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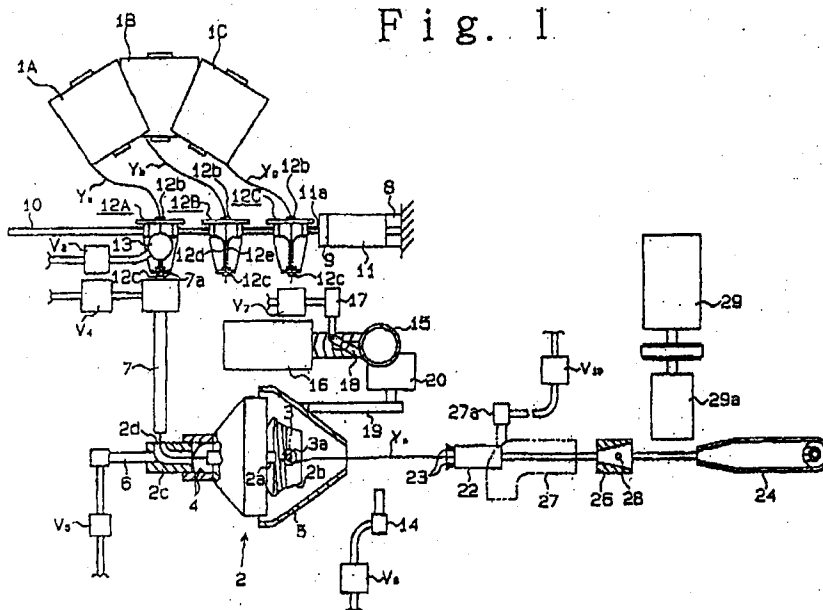
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BE DE FR IT(71) Applicant: **Kabushiki Kaisha Toyoda
Jidoshokki Seisakusho
1, Toyoda-cho 2-chome, Kariya-shi
Aichi-ken 448(JP)**(72) Inventor: **Murata, Masahiko, c/o Kabushiki
Kaisha Toyoda
Jidoshokki Seisakusho, 1, Toyoda-cho,
2-chome
Kariya-shi, Aichi-ken(JP)**(74) Representative: **Hammer, Bruno, Dr. c/o
Gebrueder Sulzer AG
KSR/Patente/0007 Zürcherstrasse 12
CH-8401 Winterthur(CH)**(54) **Apparatus for handling weft yarns in a jet loom.**

(57) The invention relates to an apparatus for preparing a new supply weft yarn in a jet loom in the event that a break has occurred to weft yarn between a weft yarn cheese and a main picking nozzle. The apparatus comprises a plurality of weft supply cheeses (1A,1B,1C), each having its own tenser (12A,12B,12C), a yarn guide nozzle (7) between the tensers and a weft yarn measuring and storage

device (2), the exit of the weft yarn measuring and storage device (2) leading to the main picking nozzle (22), and position changing means to position the exit port of each of the tensers (12A,12B,12C) alternatively in facing relation to the inlet of the yarn guide nozzle (7) by moving either the tensers or the yarn guide nozzle.

Fig. 1



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The present invention relates to an apparatus for handling weft yarns in a jet loom and, more particularly, it relates to an apparatus for preparing a new supply weft yarn in the event that a break has occurred to a weft yarn between a weft yarn cheese and a main picking nozzle of the loom.

Apparatuses of the above type are disclosed, for example, by Publication of Unexamined Japanese Utility Model Application No. 1-62377 (1989) and Publication of Unexamined Japanese Patent Application No. 1-118644 (1989). In each of these prior art apparatuses, there is provided a nipper for holding the leading end of a weft yarn from its reserve cheese, and the nipper thus holding the yarn end is shifted from its stand-by position to yarn conducting position when it becomes necessary to conduct the weft yarn to a weft yarn measuring and storage device of winding type in which a predetermined length of weft yarn is measured by winding it onto a drum and then stored thereon as reserve yarn for a pick. The yarn end at the conducting position is released from the nipper and then introduced into the yarn measuring and storage device under the influence of suction.

A weft yarn introduced into the yarn measuring and storage device must be wound for a predetermined number of turns onto a winding surface thereof before commencement of loom operation. This winding of reserve yarn should be formed orderly on the winding surface to forestall failure in weft yarn picking. For this purpose, a tenser is provided between the weft yarn cheese and the measuring and storage device for applying appropriate tension to the weft yarn to be wound on the winding surface. If no such tenser is provided, there is a fear that an extra length of weft yarn will be drawn out from the cheese when the loom operation is stopped and such extra length may cause inconvenience in the subsequent picking of a weft yarn.

With the above-described prior art apparatuses, however, a weft yarn cannot be conducted through the tenser and, therefore, automation in preparing a supply weft yarn cannot be accomplished.

An object of the present invention is to provide an apparatus for preparing a supply weft yarn automatically notwithstanding the use of tensers.

To solve the aforementioned problems, the present invention provides an apparatus which comprises tensers of the same plural number as the weft yarn supply cheeses, disposed between the respective weft yarn cheeses and the weft yarn measuring and storage device for applying tension to the corresponding weft yarns to be drawn out from the cheeses, a weft yarn guide nozzle for guiding each of the respective weft yarns which has moved past the associated tenser into a weft yarn inlet of the weft yarn measuring and storage

device, and means for moving either the tensers or the weft yarn guide nozzle so as to position an exit port of any one of the tensers and an inlet of the weft yarn guide nozzle in confronting relation to each other.

The leading ends of all weft yarns from supply cheeses except the yarn which is currently passed through the yarn measuring and storage device are previously passed through the corresponding tensers, and the exit port of the tenser which holds the weft yarn passed through the yarn measuring and storage device is positioned in confrontation with the inlet of the weft yarn guide nozzle. In the event that the yarn passed through the measuring and storage device is broken at a position upstream of the device, confronting relation is changed or shifted such that the exit port of another tenser is positioned in confrontation with the weft yarn guide nozzle inlet. In this shifted condition, the weft yarn guide nozzle is opened to inject air. The leading end of weft yarn extending slightly beyond the outlet of the tenser is introduced into the yarn guide nozzle under the influence of suction created by the above injected air and then enters into the yarn measuring and storage device under the influence of air jet in the yarn guide nozzle.

The following will describe an embodiment of the invention by way of an example with reference to the accompanying drawings including FIG. 1 through FIG. 10.

FIGS. 1 through 8 show an embodiment of apparatus for handling weft yarns in a jet loom according to the present invention: of which FIG. 1 is a plan view partially in section showing the apparatus during loom operation with a weft yarn being supplied through the apparatus; FIG. 2 is a back view showing the apparatus; FIG. 3 is a front view partially in section showing the apparatus in the same condition as in FIG. 1; FIG. 4 is a perspective view showing part of the apparatus; FIGS. 5 (a), (b) and (c) are front views showing part of the apparatus in three different conditions; FIG. 6 is a front view partially in section of the apparatus showing a condition in which a weft yarn is conducted through the weft yarn measuring and storage device; FIG. 7 is a block diagram; FIGS. 8 (a) through (d) are flow charts showing the control program for handling weft yarns; FIG. 9 (a) is a plan view showing a modified embodiment of apparatus according to the present invention; FIG. 9 (b) is a front view showing the modified embodiment; FIG. 10 is a plan showing still another modified embodiment of apparatus according to the present invention.

There are provided three cheeses 1A, 1B, 1C of weft yarn supported by cheese stand (not shown). In front of the cheeses 1A, 1B, 1C is disposed a weft yarn measuring and storage de-

vice 2 of a known winding type, and its yarn winding tube 2a is driven to rotate by a motor M (indicated in FIG. 7) which is operable independently from a main loom drive motor (not shown). A predetermined length of weft yarn drawn out through the winding tube 2a by rotation thereof and stored on the yarn winding surface 2b is released when a stop pin 3a, whose operating motion is controlled by an electromagnetic solenoid 3 supported on a glide duct 5 and having a convergent configuration, is moved out of engagement with the winding surface 2a. A yarn-break sensor 4 of photoelectric transmission type is located adjacent to the inside of a yarn guide tube 2c of the yarn measuring and storage device 2 which is in communication with the yarn winding tube 2a.

A blow nozzle 6 is provided in communication with the yarn guide tube 2c. A weft yarn guide nozzle 7 is disposed adjacently to the guide tube 2c such that an air jet from the guide nozzle 7 is directed toward the inlet 2d of the guide tube 2c. The blow nozzle 6 and yarn guide nozzle 7 are connected to an air supply tank (not shown) via a solenoid-operated two-way valves V5, V4, respectively.

An air cylinder 8 is fixedly mounted laterally from the area between the cheeses 1A, 1B, 1C and yarn guide nozzle 7 and its movable drive rod 8a has at its tip end a slider 9 fixed thereto. A guide rod 10 is disposed at a position just above the air cylinder 8, extending in parallel to the drive rod 8a and through the slider 9. The slider 9 is slidable along the guide rod 10. An air cylinder 11 is supported by the slider 9 and it has a drive rod 11a extending in parallel to the guide rod 10. The air cylinders 8, 11 are connected to the aforementioned air supply tank (not shown) via solenoid-operated three-way valves V1 and V2 (indicated in FIG. 7), respectively.

The drive rod 11a of the air cylinder 11 has fixedly mounted thereon three tenses 12A, 12B, 12C. Each of the tenses 12A, 12B, 12C has its own mounting block 12a through which the guide rod 10 extends so that each block 12a is slidable along the guide rod 10. Each tensor includes a pair of yarn guides 12b, 12c supported on opposite sides of its associated mounting block 12a and a pair of leaf springs 12d, 12e which are attached to the block 12a between the yarn guides 12b, 12c and arranged to be in contact with each other so as to hold a weft yarn therebetween. A weft yarn Ya unwound from its supply cheese 1A passes through the yarn guides 12b, 12c of the tensor 12A while being held by and between the leaf springs 12d, 12e. Similarly, weft yarns Yb, Yc from the supply cheeses 1B, 1C are passed through and held by the tensor 12B, 12C, respectively.

FIG. 1 shows a state in which the weft yarn Ya

from the supply cheese 1A is conducted into the yarn measuring and storage device 2 through the guide nozzle 7 and the same yarn is subjected to an appropriate tension by the tensor 12A. The other weft yarns Yb, Yc are passed through the tenses 12B, 12C with the leading ends thereof extending slight beyond the outlet guides 12c of the tenses 12B, 12C, respectively.

As most clearly shown in FIG. 2, an air cylinder 13 is provided immediately above one of the tenses which is then positioned adjacent to the inlet 7a of the yarn guide nozzle 7. The air cylinder 13 has a releasing pin 13a having a pointed end and shiftable by operation of the air cylinder 13 between its retracted position shown by solid line in FIG. 2 and its operative releasing position shown by dash line in the same figure. This air cylinder 13 is connected to the air supply tank (not shown) via a solenoid-operated three-way valve V3.

A blower nozzle 14 and a suction pipe 15 are disposed in facing relation to each other on opposite sides of a region just downstream of the convergent guide duct 5. The suction pipe 15 is positioned close to the suction port of a blower 16 and a yarn cutter 18 operated by an air cylinder 17 is disposed between the blower 16 and the suction pipe 15. The blower nozzle 14 and the air cylinder 17 are connected to the air supply tank (not shown) by way of a solenoid-operated two-way valve V6 and a solenoid-operated three-way valve V7, respectively.

Adjacently to the suction pipe 15 is provided a transfer arm 19 which is supported rotatably by a motor 20 and has formed at its tip end a yarn hook incorporating therein a yarn sensor 21 of photoelectric transmission type. The transfer arm 19 is movable between two positions, i.e. solid-line and phantom-line positions as shown in FIG. 6, so that its hook portion at the tip end moves past the suction port of the suction pipe 15 and then approaches the inlet port of a main weft picking nozzle 22 when the arm 19 is activated to move from the solid-line position to the phantom-line position.

A yarn-break sensor 23 of photoelectric transmission type is arranged at the inlet of the main weft picking nozzle 22. A stationary cutter 22a is attached on top of the opposite end of the picking nozzle 22. An air duct 24 and its associated blow nozzle 25 are disposed one above the other in facing relation to each other on opposite sides of the area of air jet injected by the main picking nozzle 22. An air guide 26 and its associated suction pipe 27 are arranged adjacently to the exit of the air duct 24. The air guide 26 has therein a yarn sensor 28 of photoelectric transmission type, and the suction pipe 27 is connected to a blow nozzle 27a which produces air flow for ejecting

yarn.

The main weft picking nozzle 22, air duct 24, blow nozzle 25, air guide 26 and suction pipe 27 are all mounted on a slay of the weaving loom for movement therewith. Behind the swinging area of these parts 22, 24, 25, 26 and 27 are provided a motor 29 and an air cylinder 30. A drive roller 29a is operatively connected to the motor 29 to be driven thereby, while a driven roller 30a is mounted to the air cylinder 30 so that protruding operation of the air cylinder 30 causes the roller 30a to be brought into contact engagement with the roller 29a in the area between the air duct 24 and the air guide 26.

The main weft picking nozzle 22, blow nozzle 25 and 27a are connected to the air supply tank (not shown) via solenoid-operated two-way valves V8, V9 and V10, respectively. The air cylinder 30 is connected to the air supply tank via a solenoid-operated three-way valve V11. As indicated in FIG. 7, the solenoid-operated valves V1 - V11, motors M, 20, 29, blower 16, and solenoid 3 are all controlled by a computer control C which is independently provided from a main control for the loom itself. The control C is adapted to control the operation of the motors M, 20 and 29, blower 16, solenoid 3, and solenoids for valves V1 - V11 in response to detection signals transmitted from the yarn-break sensors 4, 23 and yarn sensors 21, 28.

Flow charts (a) through (d) in FIG. 8 show a control program for preparing a new supply weft yarn in the event of a yarn break between any one of the weft supply cheeses 1A, 1B, 1C and the weft yarn measuring and storage device 2. The following will describe the operations of the above-described apparatus with reference to the flow charts.

FIGS. 1 and 3 show a state in which the weft yarn Ya unwound from the cheese 1A is being supplied during weaving operation of the loom and the yarn guide 12c of the tensor 12A is positioned in confrontation with the inlet 7a of the yarn guide nozzle 7. That is, the solenoids of the valves V1, V2 for controlling supply of air under pressure to the air cylinders 8, 11, respectively; are both in off (or de-energized) state.

If a break occurs in the weft yarn Ya between the cheese 1A and the measuring and storage device 2, this yarn break is detected by the yarn-break sensor 4, which then sends to the computer control a signal representative of failure in yarn supplying. In response to this information, the control C transmits a loom-stop signal to the loom's computer control, which in response thereto in turn provides a loom-stop command. Accordingly, the loom is caused to stop its operation with the main nozzle 22 on the slay positioned adjacent to the cloth fell of woven fabric. After the loom has been stopped, the control C provides a control signal to

energize the solenoid for valve V9 and the solenoid 3, thereby opening the blow nozzle 25 to inject air and moving the stop pin 3a away from the yarn winding surface 2b. Subsequently, the control C actuates the solenoid for valve V8 thereby to cause the main weft picking nozzle 22 to inject air for releasing the remaining yarn, if any on the winding surface 2b, through the nozzle 22. The remaining yarn Ya' thus released, which is indicated by phantom line in FIG. 3, is introduced into the air duct 24 under the influence of air flow from the blow nozzle 25 and reaches the yarn sensor 28 in the air guide 26.

The control C de-energizes the solenoids for valves V8, V9 and energizes the solenoid for valve V11 in response to yarn-detected signal from the yarn sensor 28, thereby closing the main picking nozzle 22 and blow nozzle 25 to stop air injection and also moving the roller 30a into contact engagement with the roller 29a. Then, the control C actuates the solenoid for valve V10 and the motor 29 to allow the weft yarn Ya' to be pulled by the rollers 29a, 30a and sucked into the suction pipe 27. When the whole length of weft yarn Ya' has moved past the rollers 29a, 30a, the control C responds to a yarn-absence signal from the yarn sensor 28 to cause the motor 29 to stop and the solenoids for valves V11, V10 to be turned off. Accordingly, air flow from the blow nozzle 27a is shut off and the roller 30a is moved away from its cooperating roller 29a.

On the other hand, if the control C receives no yarn-detected signal from the sensor 28 for a pre-determined length of time because of no remaining yarn Ya' on the winding surface 2b to be detected by the sensor 28, the control is operated to proceed the control program to the first step in FIG. 8 (b) without performing the steps in FIG. 8 (a) for disposing of the remaining weft yarn Ya'.

Referring to FIG. 8 (b), the control C activates the blower 16 and then energizes the solenoids for valves V5, V6, thereby causing the blower nozzle 6 to inject air and producing air flow between the blower nozzle 14 and the suction pipe 15. Air stream from the blower 6 flows through the yarn winding tube 2a into the convergent guide tube 5 and joins with the air flow between the blow nozzle 14 and the suction pipe 15. Then, the control C energizes the solenoid for valve V4, so the yarn guide nozzle 7 is opened to inject air for a pre-determined length of time. If an end of a broken weft yarn Ya is then present within this nozzle 7, the end is introduced into the yarn guide tube 2c and then detected by the yarn-break sensor 4, which in turn outputs a yarn-detected signal.

The control C, which has information on the state (ON or OFF) of the solenoids for valves V1, V2, changes the state of the solenoids if the above

yarn-detected signal from the yarn sensor 4 is not received within a predetermined length of time. In FIG. 1 and FIG. 5 (a), weft yarn Ya is being supplied with the solenoids for valves V1, V2 both in OFF state and the tenser 12A positioned just below the air cylinder 13 and in facing relation to the yarn guide nozzle 7 for supplying weft yarn Ya. FIG. 5 (b) shows a condition wherein weft yarn Yb is being supplied with the solenoid for valve V2 in ON state, the solenoid for valve V1 in OFF state and the tenser 12B positioned for supplying the weft yarn Yb. In the condition shown in FIG. 5 (C), weft yarn Yc is being supplied with the solenoids for valves V1, V2 both in ON state and the tenser 12C positioned for supplying the weft yarn Yc.

In the event that a failure in weft supplying occurs in the condition shown in FIG. 5 (a), the control C causes the solenoid of valve V2 to be energized or turned ON. Accordingly, the drive rod 11a of the air cylinder 11 is moved outward therefrom, so the weft supplying position is shifted to the tenser 12B from the tenser 12A, as shown in FIG. 5 (b). Accordingly, the leaf springs 12d, 12e of the tenser 12B are located immediately below the releasing pin 13a of the air cylinder 13, and the yarn guide 12c of the tenser 12B is positioned in confronting relation to the inlet 7a of the yarn guide nozzle 7. The control C then energizes the solenoid for valve V3, causing the releasing pin 13a to protrude downward thereby to release the contact engagement of the springs 12d, 12e. Thus, the leading end of weft yarn Yb held by the leaf springs 12d, 12e is released therefrom.

While the leading end of weft yarn Yb is free from the tenser 12B, the control C energizes the solenoid for valve V4 for a predetermined length of time to allow the yarn guide nozzle 7 to blow air for the same length of time. The leading end of yarn Yb slightly projecting from the yarn guide 12c of the tenser 12B is subjected to suction created adjacent the inlet 7a of the yarn guide nozzle 7 and introduced into the yarn guide nozzle 7 then drawn through the yarn guide tube 2c of the measuring and storage device 2. Since the weft yarn Yb is then free from the tenser 12B, the yarn Yb can be pulled through the tenser 12B easily and conducted to the measuring and storage device 2 smoothly.

In the event that a failure in weft supplying occurs in the state shown in FIG. 5 (b), the control C energizes the solenoid for valve V1 to shift the weft supplying position to the tenser 12C, as shown in FIG. 5 (c). Accordingly, the leading end of weft yarn Yc is introduced through the yarn guide nozzle 7 into the yarn guide tube 2c of the measuring and storage device 2. If a failure in weft supplying occurs in the state of FIG. 5 (c), the control C turns on the solenoids for both valves V1, V2 to change

the weft supplying position to the tenser 12A, so the leading end of weft yarn Ya is introduced through the yarn guide nozzle 7 into the yarn guide tube 2c.

The weft yarn Yb introduced into the yarn guide tube 2c is blown through the yarn winding tube 2a of the measuring and storage device 2 by air flow from the blow nozzle 6. If the yarn Yb is thus conducted properly into the measuring and storage device 2, it is detected by the yarn-break sensor 4, which then outputs a yarn-detected signal to the control C. If the control C fails to receive such a signal from the sensor 4 within a predetermined length of time, however, the weft yarn supplying position is changed to the tenser 12C for passing the yarn Yc into the measuring and storage device 2. If the control C fails to receive the signal from the sensor 4 even after two times of changing of yarn supplying position, the control C provides command signals to stop the blower 16 and to de-energize the solenoid 3 and the solenoids for valves V3, V5, V6, and also a command signal to activate the alarming device 31.

When the yarn Yb has passed properly into the measuring and storage device 2, the control C turns off the solenoid for valve V3 after an elapse of a predetermined length of time after it received the yarn-detected signal from the yarn-break sensor 4. The releasing pin 13a is retracted to its original position so that the weft yarn Yb is held between the leaf springs 12d, 12e of the tenser 12B. Simultaneously, the solenoid 3 and the solenoids for valves V5, V6 are turned off to move the stop pin 3a into engagement with the winding surface 2b and to stop air blowing from the blow nozzles 6 and 14.

The weft yarn Yb blown out through the yarn winding tube 2a is guided by the converging action of the guide duct 5 to the region of an air stream flowing from the blow nozzle 14 to the suction pipe 15, where the yarn Yb is carried by the air stream to be drawn into the suction pipe 15. Because the weft yarn Yb is held by the tenser 12B, suction created in the suction pipe 15 applies appropriate tension to the weft yarn.

While the weft yarn Yb is thus held by the suction in the suction pipe 15, the control C causes the motor M to rotate for a predetermined number of turns to wind a reserve yarn with a predetermined length around the winding surface 2b. After such reserve yarn winding, the control C turns on and then off the solenoid for valve V7, thereby causing the cutter 18 to make a complete cutting stroke. Thus, the leading end of weft yarn Yb is cut to a predetermined length. Subsequently, the motor 20 is rotated for a predetermined number of turns to swing the transfer arm 19 from its solid-line position to phantom-line position shown in FIG. 6. If

the weft yarn Yb is then caught by the hook at the distal end of the transfer arm 19, the yarn sensor 21 is operated by detecting the yarn and outputs a yarn-detected signal to the control C. If the control C fails to receive the above signal from the yarn sensor 21 within a predetermined length of time, the blower 16 is stopped and the motor 20 is reversed, with simultaneous indication of alarm by the alarming device 31.

If the control C has received the above signal from the yarn sensor 21, the solenoid 3 is energized to move the stop pin 3a away from the yarn winding surface 2b. Then, the solenoids for valves V9, V8 are energized to open the blow nozzle 25 and main picking nozzle 22, respectively. The end of weft yarn Yb hooked by the transfer arm 19 is positioned close to the inlet of the main picking nozzle 22, where the yarn end is introduced into the nozzle by suction to be flown therefrom by jet air. The weft yarn Yb coming out from the main picking nozzle 22 is subjected to the influence of air stream created by the blow nozzle 25 and moves to the air guide 26, where it is detected by the yarn sensor 28. In response to a yarn-detected signal from the yarn sensor 28, the control C turns off the solenoid 3 and the solenoid for valve V9 and also stops the blower 16. If the yarn-detected signal is not received by the control C, the latter outputs a command signal to activate the alarming device 31.

When the control C receives the yarn-detected signal from the yarn sensor 28, the solenoid for valve 11 is energized to move the roller 30a into contact engagement with its associated roller 29a to nip the weft yarn Yb therebetween. Then the motor M is rotated for a predetermined number of turns to wind the weft yarn Yb for a predetermined number of turns around the winding surface 2b to form reserve yarn with a predetermined length.

After such reserve yarn winding, the solenoid for valve V10 is energized and, simultaneously, the motor 29 is operated, so the free end of weft yarn Yb is pulled and sucked into the suction pipe 27. The weft yarn Yb thus tensioned by pulling is cut by the stationary cutter 22a on the main picking nozzle 22. When the entire of the cut yarn has moved past the yarn sensor 28, a no-yarn-detected signal is produced by the sensor 28. The control computer responds to this signal, thereby stopping the motor 29 and turning off the solenoids of valves V11, V10. Thus, the loom is resumed to its starting position ready for restarting.

After preparation for a new supply weft yarn has been completed, a predetermined length of weft yarn Yb is wound round the winding surface 2b of the yarn measuring and storage device 2 and this length of yarn is inserted when the loom starts its weaving operation. It is noted that failure in weft

picking may occur unless this reserve yarn is wound orderly on the winding surface 2b. As mentioned earlier, one way to achieve good winding on the winding surface 2b is to apply appropriate tension the weft yarn while it is being wound on the surface. For this purpose, it is necessary for tenses such as 12A, 12B, 12C to be provided between the supply cheeses and the weft yarn measuring and storage device. In the above-described embodiment according to the invention, in the event of a break in a weft yarn to be picked, a tensor for another weft yarn, which is then unused as supply yarn, is shifted to position in confrontation with the inlet 7a of the yarn guide nozzle 7, which is then energized to introduce the new weft yarn into the weft yarn measuring and storage device 2. Thus, yarn winding to form reserve weft yarn on the winding surface 2b can be performed while applying appropriate tension to the weft yarn, with the result that the reserve yarn can be wound on the winding surface in an orderly manner and, therefore, weft picking can be performed smoothly.

Provision of tenses such as 12A, 12B, 12C is necessary also for preventing the supply cheese from allowing excess length of weft yarn to be unwound therefrom when loom operation is stopped. Without the tenses, such excess length of weft yarn will be pulled out from the supply cheese by inertia thereof when the loom operation is stopped and, therefore, yarn winding on the winding surface 2a becomes irregular, resulting in failure in weft picking.

According to the present invention, each of the tenses 12A, 12B, 12C has a weft yarn passed therethrough previously and each tensor is shiftable to a position where the tensor is in facing relation to the yarn guide nozzle 7. Therefore, conventionally troublesome work of conducting a weft yarn through a tensor can be automated. Additionally, neat winding of yarn for reserve yarn formation can be achieved and unwinding of unnecessary excess length of weft yarn from the cheese can be prevented successfully.

It is to be understood that the present invention is not limited to the above-described embodiment, but it may be practiced in other various forms, as exemplified in FIGS. 9 (a) and (b), wherein a plurality of supply cheeses 1A, 1B, 1C, 1D each having its own tensor 12A, 12B, 12C, 12D is mounted to a turntable 32a which is supported at the top of a supply cheese stand 32 and driven to rotate by a motor 33 so that each of the cheeses together with its associated tensor is movable to weft supply position in which the tensor is positioned in confrontation with the yarn guide nozzle 7. In this modified embodiment, since each cheese and its associated tensor are arranged in an optimum positional relation to each other, unwinding of yarn from

the cheese can be carried out under desirable conditions.

Though a releasing pin such as 13 is used for releasing a weft yarn from the tenser in either of the above-described two embodiments, a weft yarn held by the tenser may be delivered to the guide nozzle 7 by application of an appropriately strong air jet through the tenser instead of releasing the yarn from the tenser.

In either of the above-described two embodiments, each of the tenses is moveable to weft yarn supplying position in which the yarn guide 12C of the tenser is positioned in confrontation with the inlet 7a of the yarn guide nozzle 7. As shown in FIG. 10, however, it may be so arranged that the yarn guide nozzle 7 is driven by a motor 34 to be swingable with respect to the tenses 1A, 1B, 1C which are arranged so that the yarn guide 12C of each tenser may be positioned in confronting relation to the inlet 7a of the yarn guide nozzle 7. This arrangement is advantageous in terms of space factor.

In this embodiment, the tenses which are operable to mechanically hold a weft yarn may be substituted with tenses which are pneumatically operable for the same purpose.

According to the present invention, wherein there are provided tenses of the same plural number as the weft yarn cheeses and a single weft yarn guide nozzle for guiding each of the respective weft yarns from the associated tenser into a weft yarn inlet of weft yarn measuring and storage device and, in the event of a failure in weft yarn supplying, either the tenses or the weft yarn guide nozzle are shifted so as to position the exit port of any one of said tenses and an inlet of the weft yarn guide nozzle in confrontation with each other, smooth conducting of a weft yarn through a tenser into the weft yarn measuring and storage device can be performed automatically and, therefore, winding of reserve weft yarn around the yarn winding surface, the condition of which greatly influences the success in weft picking, can be performed in an orderly manner.

The invention relates to an apparatus for preparing a new supply weft yarn in a jet loom in the event that a break has occurred to weft yarn between a weft yarn cheese and a main picking nozzle. The apparatus comprises a plurality of weft supply cheeses, each having its own tenser, a yarn guide nozzle between the tenses and a weft yarn measuring and storage device, the exit of the weft yarn measuring and storage device leading to the main picking nozzle, and position changing means to position the exit port of each of the tenses alternatively in facing relation to the inlet of the yarn guide nozzle by moving either the tenses or the yarn guide nozzle.

Claims

1. An apparatus for handling weft yarns (Y_a , Y_b , Y_c) from a plurality of weft yarn supply cheeses (1A, 1B, 1C) in a jet loom wherein a length of weft yarn unwound from any one of said weft yarn cheeses (1A, 1B, 1C) is measured and stored by a weft yarn measuring and storage device of winding type (2) and the weft yarn thus measured and stored is then picked by a fluid jet injected from a main picking nozzle (22), said apparatus being

characterized by:

tenses (12A, 12B, 12C) of the same plural number as said weft yarn cheeses (1A, 1B, 1C) disposed between the respective weft yarn cheeses (1A, 1B, 1C) and said weft yarn measuring and storage device (2) for applying tension to the corresponding weft yarns (Y_a , Y_b , Y_c) to be drawn out from said cheeses (1A, 1B, 1C);

a weft yarn guide nozzle (7) for guiding each of the respective weft yarns (Y_a , Y_b , Y_c) which has moved past the associated tenser (12A, 12B, 12C) into a weft yarn inlet (2d) of said weft yarn measuring and storage device (2); and

means for moving either said tenses (12A, 12B, 12C) or said weft yarn guide nozzle (7) so as to position an exit port of any one of said tenses (12A, 12B, 12C) and an inlet (7a) of said weft yarn guide nozzle (7) in confronting relation to each other.

2. Apparatus according to claim 1, **characterized in** the tenses (12A, 12B, 12C) comprising a mounting block (12a), a pair of yarn guides (12b, 12c) supported on opposite sides of the mounting block (12a), a pair of leaf springs (12d, 12e) being attached to the mounting block (12a) between the yarn guides (12b, 12c) and being arranged to be in contact with each other for holding a yarn therebetween.
3. Apparatus according to claim 2, **characterized in** an air cylinder (13) being provided above the tenser, which is positioned adjacent to the inlet (7a) of the yarn guide nozzle (7), the air cylinder (13) operating a releasing pin (13a) which causes in its downward position the release of the contact of the leaf springs (12d, 12e), and by that the release of the yarn held between the leaf springs (12d, 12e).
4. Apparatus according to one of the claims 1 to 3,

characterized in

a blower nozzle (14) and a suction pipe (15) being disposed facing each other in the outlet area of the weft yarn measuring and storage device (2), the suction pipe (15) being positioned close to the suction port of a blower (16), and a yarn cutter (18) being disposed between blower (16) and suction pipe (15). 5

the tensers (12A, 12B, 12C) being pneumatically operable.

5. Apparatus according to claim 4, 10
characterized in

a transfer arm (19) being provided adjacently to the suction pipe (15), said transfer arm (19) being rotatably supported by a motor (20), and being provided at its end with a yarn hook incorporating therein a yarn sensor (21), said yarn hook being movable between the suction pipe (15) and a main weft picking nozzle (22). 15

6. Apparatus according to claim 5, 20
characterized in
 the main weft picking nozzle (22) being provided with a yarn-break sensor (23) at its inlet end and with a stationary cutter (22a) at its opposite end. 25

7. Apparatus according to claims 1 to 6, 30
characterized in
 the weft yarn cheeses (1A, 1B, 1C) being stationary mounted, the tensers (12A, 12B, 12C) being mounted on a linearly movable drive rod (11a), the drive rod (11a) being driven by at least one cylinder (11), so that each of the tensers (12A, 12B, 12C) is movable in front of the inlet (7a) of the stationary yarn guide nozzle (7). 35

8. Apparatus according to one of claims 1 to 6, 40
characterized in
 a plurality of weft yarn supply cheeses (1A, 1B, 1C, 1D), each having its own tensor (12A, 12B, 12C, 12D), being mounted to a turntable so that each of the cheeses (1A, 1B, 1C, 1D) together with its associated tensor (12A, 12B, 12C, 12D) is movable in front of the inlet (7a) of the stationary yarn guide nozzle (7). (Fig. 9) 45

9. Apparatus according to claims 1 to 6, 50
characterized in
 the yarn guide nozzle (7) being swingable with respect to the stationary tensers (12A, 12B, 12C), which are arranged, so that the inlet (7a) of the yarn guide nozzle (7) may be positioned in confronting relation to each tensor (12A, 12B, 12C). (Fig. 10) 55

10. Apparatus according to claim 9,
characterized in

Fig. 1

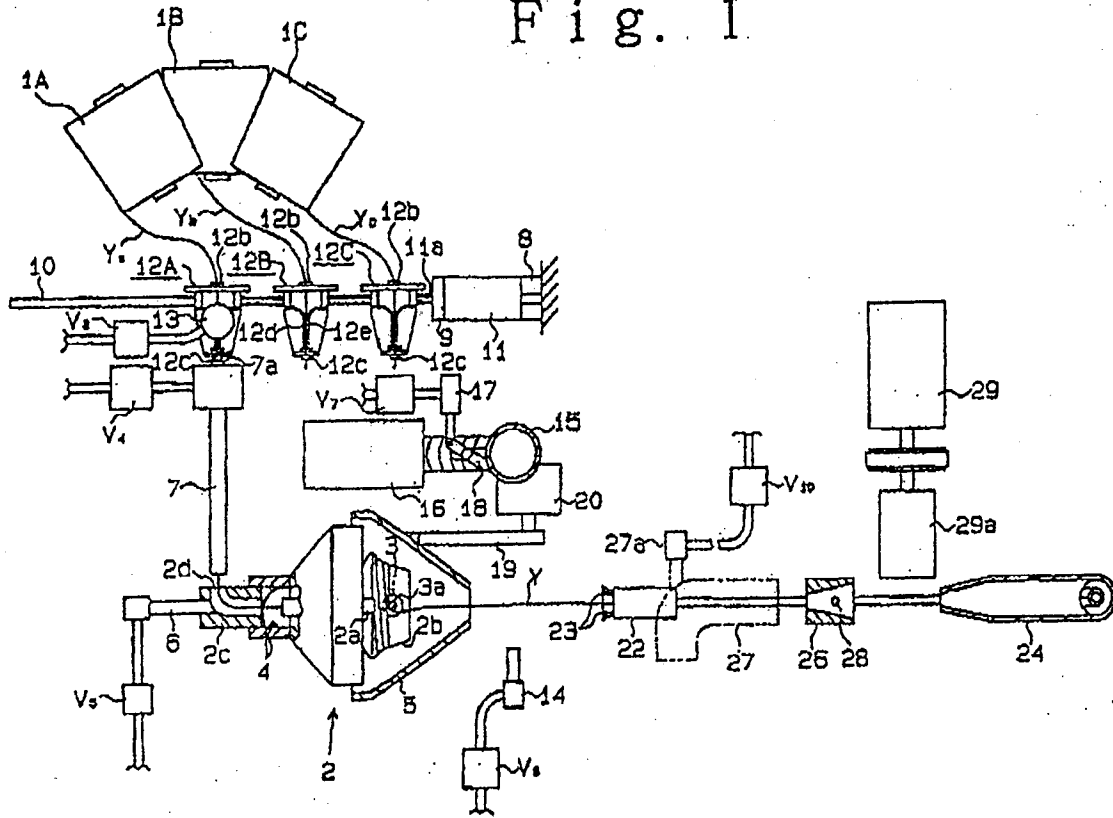


Fig. 2

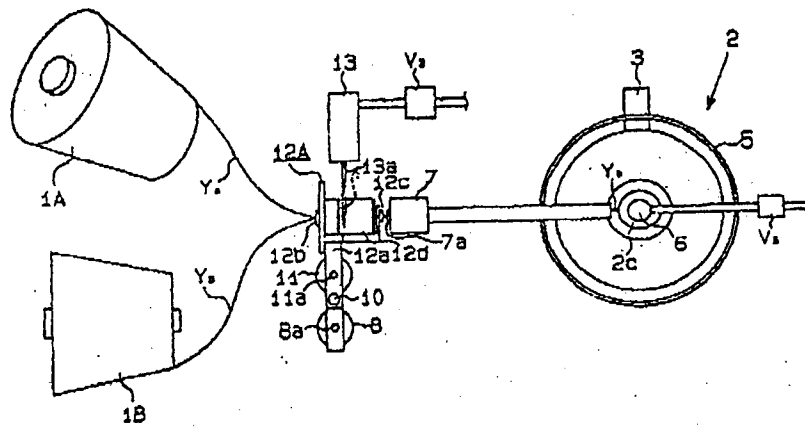


Fig. 3

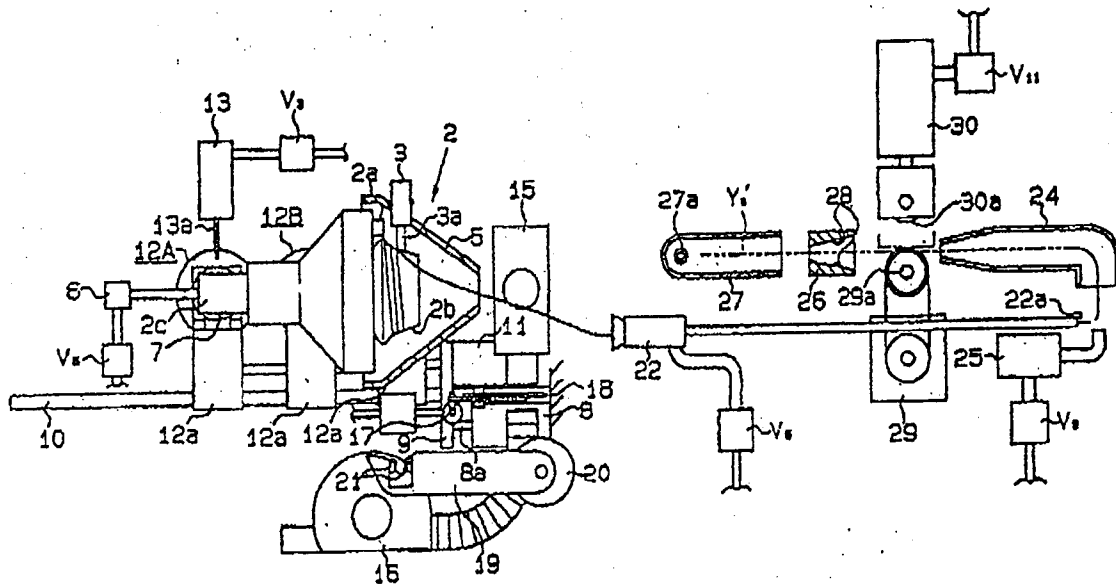


Fig. 4

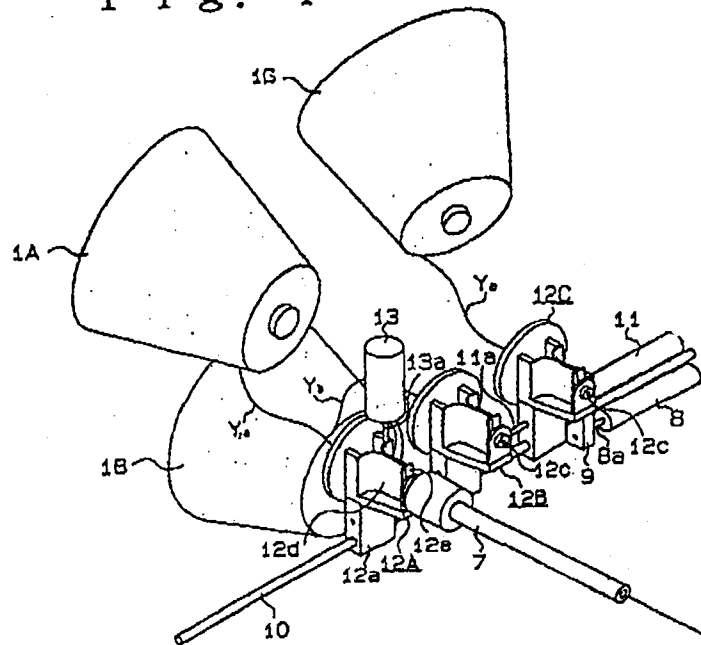


Fig. 5 (a)

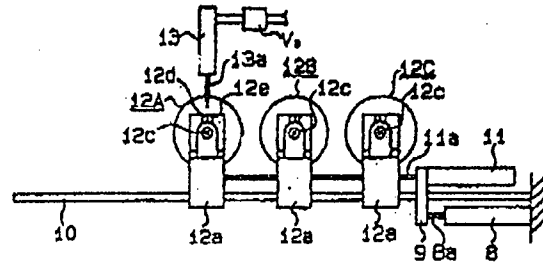


Fig. 5 (b)

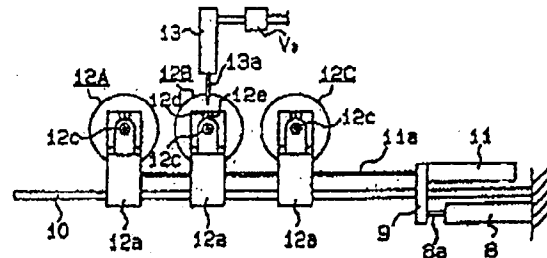


Fig. 5 (c)

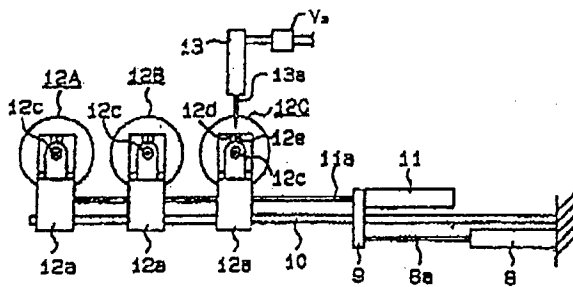


Fig. 6

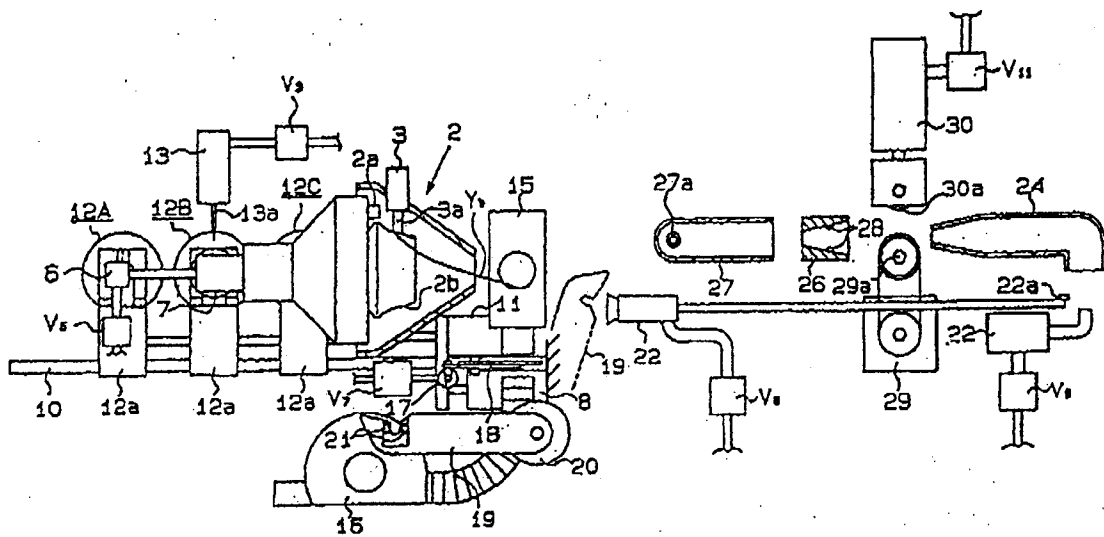


Fig. 7

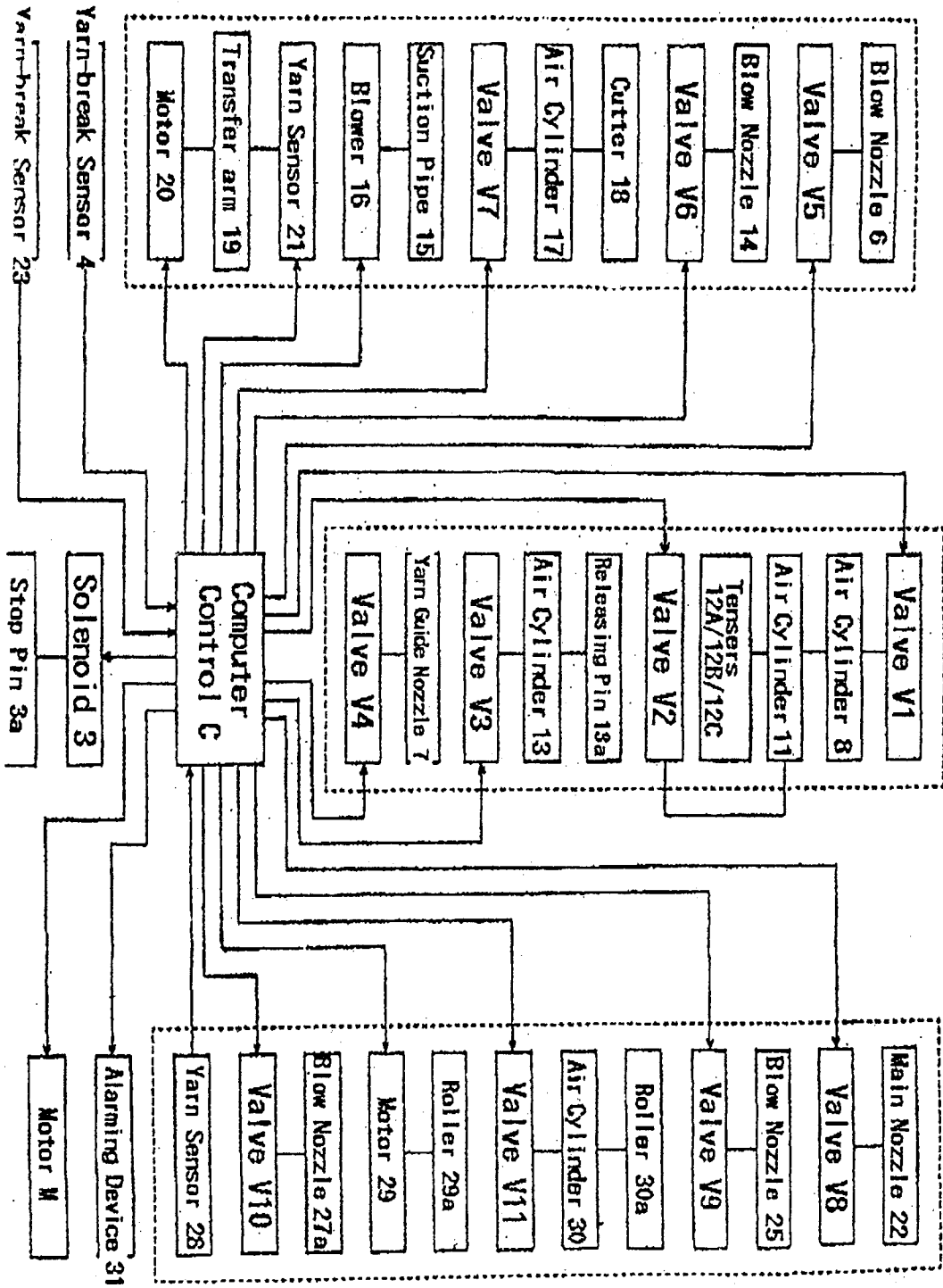


Fig. 8 (a)

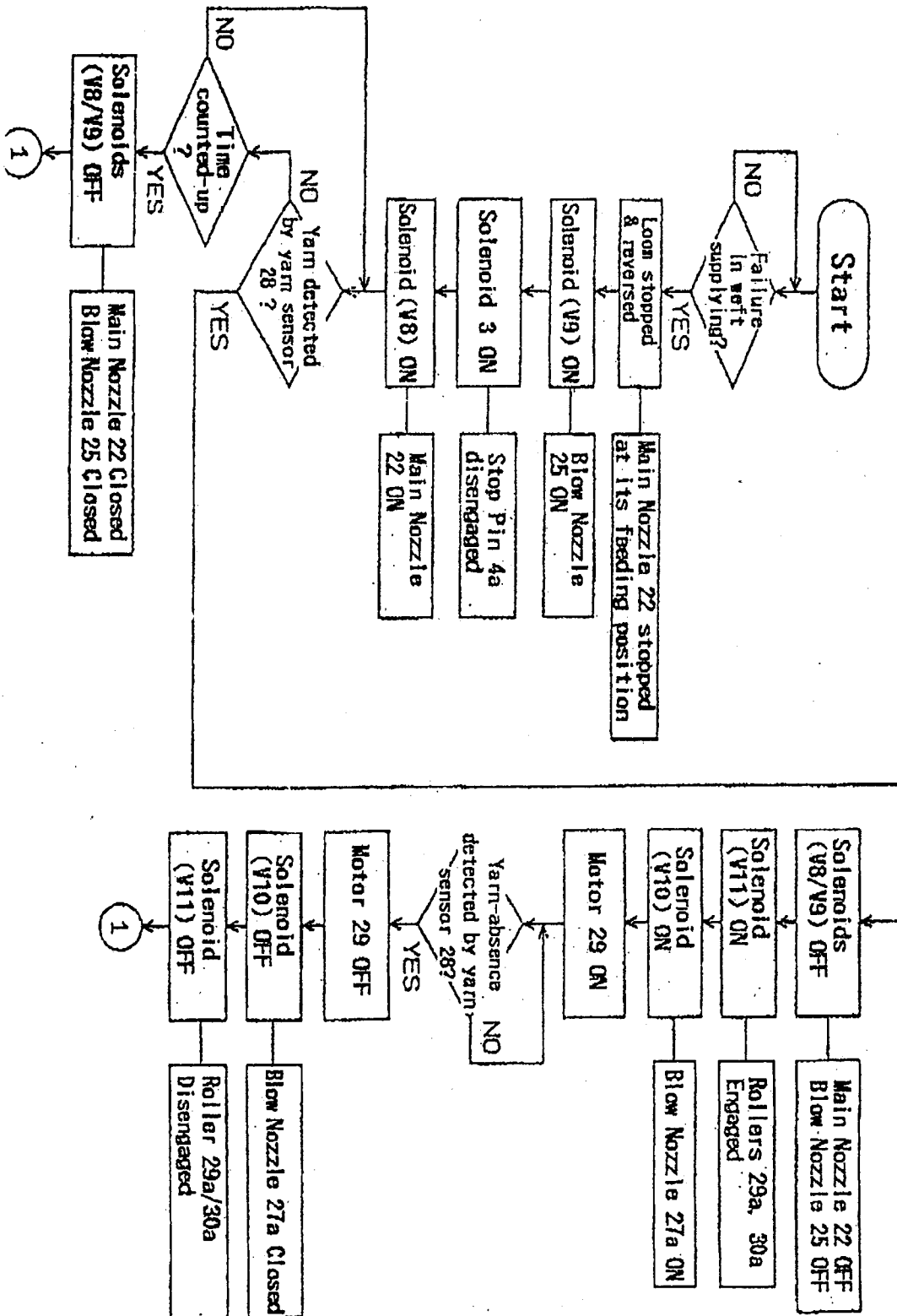


Fig. 8 (b)

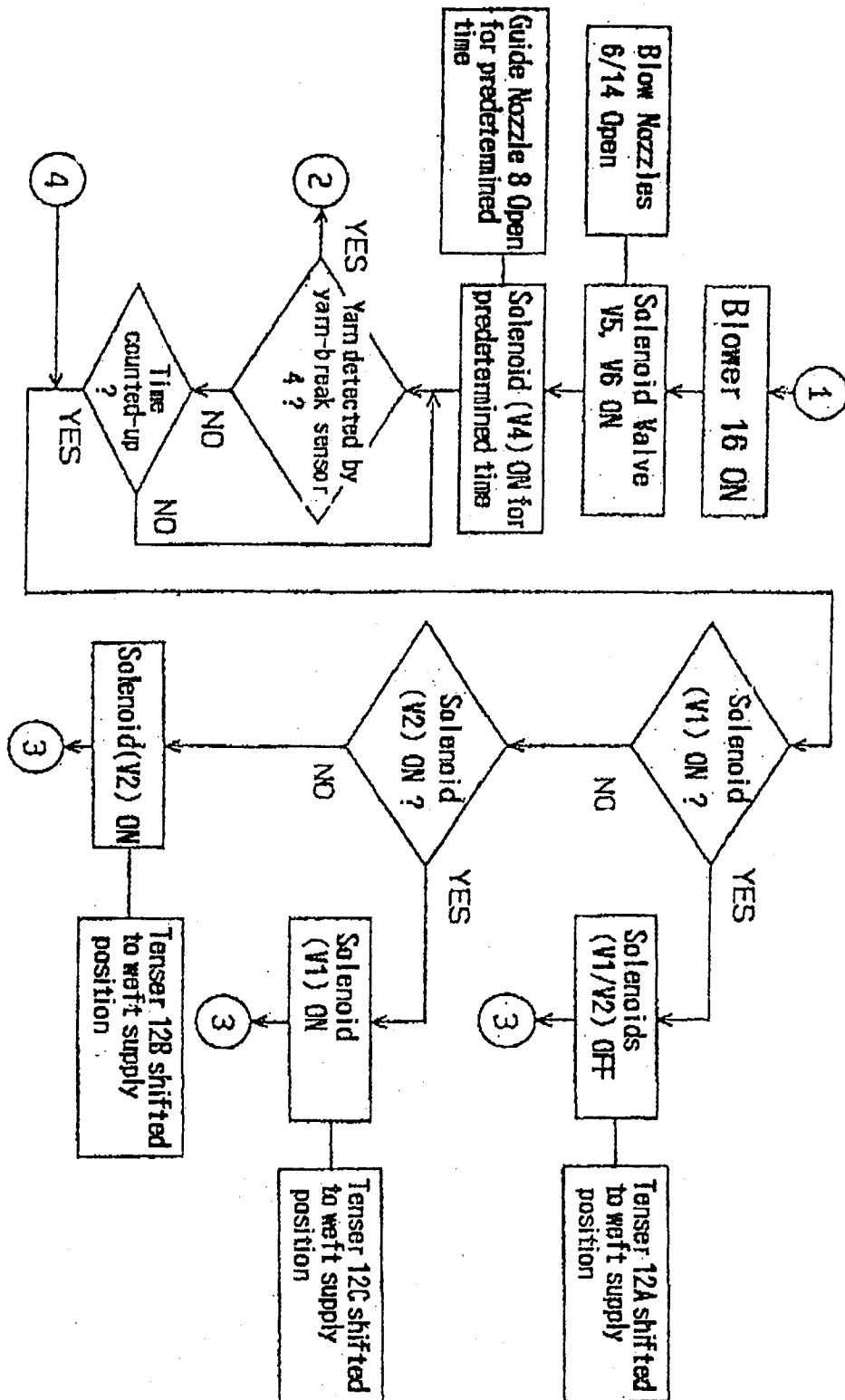


Fig. 8(c)

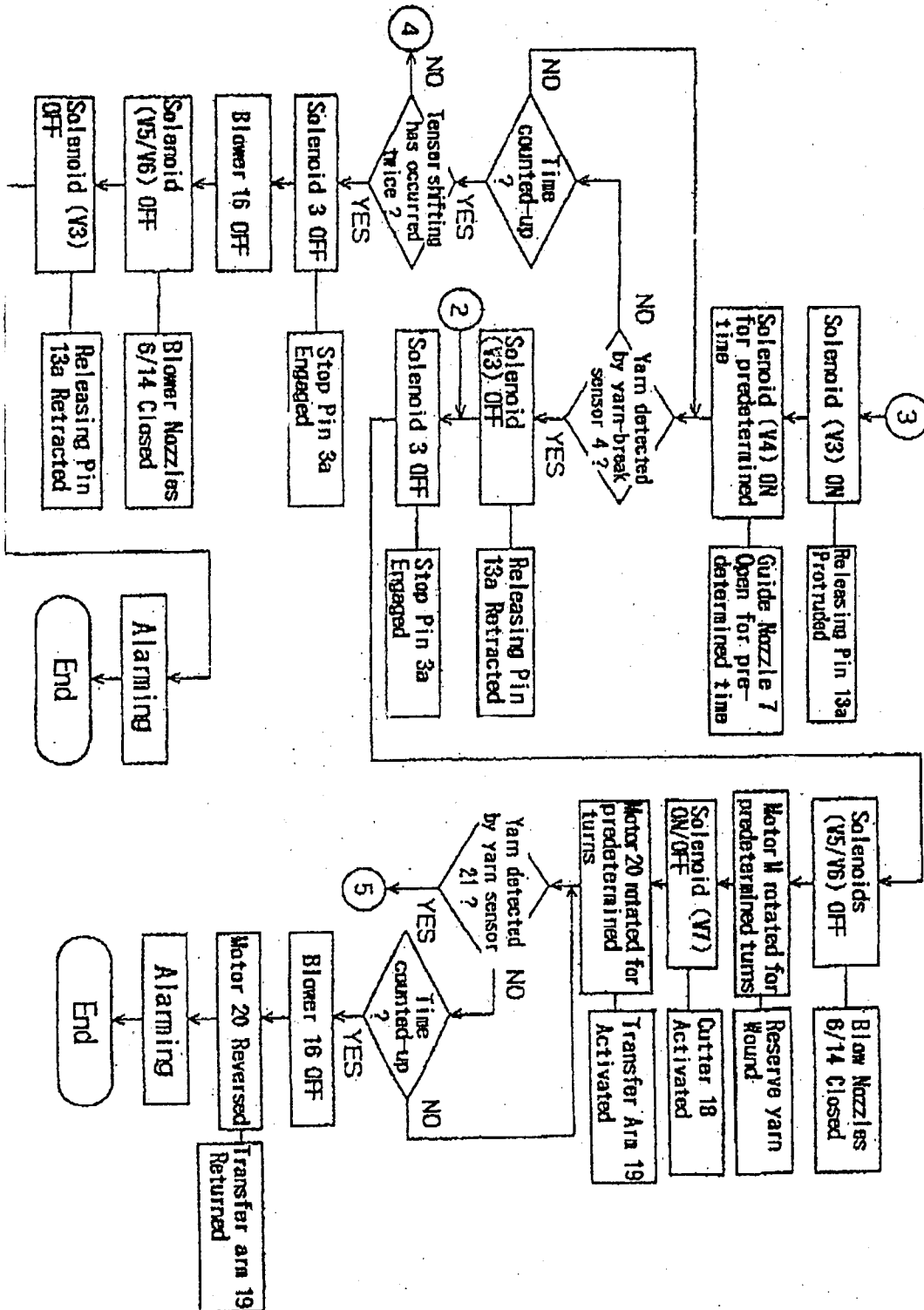


Fig. 8 (d)

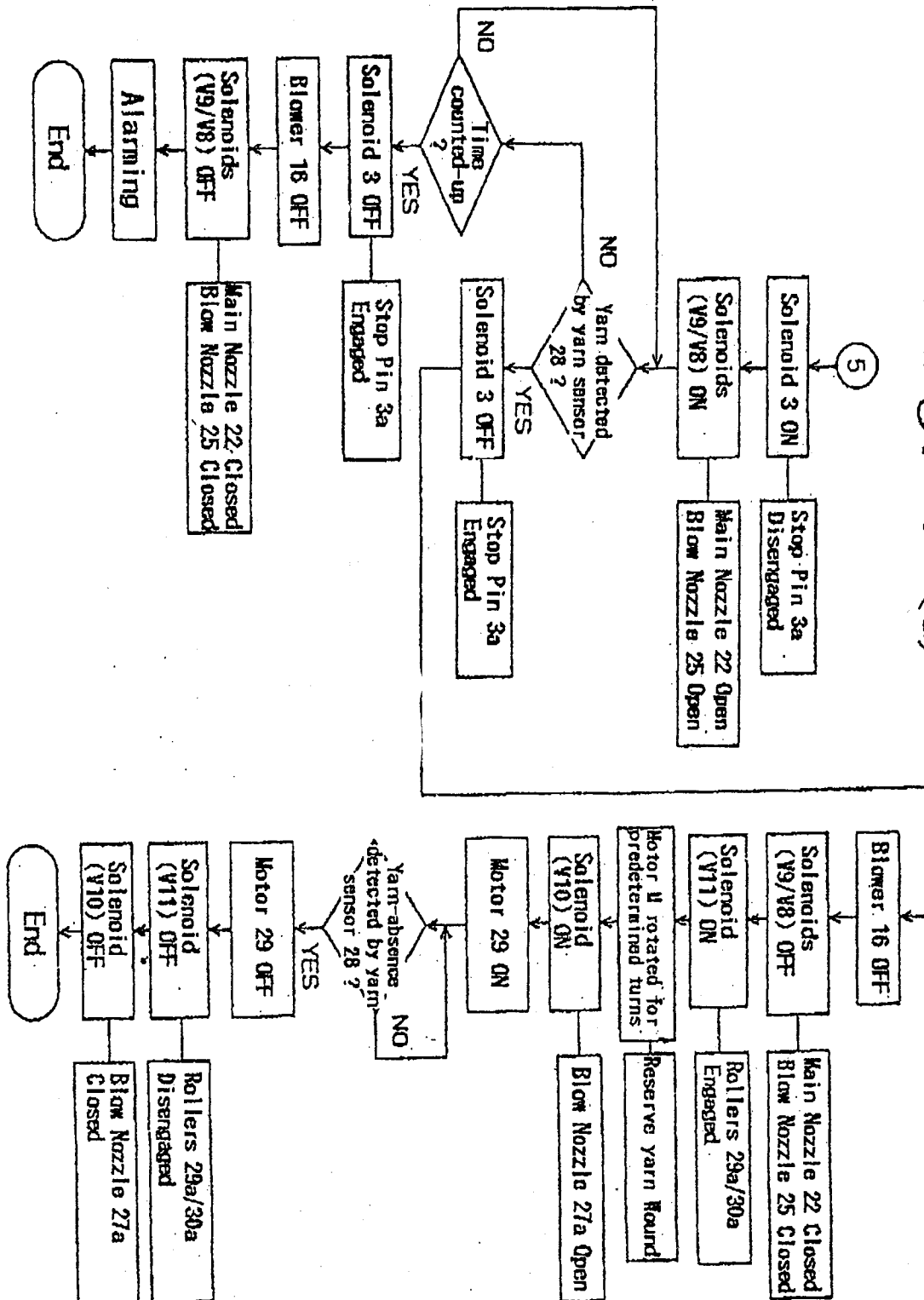


Fig. 9 (a)

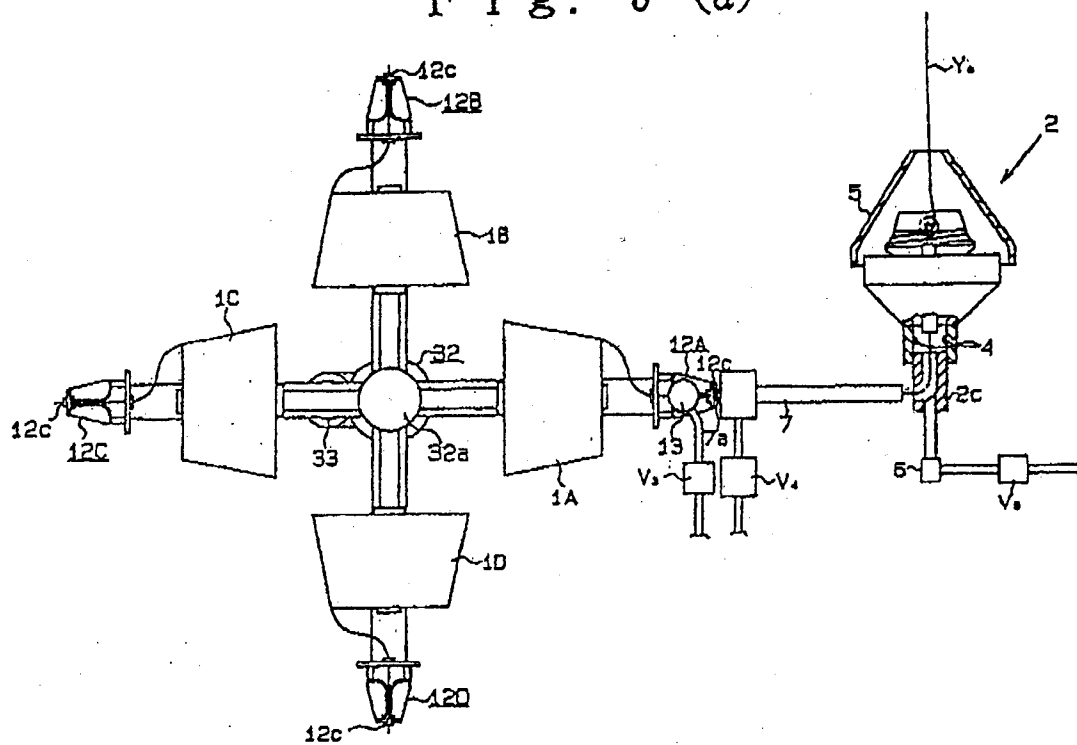


Fig. 9 (b)

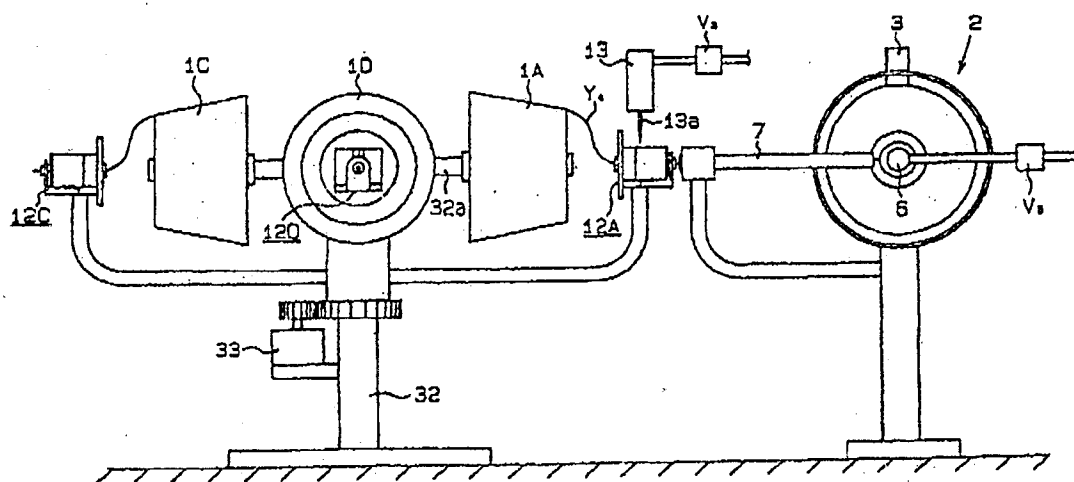
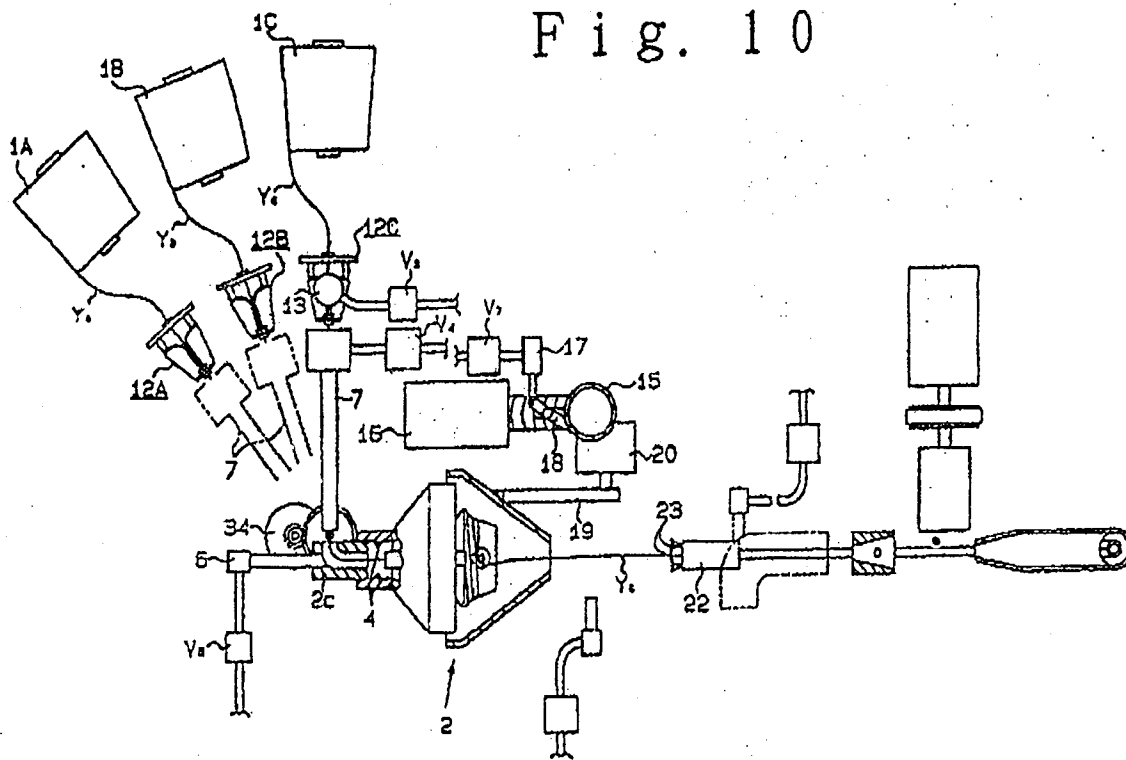


Fig. 10





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 91111522.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP - A1 - 0 362 925 (PICANOL) * Fig. 1 *	1	D 03 D 47/34
A		4, 7, 10	
X	EP - A1 - 0 365 472 (SULZER) * Fig. 1, 2, 3 *	1, 8	
A		6	
A	EP - A1 - 0 355 281 (NISSAN) * Fig. 1, 7, 16, 21 *	1, 2	
P, A	EP - A2 - 0 388 680 (K.K. TOYODA) * Totality *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D 03 D 47/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 14-11-1991	Examiner BAUMANN
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			