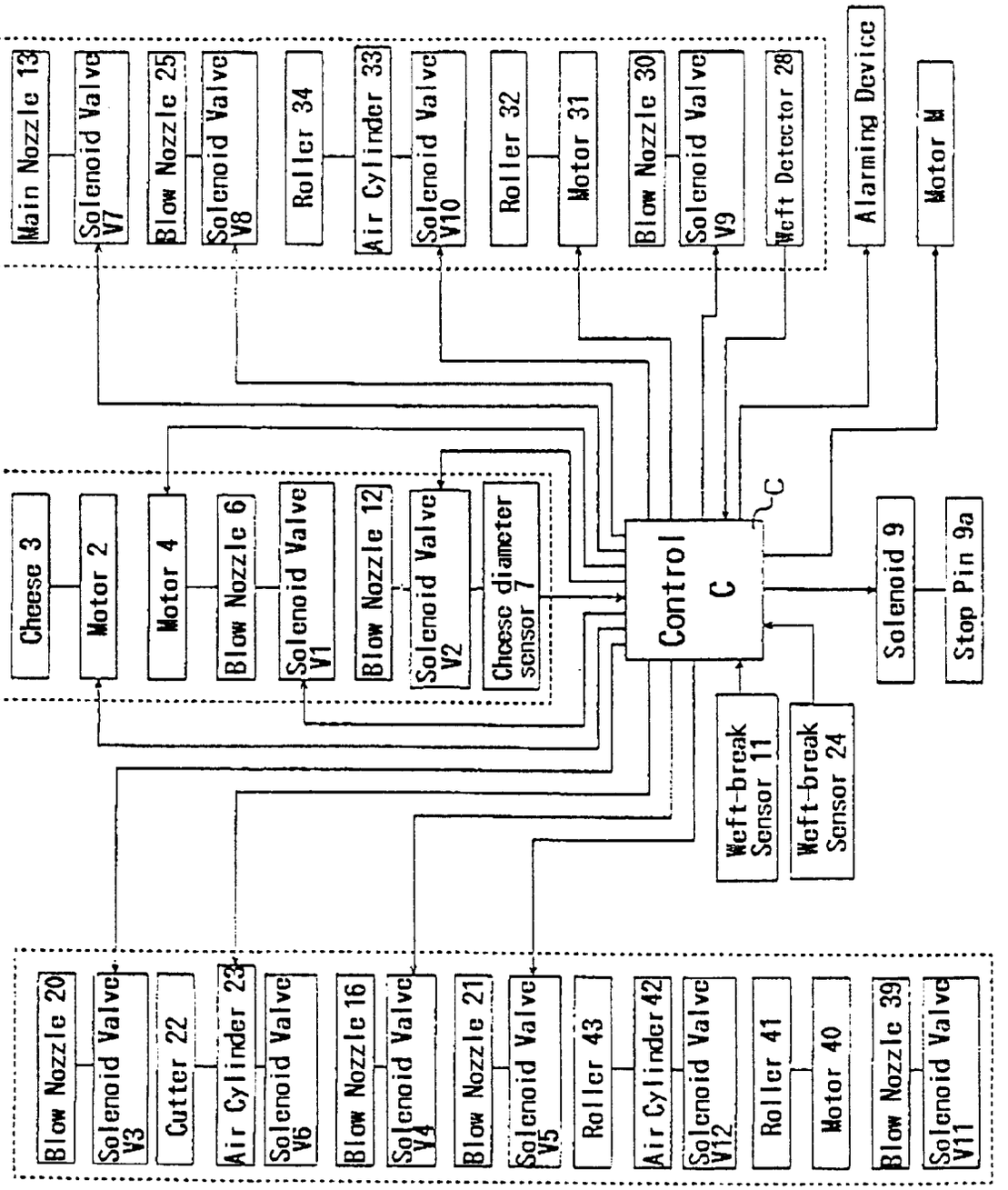

Main Nozzle 13
Solenoid Valve V7
Blow Nozzle 25
Solenoid Valve V8
Roller 34
Air Cylinder 33
Solenoid Valve V10
Roller 32
Motor 31
Blow Nozzle 30
Solenoid Valve V9
Weft Detector 28
Alarming Device
Motor M
Cheese 3
Motor 2
Motor 4
Blow Nozzle 6
Solenoid Valve V1
Blow Nozzle 12
Solenoid Valve V2
Cheese diameter sensor 7
Control C
C
Solenoid 9
Stop Pin 9a
Weft-break Sensor 11
Weft-break Sensor 24
Blow Nozzle 20
Solenoid Valve V3
Cutter 22
Air Cylinder 23
Solenoid Valve V6
Blow Nozzle 16
Solenoid Valve V4
Blow Nozzle 21
Solenoid Valve V5
Roller 43
Air Cylinder 42
Solenoid Valve V12
Roller 41
Motor 40
Blow Nozzle 39
Solenoid Valve V11

Fig. 11 (a)

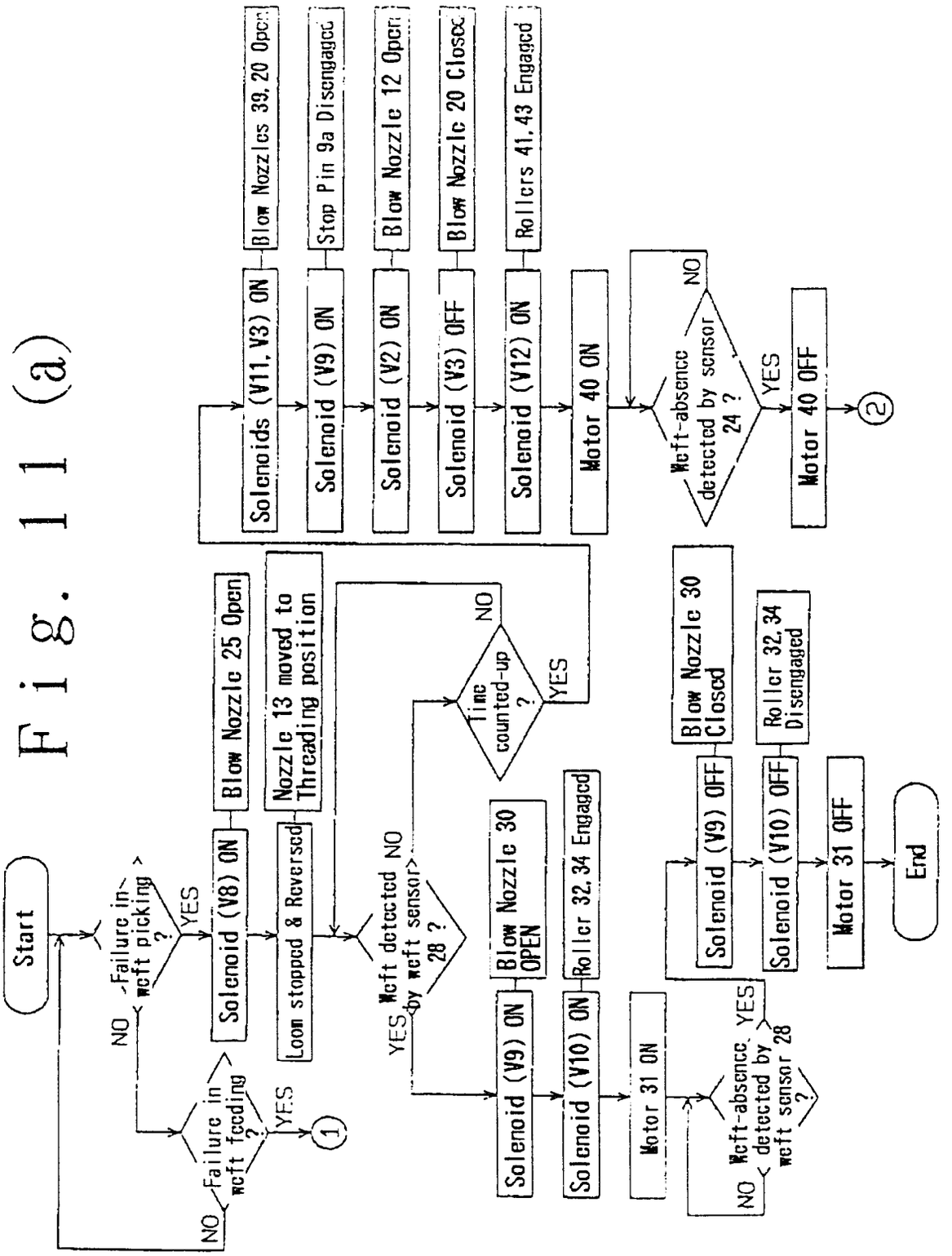

Start
Failure in weft picking ?
YES
NO
Failure in weft feeding ?
YES
NO
Solenoid (V8) ON
Blow Nozzle 25 Open
Loom stopped & Reversed
Nozzle 13 moved to Threading position
①
Weft detected by weft sensor 28 ?
YES
NO
Time counted-up ?
YES
NO
Solenoid (V9) ON
Blow Nozzle 30 OPEN
Solenoid (V10) ON
Roller 32, 34 Engaged
Motor 31 ON
Weft-absence detected by weft sensor 28 ?
NO
YES
Solenoid (V9) OFF
Blow Nozzle 30 Closed
Solenoid (V10) OFF
Roller 32, 34 Disengaged
Motor 31 OFF
End
Solenoids (V11, V3) ON
Blow Nozzles 39, 20 Open
Solenoid (V9) ON
Stop Pin 9a Disengaged
Solenoid (V2) ON
Blow Nozzle 12 Open
Solenoid (V3) OFF
Blow Nozzle 20 Closed
Solenoid (V12) ON
Rollers 41, 43 Engaged
Motor 40 ON
Weft-absence detected by sensor 24 ?
NO
YES
Motor 40 OFF
②

Fig. 11 (b)

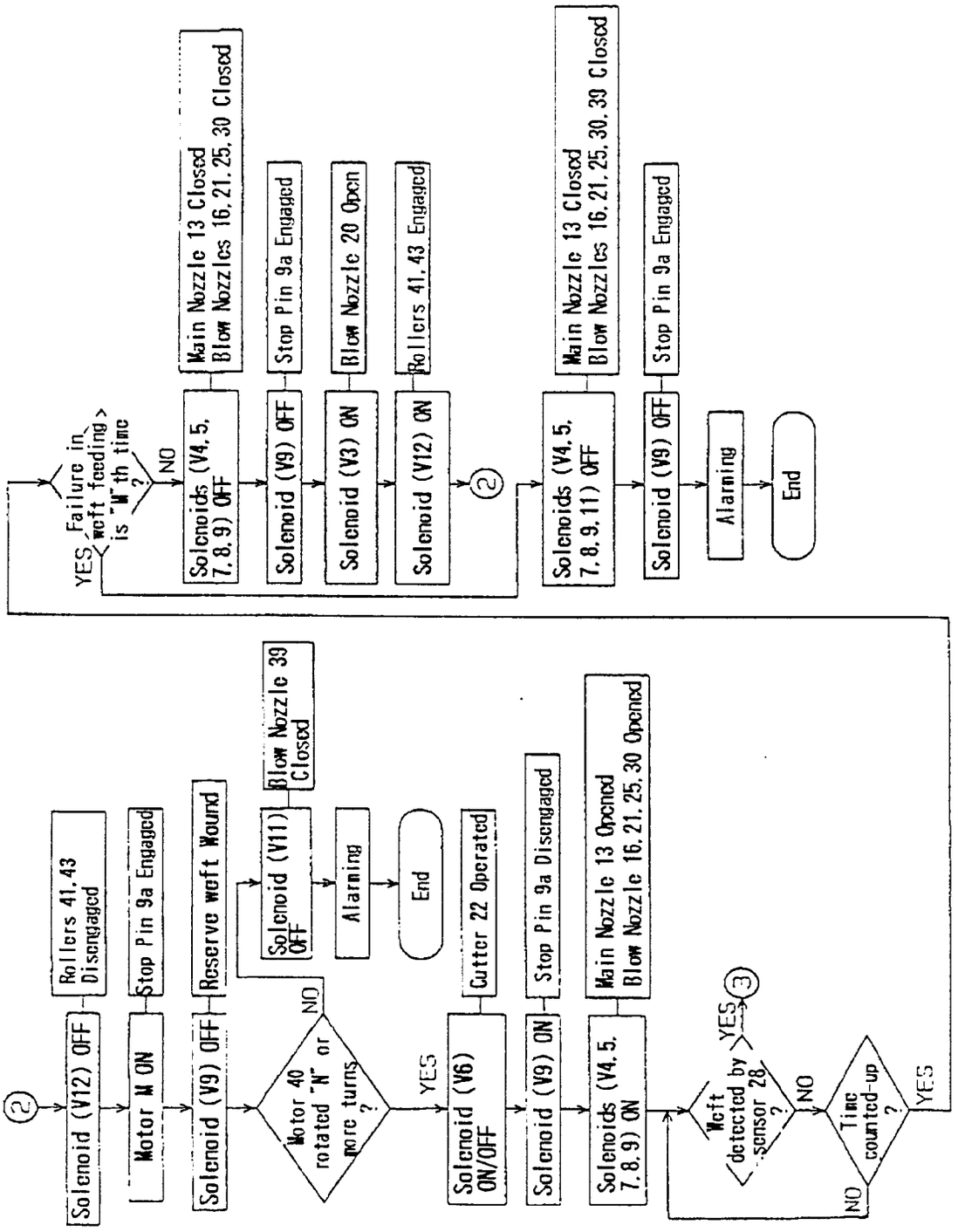

②
Solenoid (V12) OFF
Rollers 41, 43 Disengaged
Motor M ON
Stop Pin 9a Engaged
Solenoid (V9) OFF
Reserve weft Wound
Motor 40 rotated "N" or more turns ?
NO
Solenoid (V11) OFF
Blow Nozzle 39 Closed
Alarming
End
YES
Solenoid (V6) ON/OFF
Cutter 22 Operated
Solenoid (V9) ON
Stop Pin 9a Disengaged
Solenoids (V4, 5, 7, 8, 9) ON
Main Nozzle 13 Opened
Blow Nozzle 16, 21, 25, 30 Opened
Weft detected by sensor 28 ?
YES
③
NO
Time counted-up ?
NO
YES
YES
Failure in weft feeding > is "M" th time ?
NO
Solenoids (V4, 5, 7, 8, 9) OFF
Main Nozzle 13 Closed
Blow Nozzles 16, 21, 25, 30 Closed
Solenoid (V9) OFF
Stop Pin 9a Engaged
Solenoid (V3) ON
Blow Nozzle 20 Open
Solenoid (V12) ON
Rollers 41, 43 Engaged
②
Solenoids (V4, 5, 7, 8, 9, 11) OFF
Main Nozzle 13 Closed
Blow Nozzles 16, 21, 25, 30, 39 Closed
Solenoid (V9) OFF
Stop Pin 9a Engaged
Alarming
End

Fig. 11 (c)

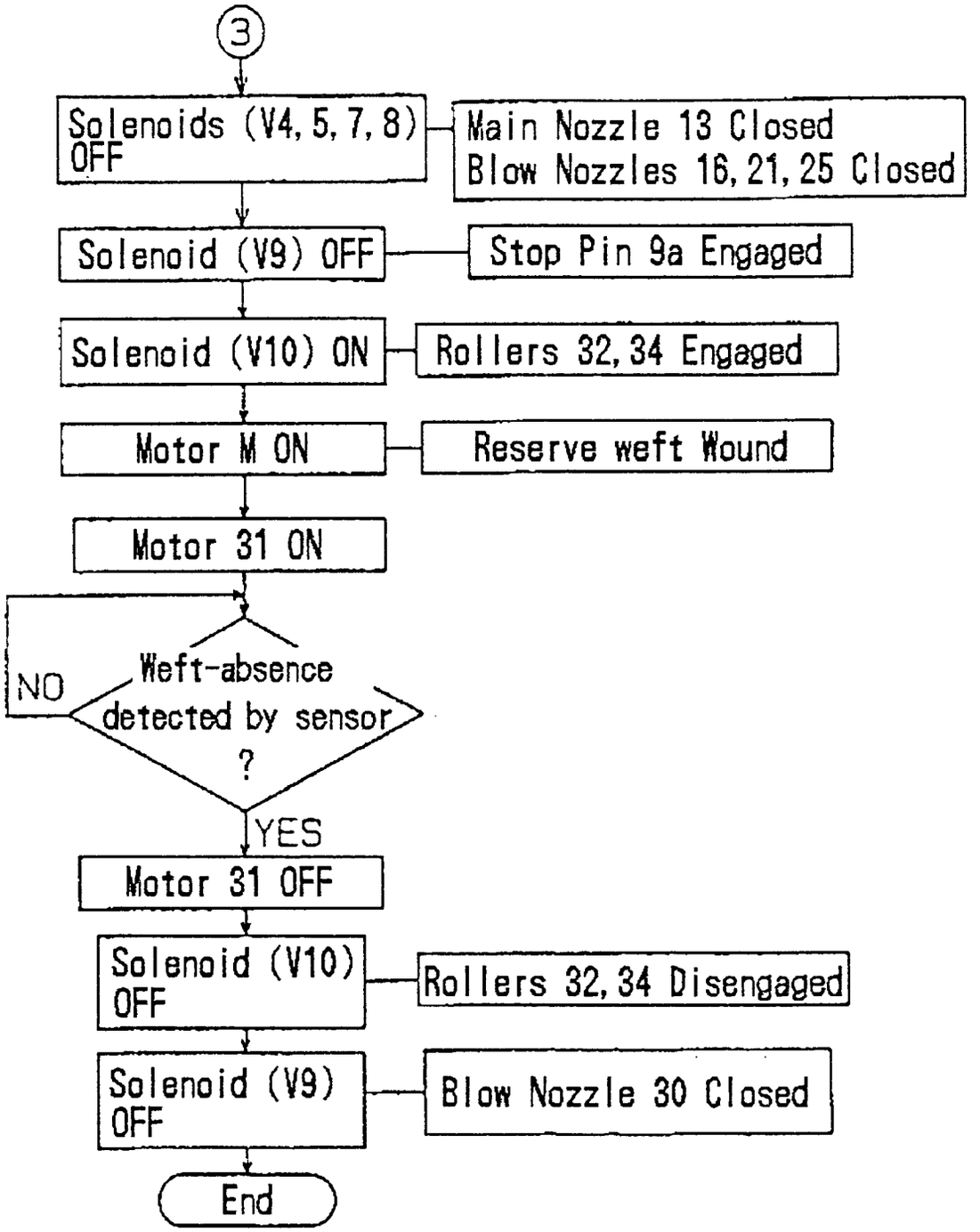

3
Solenoids (V4, 5, 7, 8) OFF
Main Nozzle 13 Closed
Blow Nozzles 16, 21, 25 Closed
Solenoid (V9) OFF
Stop Pin 9a Engaged
Solenoid (V10) ON
Rollers 32, 34 Engaged
Motor M ON
Reserve weft Wound
Motor 31 ON
Weft-absence detected by sensor ?
NO
YES
Motor 31 OFF
Solenoid (V10) OFF
Rollers 32, 34 Disengaged
Solenoid (V9) OFF
Blow Nozzle 30 Closed
End

Fig. 11 (d)

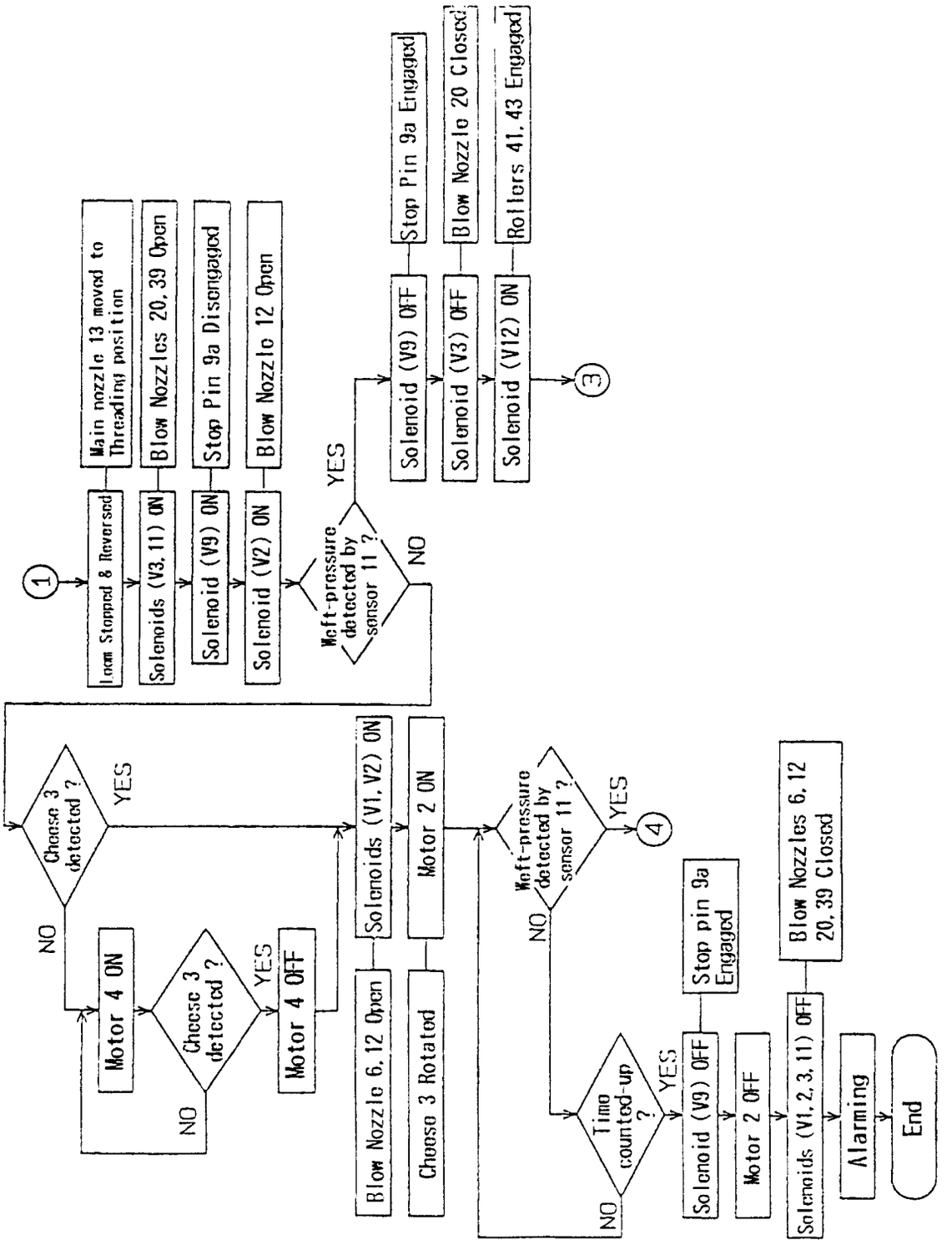
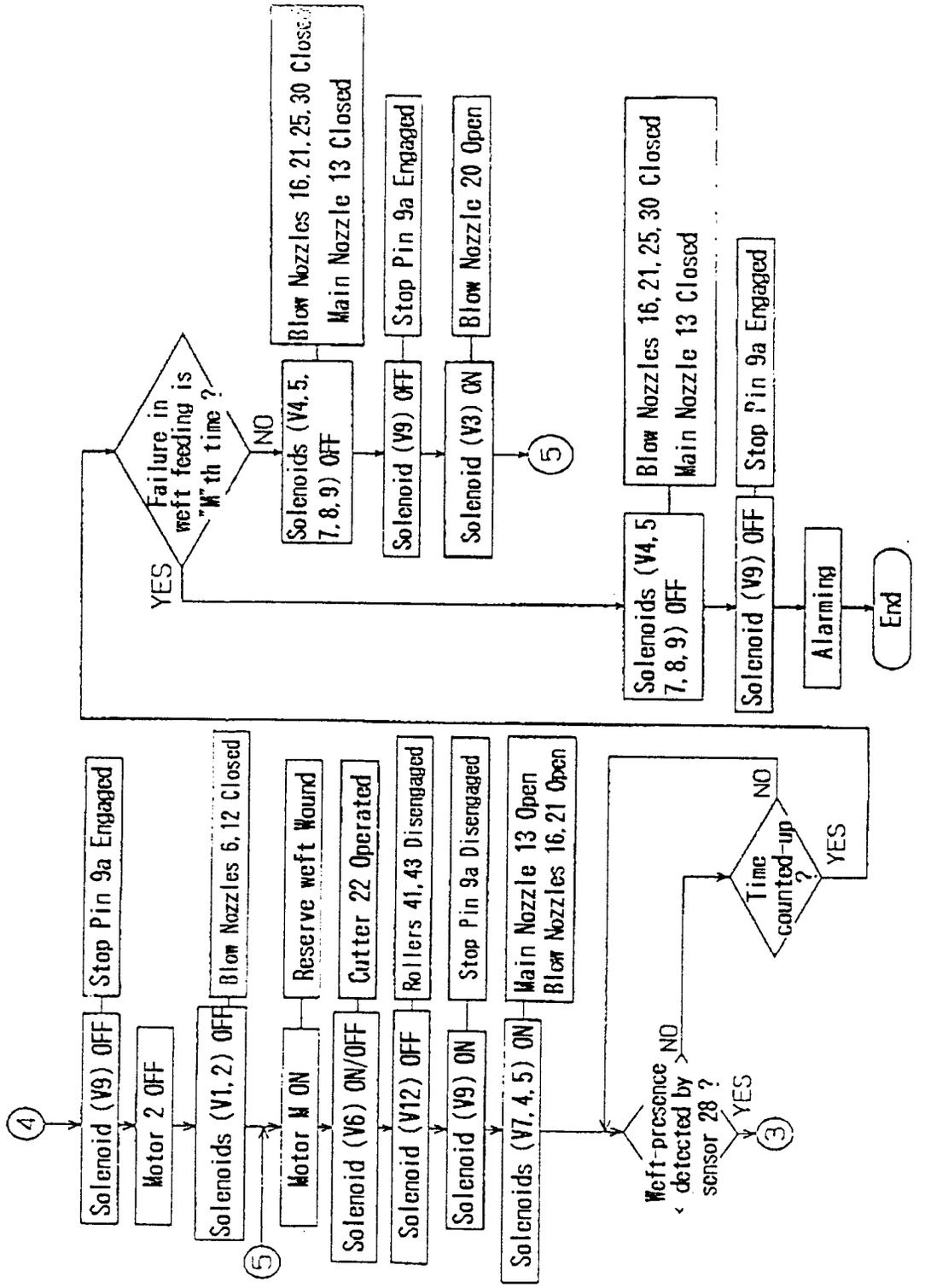

Motor 4 ON
Cheese 3 detected ?
NO
YES
Motor 4 OFF
Cheese 3 detected ?
NO
YES
Blow Nozzle 6, 12 Open
Solenoids (V1, V2) ON
Choose 3 Rotated
Motor 2 ON
Weft-pressure detected by sensor 11 ?
NO
YES
4
Time counted-up ?
NO
YES
Solenoid (V9) OFF
Stop pin 9a Engaged
Motor 2 OFF
Solenoids (V1, 2, 3, 11) OFF
Blow Nozzles 6, 12 20, 39 Closed
Alarming
End
1
Loom Stopped & Reversed
Main nozzle 13 moved to Threading position
Solenoids (V3, 11) ON
Blow Nozzles 20, 39 Open
Solenoid (V9) ON
Stop Pin 9a Disengaged
Solenoid (V2) ON
Blow Nozzle 12 Open
Weft-pressure detected by sensor 11 ?
NO
YES
Solenoid (V9) OFF
Stop Pin 9a Engaged
Solenoid (V3) OFF
Blow Nozzle 20 Closed
Solenoid (V12) ON
Rollers 41, 43 Engaged
3

Fig. 11 (e)


4
Solenoid (V9) OFF
Stop Pin 9a Engaged
Motor 2 OFF
Solenoids (V1, 2) OFF
Blow Nozzles 6, 12 Closed
5
Motor M ON
Reserve weft Wound
Solenoid (V6) ON/OFF
Cutter 22 Operated
Solenoid (V12) OFF
Rollers 41, 43 Disengaged
Solenoid (V9) ON
Stop Pin 9a Disengaged
Solenoids (V7, 4, 5) ON
Main Nozzle 13 Open
Blow Nozzles 16, 21 Open
Weft-presence detected by sensor 28 ?
NO
YES
3
Time counted-up ?
NO
YES
Failure in weft feeding is "M"th time ?
YES
NO
Solenoids (V4, 5, 7, 8, 9) OFF
Blow Nozzles 16, 21, 25, 30 Closed
Main Nozzle 13 Closed
Solenoid (V9) OFF
Stop Pin 9a Engaged
Solenoid (V3) ON
Blow Nozzle 20 Open
5
Solenoids (V4, 5 7, 8, 9) OFF
Blow Nozzles 16, 21, 25, 30 Closed
Main Nozzle 13 Closed
Solenoid (V9) OFF
Stop Pin 9a Engaged
Alarming
End

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 81 0680

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)
P,X	EP-A-0 388 680 (TOYODA JIDOSHOKKI SEISAKUSHO) * page 6, column 8, line 26 - page 7, column 9, line 25; figures 1-18 *	1-6	D03D47/34
Y	US-A-4 890 650 (KINPEI MITSUYA) * column 3, line 39 - column 6, line 28; figures 1-16 *	1-6	
Y	EP-A-0 372 618 (PICANOL N.V.) * page 3, column 4, line 12 - line 41; figures 2,3 *	1-6	
A	EP-A-0 236 597 (TSUDACOMA COR.) * page 7, line 16 - line 43; figures 1-7 *	1-6	
P,A	DE-A-4 025 152 (ISHIKAWA SEISAKUSHO, LTD.,) * column 4, line 31 - line 57; figures 1-6 *	1	
A	EP-A-0 269 140 (PICANOL N.V.) * page 2, column 2, line 12 - line 44; figures 1-8 *	1	
			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	13 JANUARY 1992	HENNINGSEN O.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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