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(54) Apparatus for disposing of excess warp yarn in a jet loom.

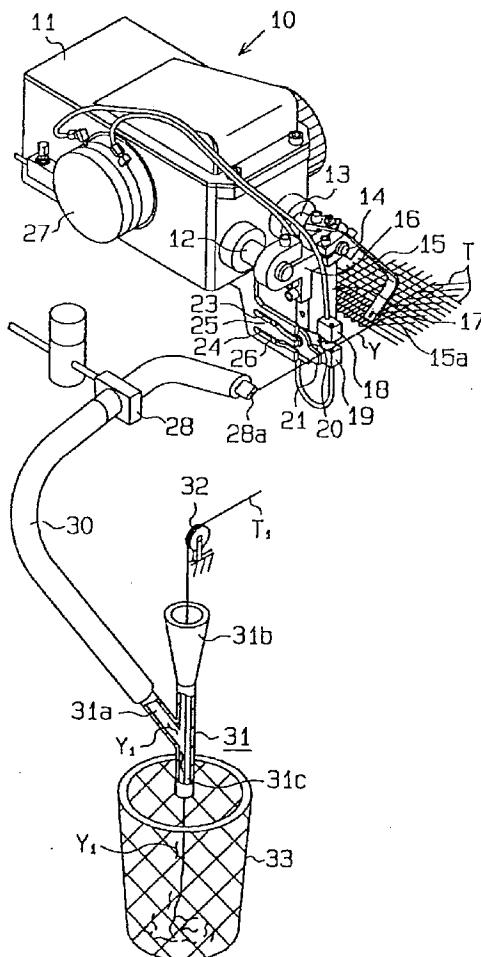
(57) OBJECT

To provide an apparatus which can dispose of an excess warp yarn smoothly in a jet loom.

STRUCTURE

There is provided a suction nozzle 28 beside a tuck-in device 1. The suction nozzle 28 is activated in an intermittent manner by a solenoid-operated valve V₆ and produces suction air for catching and holding the leading end of each inserted weft Y at its inlet 28a. The suction nozzle 28 has connected thereto a hose 30 whose other end is in turn connected to a bifurcated tube 31. Air jet issued from the suction nozzle 28 produces air flow through one branch portion 31a and convergent portion 31c of the bifurcated tube 31 and blown toward a dust box 33. The excess warp yarn T₁ guided by a guide roller 32 is withdrawn through the other branch portion 31a and the convergent portion 31c of the tube 31 to be discarded into the dust box 33.

F i g. 2



DETAILED DESCRIPTION OF THE INVENTION

INDUSTRIAL FIELD OF UTILIZATION

5 The present invention relates to an apparatus for disposing of excess warp yarn let off from a warp beam and unwoven into a fabric in a jet loom which is operable to insert a weft into a warp shed by air jet issued intermittently from a weft inserting nozzle of the loom.

PRIOR ART

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Publication of Unexamined Japanese Utility Model Application 54-69956 (1979) discloses an apparatus for disposing of excess warp yarn which uses a pair of engaged gears rotatable in synchronism with a trimmed selavage withdrawing device. The excess warp yarn is introduced between the rotating gears and discarded together with trimmed selavage.

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Publication of Unexamined Japanese Patent Application 46-36450 (1973) proposes an apparatus using a reversible air blower for disposing of excess warp yarn. Excess warp yarn is collected in a collector box having a perforated bottom through which suction air is flown by the blower. When the collector box is filled with a predetermined amount of excess warp yarn, the yarn is cut off from its succeeding excess warp yarn. The collected warp yarn is moved to a dust box by reverse air flow generated by reversing the air blower.

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PROBLEMS THAT THE INVENTION IS TO SOLVE

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In the apparatus according to Publication 54-69956, there is a fear that the warp yarn may be entangled around the gears, with the result that elimination of not only the excess warp yarn but also the trimmed selavage cannot be continued if such entanglement should occur.

The apparatus according to Publication 46-36450 is costly in that it requires a blower. Additionally, because flow of suction air is decreased with an increase in accumulation of excess warp yarn collected in the box, it is required that the blower should be operated so as to produce a strong flow of suction air. However, this may cause a break in the excess warp yarn.

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Therefore, it is an object of the present invention to provide an apparatus for disposing of an excess warp yarn which can perform elimination of the excess warp yarn smoothly and which is also advantageous in terms of cost.

[MEANS SOLVING THE PROBLEMS]

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To achieve the above object, the invention provides an apparatus for disposing of excess warp yarn let off from a warp beam in a jet loom having first fluid injection means for inserting a weft into a warp shed and for assisting the weft in flying through the warp shed by air jets issued intermittently therefrom, wherein the excess warp yarn is guided to a region which is subjected to the action of air jet from any of the first fluid injection means or of air jet from second fluid injection means for catching and holding the leading end of an inserted weft by air flow produced by air jet issued intermittently therefrom so that the excess warp yarn is withdrawn by the above-mentioned action of air jet.

OPERATION OF THE INVENTION

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A weft is inserted into a warp shed by air jet issued from a main weft inserting nozzle and assisted in flying through the shed by relayed air jets issued from auxiliary weft inserting nozzles. The first fluid injection means is comprised by these main and auxiliary nozzles. The leading end of an inserted weft is caught and held by flow of suction air produced by air jet issued by the second fluid injection means. Excess warp yarn is guided to a region which is subjected to the action of air jet issued from the first or second fluid injection means. Because the first and second fluid injection means are activated intermittently to provide air jet synchronously with weft insertion, the excess warp yarn is withdrawn by the intermittent action of air jet without being broken.

EMBODIMENTS

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The following will describe an embodiment of an apparatus for disposing of excess warp yarn in a jet loom while having reference to the accompanying drawings including FIGS. 1 to 4.

FIG. 1 is a schematic diagram showing an embodiment of apparatus for disposing of an excess warp yarn

in a jet loom according to present the invention.

FIG. 2 is a perspective view showing an arrangement of the apparatus of FIG. 1 together with a tuck-in device.

FIG. 3 a cross-sectional view showing part the tuck-in device of FIG. 2.

5 FIG. 4 is a schematic diagram similar to FIG. 1, but showing another embodiment of apparatus according to the invention.

10 A weft Y inserted into a warp shed from a main weft inserting nozzle 1 by air jet issued therefrom is assisted in flying through the shed by relayed air jets issued from a plurality of sets of auxiliary nozzles 2, 3, 4, 5. If the weft insertion is done properly, the leading end of the inserted weft Y is detected by a weft detector 6 within a predetermined range of crank angles of the loom. The weft detector 6 generates a signal to a control computer C, which in turn determines either to continue or to stop the weaving operation of the loom depending on the received signal.

15 Injection of air jet from the main weft inserting nozzle 1 is controlled by a solenoid-operated valve V1, while injection of air jet from the auxiliary weft inserting nozzles 2, 3, 4, 5, is controlled by similar solenoid-operated valves V₂, V₃, V₄, V₅, respectively. To be more specific, air injection from each nozzle takes place when its associated solenoid is being energized, thus keeping the valve opened, and the air injection is stopped when the same solenoid is deenergized thereby to close the valve. The valve V₁ is connected to an air tank 7 holding therein air under pressure, and the valves V₂ - V₅ are connected to a common air tank 8.

20 The solenoid-operated valves V₁-V₅ are actuated to open and close in response to a command signal from the control computer C which provides such command in response to signals transmitted from a rotary encoder 9 monitoring the current crank angle of the loom.

25 As shown in FIGS 1 and 2, there is disposed a tuck-in device 10 at the extreme end of weft insertion. The tuck-in device 10 includes a cam box 11 containing therein a cam operated drive mechanism. The cam box 11 has a shaft 12 and hollow shaft 13 both extending out therefrom and reciprocally movable in and out along warp yarns T. The hollow shaft 13 receives therein a needle shaft 14 which is reciprocally rotatable by the drive mechanism in the cam box 11 and carries at its end a needle 15. Rotation of the needle shaft 14 causes the needle 15 to swing about the shaft, thereby inserting the needle end into a warp shed through the upper sheet of warp yarns T and moving it beyond the adjacent lateral edge of woven fabric W. As shown clearly in FIG. 3, the needle 15 is formed at its end portion with a threading hole 15a.

30 Between the projecting ends of the shafts 12, 13 is fixed a mounting 16 to which a support block 17 is fastened. Two nozzle blocks 18, 19 are mounted one above the other on the front surface of the support block 17. As shown in detail in FIG. 3, the upper nozzle block 18 has a threading air jet nozzle 18a opening at the bottom thereof, while the lower nozzle block 19 has an air jet reception hole 19a bored therethrough in alignment with the opening of the threading air jet nozzle 18a. On the other hand, the lower nozzle block 19 has a weft holding air jet nozzle 19b opening at the top thereof, while the upper nozzle block 18 has air jet reception hole 18b bored therethrough in alignment with the opening of the weft holding air jet nozzle 19b.

35 A pair of cutter blades 20, 21 is rotatably supported on the support block 17. The cutter blades 20, 21 have guide pins 25, 26 projecting therefrom and engaging with guide slits 23 24, respectively, formed in a guide plate depending from the bottom of the cam box 11. The guide pins 25, 26 of the cutter blades 20, 21 are movable along the guide slits 23, 24 back and forth together with the shaft 12 and hollow shaft 13, and such movement of the guide pins along the guide slits causes the cutter blades 20, 21 to make a cutting motion. The leading end of an inserted weft Y reaching the terminating end of weft insertion is cut by the cutter blades 20, 21 then actuated to make such cutting motion.

40 On a lateral side of the cam box 11 is mounted a mechanical rotary valve mechanism 27 which is driven to operate by the cam-operated drive mechanism in the cam box 11. The threading air jet nozzle 18a and the weft holding air jet nozzle 19b are connected to the rotary valve mechanism 16 by way of tubes so that air injection from the nozzles 18a and 19b is controlled by the rotary valve mechanism 16. As the leading end of an inserted weft Y reaches suction inlet 28a of a suction nozzle 28, which will be described in detail hereinafter, the same end is caught and held by the flow of suction air, as shown in FIG. 2. Then, the weft Y is cut by the cutter blades 20, 21 and the cut leading end of the weft is held in the reception hole 18b by air jet from the weft holding nozzle 19b.

45 Then, the cut end of the weft is passed through the threading hole 15a of the needle 15, which is then already swung to a position where its hole 15a is in alignment with the air jet reception hole 19a, by air jet issued from the threading air jet nozzle 18a. Tucked selvedge is formed when the needle 15 with the weft leading end passed through its hole 15a is swung back out of the warp sheets.

50 As shown in FIGS. 1 and 2, there is provided the above mentioned suction nozzle 28 beyond the tuck-in device 10 as viewed from the weft inserting nozzle 1. The suction nozzle 28 has its suction inlet 28a disposed just beside the clearance between the nozzle blocks 18, 19 so that the leading end of an inserted weft Y moves

past the clearance and reaches the suction inlet 28a.

The suction nozzle 28 is connected via a solenoid operated valve V_6 to an air supply tank 29 holding therein air under pressure. The solenoid-operated valve V_6 is actuated to open and close by a command signal generated by the control computer C. To be more specific, the valve V_6 is opened substantially simultaneously with opening of the valve V_5 for the auxiliary weft inserting nozzles 5 and closed immediately after the cutter blades 20, 21 has made the cutting of the weft Y. By so controlling the valve V_6 , the leading end of the inserted weft Y can be caught and held by suction air produced adjacent the suction inlet 28a by air jet issued from the suction nozzle 28 into a hose 30 connected at one end thereof to the suction nozzle.

Reference numeral 31 designates a bifurcated tube having two branch portions 31a, 31b and a convergent portion 31c. The other end of the hose 30 is connected to one branch portion 31a, so that air jet from the suction nozzle 28 produces air flow in the hose 30 and the branch portion 31a and convergent portion 31c of the tube 31. Excess warp yarn T_1 let off from a warp beam of the loom is guided by a guide roller 32 and introduced into the other branch portion 31b of the tube 31.

A weft piece Y₁ cut off the leading end of inserted weft Y by the cutter blades 20, 21 is flown through the hose 30, tube branch and convergent portions 31a, 31c and discarded into a trash box 33 disposed just below the tube 31, while the excess warp yarn T_1 introduced into the branch portion 31b is also pulled by air flow in the tube convergent portion 31c to be discharged into the trash box 33.

A jet loom equipped with a tuck-in device such as 10 is usually provided with a device such as suction nozzle 28 for catching and holding the leading end of an inserted weft. Making use of such an existing device for the purpose of disposing of an excess warp yarn as in the above-described embodiment can dispense with an additional and hence costly device for eliminating the excess warp yarn. Because the suction nozzle 28 is activated to inject air in an intermittent manner in synchronism with weft inserting operation, the warp yarn T_1 is withdrawn under the influence of intermittently produced air flow. It is noted that the excess warp yarn T_1 is withdrawn through the tube 31 by air flow whose withdrawing force is greater than that of the air suction at the inlet 28a for catching and holding the leading end of inserted weft Y, and that the warp yarn T_1 , if exposed to such air flow constantly, may be broken. However, application of intermittent air flow to the warp yarn T_1 can prevent a break. It is further noted that, though the suction nozzle 28 issues air jet only for a predetermined length of time in one rotation of the loom, the warp yarn T_1 can receive the influence of air flow due to residual pressure even after the nozzle is closed. Therefore, the warp yarn T_1 can be withdrawn under an appropriate tension without being slackened.

It is to be understood that the present invention can be practiced in other forms and modification than the above described embodiment, as exemplified by an embodiment shown in FIG. 4. This embodiment differs from that shown in FIGS. 1, 2 in that the suction nozzle 28 and its control valve V_6 are disused and the branch portion 31a of the bifurcated tube 31 is connected to the solenoid-operated valve V_5 for the auxiliary nozzles 5 via a distributor 34 so that air under pressure is supplied to the tube 31, as well as to the auxiliary nozzles 5, through the distributor 34. Since the main and auxiliary nozzles are activated intermittently, the distributor 34 may be connected to any of the other solenoid-operated valves V_1 - V_4 for the same purpose of supplying air under pressure to the bifurcated tube 31.

In some jet looms having no tuck-in device, a stretch nozzle is used which produce air jet intermittently in synchronism with weft inserting operation to provide suction air for catching and holding the leading end of an inserted weft. Such stretch nozzle may be utilized advantageously for disposing of an excess warp yarn.

The invention provides for an apparatus which can dispose of an excess warp yarn smoothly in a jet loom. There is provided a suction nozzle 28 beside a tuck-in device 1. The suction nozzle 28 is activated in an intermittent manner by a solenoid-operated valve V_6 and produces suction air for catching and holding the leading end of each inserted weft Y at its inlet 28a. The suction nozzle 28 has connected thereto a hose 30 whose other end is in turn connected to a bifurcated tube 31. Air jet issued from the suction nozzle 28 produces air flow through one branch portion 31a and convergent portion 31c of the bifurcated tube 31 and blown toward a dust box 33. The excess warp yarn T_1 guided by a guide roller 32 is withdrawn through the other branch portion 31a and the convergent portion 31c of the tube 31 to be discarded into the dust box 33.

50 EFFECT OF THE INVENTION

As it is now apparent from the foregoing, the apparatus of the invention, which makes use of intermittent air flow created by air jet from the fluid injection means for weft insertion and flying or from the fluid injection means for catching and holding the leading end of an inserted weft for the purpose of withdrawing the excess warp yarn, can dispose of the warp yarn smoothly without causing a break thereto.

[DESIGNATION OF REFERENCE NUMERALS]

28 ... Suction nozzle as the fluid injection means; 31 ... Bifurcated tube; V₆ ... Solenoid-operated valve comprising part of the fluid injection means.

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Claims

1. Apparatus for disposing of excess warp yarn (T₁) let off from a warp beam in a jet loom having first fluid injection means (1, 2, 3, 4, 5) for inserting a weft (Y) into a warp shed and for assisting said weft (Y) in flying through said warp shed by air jets (1, 2, 3, 4, 5) issued intermittently therefrom, wherein said excess warp yarn (T₁) is guided to a region which is subjected to the action of air jet from any of said first fluid injection means (1, 2, 3, 4, 5) or of air jet from second fluid injection means (29, V₆, 28, 28a) for catching and holding the leading end of an inserted weft (Y) by air flow produced by air jet issued intermittently therefrom so that said excess warp yarn (T₁) is withdrawn by said action of air jet.
2. Apparatus for disposing of excess warp yarn (T₁) let off from a warp beam in a jet loom having first fluid injection means (1, 2, 3, 4, 5) for inserting a weft (Y) into a warp shed and for assisting said weft (Y) in flying through said warp shed by air jets (1, 2, 3, 4, 5) issued intermittently therefrom, wherein said excess warp yarn (T₁) is guided to a region (31b) which is subjected to the varying action of an air jet from any of said first fluid injection means (1, 2, 3, 4, 5) or of air jet from second fluid injection means (29, V₆, 28, 28a) in such a way that said excess warp yarn (T₁) is withdrawn by said action of air jet.
3. Apparatus as claimed in claim 1 or claim 2, the second fluid injection means where the region which is subjected to the intermittent action of air is the suction opening (31b) of a suction tube (31).
4. Apparatus as claimed in claim 3, the suction tube opening being a the opening of a branch (31b) of a bifurcated suction tube (31, 31a, 31b, 31c).
5. Apparatus as claimed in claim 4 with a connection (V₅) from the fluid source (8) for an intermittently driven auxiliary nozzle (5), to the flow generating branch (31a) of the bifurcated tube (31), as to generate a varying suction air flow in the suction branch (31b) of the suction tube (31).
6. Apparatus as claimed in claims 4, 3 and 1 with a connection (30) from a fluid source (9), intermittently driving an arriving weft catching suction nozzle (28) to the flow generating branch (31a) of the bifurcated tube (31), as to generate a varying suction air flow in the suction branch (31b) of the suction tube (31).
7. Loom with an apparatus as claimed in any of claims 1 to 6.

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Fig. 1

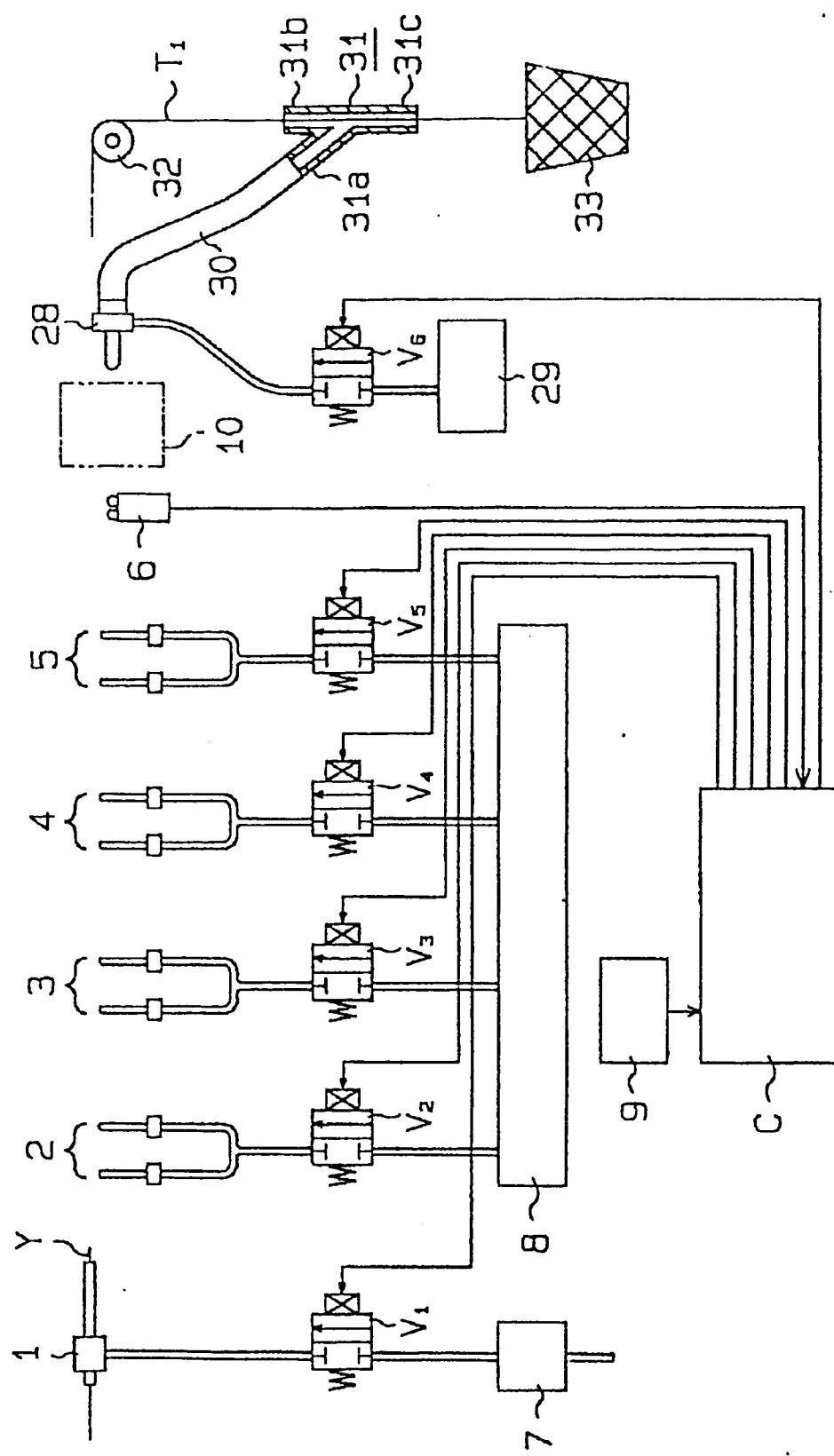


Fig. 2

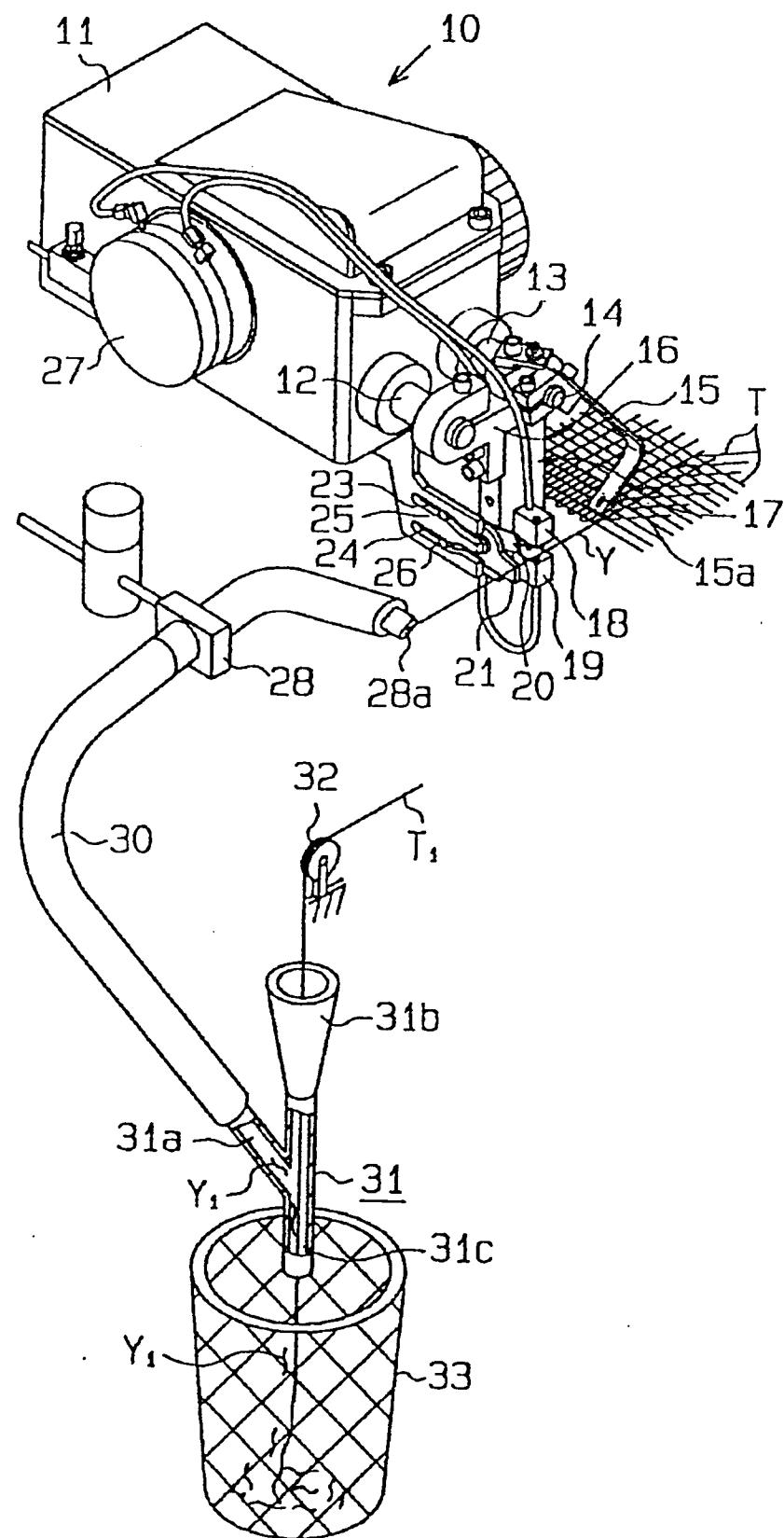


Fig. 3

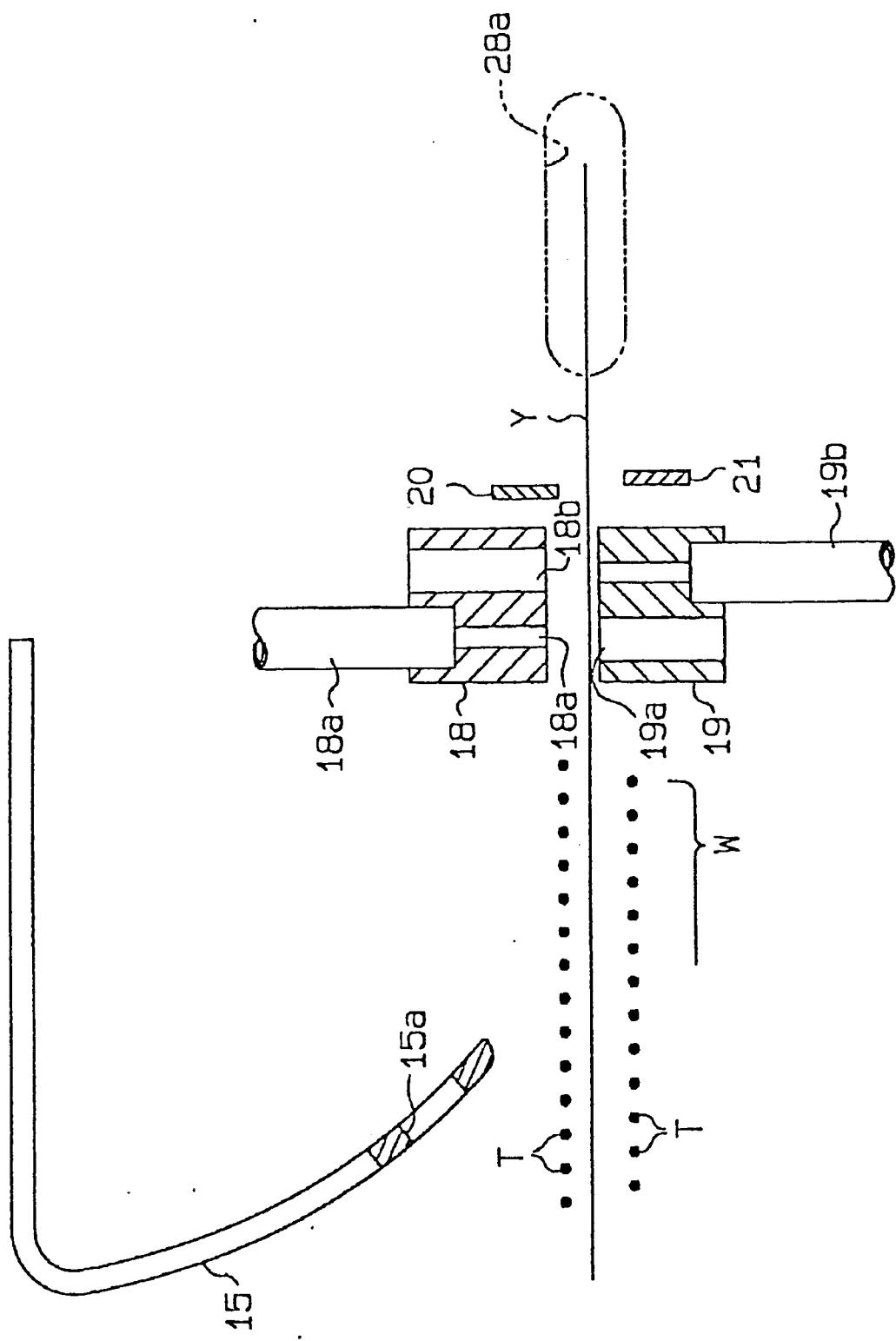
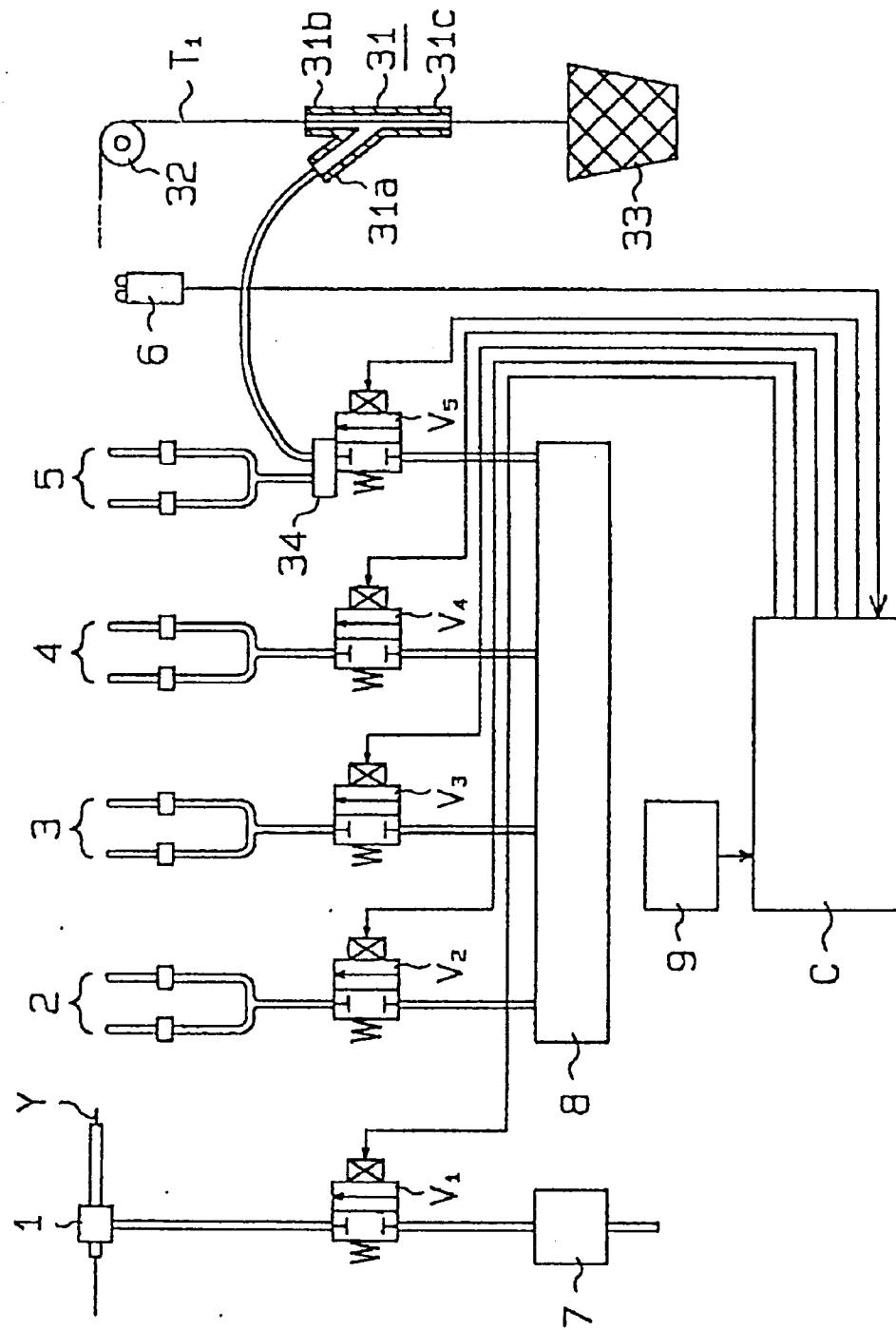


Fig. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 81 0649

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.CI.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	US-A-4 513 791 (DILLON) * column 4, line 32 - column 5, line 17; figures *	1-7	D03J1/02
D, Y	JP-U-54 069 956 (...) * figures *	1-7	
D, X	JP-A-48 036 450 (...) * figures *	2	
A	US-A-4 453 572 (KEY) * column 2, line 29 - line 68; figures *	1-4,6,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			D03J D03D
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search		Examiner
THE HAGUE	6 January 1994		Rebiere, J-L
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone		T : theory or principle underlying the invention	
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P : intermediate document		& : member of the same patent family, corresponding document	