



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 0 806 503 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**02.10.2002 Bulletin 2002/40**

(51) Int Cl.7: **D02G 1/04**, G01N 33/36,  
D01H 13/16, B65H 63/028,  
B65H 63/036

(21) Application number: **97105860.7**

(22) Date of filing: **09.04.1997**

(54) **A doubled yarn false twisting machine**

Maschine zum Falschdrallzwirnen eines Zwirns

Machine à conférer une fausse torsion à un fil texturé

(84) Designated Contracting States:  
**CH DE FR IT LI**

• **Nagata, Haruhisa**  
**Nagaokakyo-shi, Kyoto (JP)**

(30) Priority: **07.05.1996 JP 11239696**

(74) Representative: **Liedl, Christine, Dipl.-Chem. et al**  
**Hansmann & Vogeser**  
**Patentanwälte**  
**Postfach 70 08 60**  
**81308 München (DE)**

(43) Date of publication of application:  
**12.11.1997 Bulletin 1997/46**

(73) Proprietor: **Murata Kikai Kabushiki Kaisha**  
**Minami-ku, Kyoto-shi, Kyoto 601 (JP)**

(56) References cited:  
**EP-A- 0 495 446** **US-A- 4 947 633**  
**US-A- 5 502 961**

(72) Inventors:

• **Tone, Shoichi**  
**Sakyo-ku, Kyoto-shi, Kyoto (JP)**

**EP 0 806 503 B1**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

**[0001]** The present invention relates to a doubled yarn false twisting machine.

**[0002]** On false twisting machines, as disclosed in EP-A-0 495 446 and US-A-5 502 961 delivery of even a single yarn is carried out by feed rollers, and when a yarn breakage occurs in the yarn pathway, the yarn upstream from the place where the breakage has occurred becomes entangled in the machine and it is thus necessary to cut the yarn in front of the upstream feed rollers. As conventional electrical capacitance type yarn breakage detection devices only detect the presence or absence of a yarn in the detection part, they do not work unless all of the yarns comprising the conjugated yarn are cut and do not operate even if only one of the plurality of yarns is uncut. Accordingly, in order to detect a yarn breakage, a mechanical yarn breakage detection device is also arranged upstream of the first feed rollers that are upstream of where the yarns are combined and does not influence the transfer of the false twist. A breakage in any single yarn may thus be detected before the yarns are combined.

**[0003]** A schematic drawing of a conventional doubled gain false twisting machine is shown in Figure 6 with a mechanical yarn breakage detection device 4 being arranged between a cutter 2 and a first feed roller F1.

**[0004]** After the supplied yarn Y is passed by a first feed roller F1 via the cutter 2 and the mechanical yarn breakage detection device 4, then passed through a primary heater H1 and a cooling plate L2, then false twist processed by a false twister 9, then had the untwisting tension detected by a untwisting tension detection device 1 and doubled by an entangling device IL, the conjugated yarn which has been doubled is wound by a winding device W via a yarn breakage detection device 3. With the above mentioned prior art false twisting machines the untwisting tension detection device is used to keep the tension within a defined operating range and to maintain a predetermine quality level.

**[0005]** In this example, if a single yam of the yarns comprising the conjugated yarn breaks after the first feed roller F1 and then becomes wrapped around the shaft of the feed roller F1, there is still yarn Y in the mechanical yarn breakage detection device 4 and on top of this, as there is also at least a single yam of those comprising the conjugated yarn remains in the electrical capacitance yarn breakage detection device 3, detection of the breakage is impossible.

**[0006]** The following is a brief description of yarn breakage detection devices. A mechanical type and electrical capacitance type of yarn breakage detection devices are used on conventional false twisting machines and an antistatic agent is used on partially draw textured yarn being the supply yarn. Detection of the presence or absence of yarn by the electrical capacitance yarn breakage detection device which detects whether there is a yarn by the capacitance of static elec-

tricity is very difficult as the yarn is almost completely uncharged and thus a mechanical yarn breakage detection device is used which detects the presence or absence of yarn by contact. This antistatic agent soon becomes ineffective if heated and thus a non-contact electrical capacitance yarn breakage detection device is used for the yarn which has passed through the primary heater.

**[0007]** Thus, when a conventional mechanical yarn breakage detection device is arranged upstream of the first feed roller as described above, a number of problems arise.

**[0008]** Firstly, there is no realisation that the conjugated yarn is no longer a conjugated yarn and production will continue as a defective product due to the breakage occurring downstream of the detection device.

**[0009]** Secondly, there is a possibility that the yarn end of the downstream side of the broken yarn may be wound on the winding package or the upstream side yarn end is not wound and becomes entangled on the rotating part of the shaft etc. of the feed roller. If this entanglement occurs, the yarn continues to be fed and forms a lump but even in this case, it is not detected by the yarn breakage detection device. In the worst possible case, this may cause the stoppage of the machine and thus require an operation to remove the entangled lump. As a result, it is preferable to arrange the yarn breakage detection device as far as possible downstream being the winding device side.

**[0010]** However, as previously described, an electrical capacitance or mechanical yarn breakage detection device is not suitable for the detection of a yarn breakage after the doubling of the yarn. A high performance device that is able to detect a single yarn breakage whilst in the doubled yarn state has been proposed as an electrical capacitance yarn breakage detection device but this is unusable due to the high costs.

**[0011]** It is an object of the present invention to propose a doubled yarn false twisting machine that is able to avoid entangling problems if a single yarn breakage occurs.

**[0012]** This problem is accomplished by the features of claim 1. This solution is based on the use of the untwisting tension detecting device to detect a single yarn breakage and to cut all yarn forming the doubled yarn.

**[0013]** The tension detection device for detecting the untwisting tension is connected to the control device that operates the cutter upon judging a yarn breakage from a tension change. When the detected untwisting tension drops by exceeding the normal range based on the properties of the yarn or the like, the cutter is operated due to supposition of a yarn breakage. The tension value at which the cutter operates is the value close to zero referring to the margin of error with the zero point setting in the case of tension zero or is the value lower than the aforementioned range of untwisting tension.

**[0014]** Furthermore, the aforementioned tension detection device measures the combining force of the un-

twisting tension of the plurality of yarns which are doubled, defines the operating range and judges a yarn breakage when the untwisting tension drops outside of that range.

**[0015]** Accordingly, as the untwisting tension of the conjugated yarn is the sum of the untwisting tensions of each yarn comprising the conjugated yarn, when a single yarn breaks, the tension changes by the amount of the untwisting tension of that broken yarn. As the untwisting tension is normally always changing to some degree, the change when a single yarn of the yarns comprising the conjugated yarn breaks may not necessarily be due to the untwisting tension of a broken yarn. As a result, an operating range is defined and the cutter is operated regardless of the presence or absence of yarn when the untwisting tension drops out of that range.

**[0016]** Single yarn processing may be of course also performed on the doubled yarn false twisting machine if the cutter is disengaged.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0017]** Figure 1 is a schematic drawing of a doubled yarn false twisting machine of the present invention.

**[0018]** Figure 2 is a side view of the doubled yarn false twisting machine of the present invention.

**[0019]** Figure 3 and 4 are schematic drawings of untwisting tension detection devices of a false twisting machine.

**[0020]** Figure 5 is a graph showing the relationship between the untwisting tension and yarn breakage.

**[0021]** Figure 6 is a schematic drawing of a conventional doubled yarn false twisting machine.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0022]** A draw texturizing machine M being a typical example of the present invention which carries out texture processing of a melt-spun synthetic filament yarn is shown in Figure 2. Ps is a supply package that is supported by a creel stand S. L1 is a guide pipe that guides a filament yarn Y unwound from supply packages Ps to a first feed roller F1. H1 is a primary heater that heat processes the yarn Y false twisted by a false twister 9. L2 is a cooling plate that fixes the properties of the yarn heat processed by the primary heater H1 by cooling. IL is an entangling device which entangles the yarn Y comprising a plurality of fiber bundles in approximately uniform intervals by a fluid and is able to form conjugated yarn by entangling a plurality of single yarns. Furthermore, when the entangling process is carried out, the unwinding properties are improved in the case of conjugated yarn or single yarn. O is an oiling roller that applies a lubricant to the yarn Y. W is a winding device that winds the yarn Y on a package Pw.

**[0023]** As shown in Figure 2, the draw texturizing machine M is arranged with the creel stand S along the

frame K and the filament yarn Y of the supply packages Ps supported on this creel stand S is unwound and guided to the first feed roller F1 by the guide pipe L1. A cutter 2 is arranged at the yarn exit hole of this guide pipe L1.

**[0024]** The yarn is then guided to a second feed roller F2 via the primary heater H1 for texturing, the cooling plate L2, the false twister 9 and an untwisting tension detection device 1 that is arranged in order to obtain various information necessary for quality management of the package such as changes in untwisting tension T. By this process, the filament yarn Y is false twisted and heat fixed while being draw textured and bulkiness process is imparted on the filament yarn Y. Then, after doubling by the entangling device IL, it is wound on the package Pw by the winding device W via a third feed roller F3, a fourth feed roller F4, yarn breakage detection device 3, operation alley L3 and oiling roller O.

**[0025]** The structure of the main part of the doubled yarn false twisting machine M of the present invention will now be described with reference to Figure 1 being a schematic drawing.

**[0026]** 3 is the yarn breakage detection device which operates the cutter 2 and cuts the yarn Y upon detecting a yarn breakage. 1 is the untwisting tension detection device which also serves as a yarn breakage detection device and which sends signals to a control part 6 by obtaining various information necessary for quality management of the package such as changes in untwisting tension T by an internal sensor 5 and controls the untwisting tension T of the yarn Y by a contact pressure control means such as a cylinder that adjusts the contact pressure of the false twister 9, based on the suitable signals sent from the control part 6. Apart from this, a yarn breakage is set for when the untwisting tension T shows a change exceeding the management range and the cutter 2 is operated by a signal from the control part 6.

**[0027]** In the case of normal winding, the yarn Y via the cutter 2 passes the first feed roller F1, primary heater H1, cooling plate L2, is false twist processed by the false twister 9, has the untwisting tension T detected by the untwisting tension detection device 1 and that result is entered in the control part 6. The control part 6 is pre-entered with target values for the untwisting tension T, the tension upper limit Tu and lower limit Td being the control range with respect to that target value To are entered simultaneously and the untwisting tension T of the false twister 9 is controlled via the contact pressure control means so as to be the target value To based on the untwisting tension T from the sensor 5.

**[0028]** Furthermore, high quality yarn Y which has been controlled such that the untwisting tension T is within the target range is wound as a conjugated yarn by the winding device W via the yarn breakage detection device 3 after being doubled by the entangling device IL.

**[0029]** The untwisting tension detection device 1 with two internal sensors 5 is shown in Figure 3. The conjugated yarn comprises two doubled yarns, and the yarn

path is separate for each yarn Y so that the untwisting tension T may be detected and a respective moving guide roller 8 and a sensor 5 are provided.

**[0030]** Provided that the untwisting tension T of the conjugated yarn is for example 100g, with the untwisting tension of one yarn at 70g and the untwisting tension of the other at 30g and if a conjugated yarn of higher quality is to be produced, an embodiment arranged with such a plurality of sensors in the untwisting tension detection device 1 is able to produce better yarn by controlling the untwisting tensions of each of the composing yarns.

**[0031]** As shown in Figure 3, the untwisting tension detection device 1 has a yarn path made of a guide 7 of which the shaft is fixed and a guide 8 that is linked to the sensor 5 and moves in response to the yarn tension, and measures the untwisting tension of the yarn Y passing along this yarn path. A single yarn false twisted by the false twister 9 passes along one yarn path. When this untwisting tension detection device 1 detects normal changes, if necessary, a yarn of higher quality may be produced by the control of the untwisting tension of the yarn Y by controlling a cylinder that adjusts the contact pressure of the false twister 9.

**[0032]** Thus, for example, it is supposed that a conjugated yarn YC is comprised of two single yarns being a 150 denier yarn YA and a 75 denier yarn YB, and that a yarn breakage occurs when the untwisting tension T of the yarn YA is 70g and the untwisting tension T of the yarn YB is 30g. If a yarn breakage occurred in yarn YB, the untwisting tension T of the sensor 5 detecting the untwisting tension T of YB would become a value close to zero, a yarn breakage would be recognised and, the cutter 2 would be operated and the yarns YA, YB would be cut.

**[0033]** In this example, one sensor 5 detects the untwisting tension T of a single yarn Y, and when the winding tension has become 0, it should be thought of as a yarn breakage but without actual experimentation, this can not be known. There is a margin of error and the untwisting tension T rarely reaches 0 even if a yarn breakage has occurred. Therefore, it is preferable to judge a yarn breakage when the untwisting tension T is close to 0 by reference to the margin of error and degree of change of the untwisting tension T.

**[0034]** Further, a yarn breakage may also be judged by large changes in the unwinding tension T of a single yarn such as changes of over half the unwinding tension T.

**[0035]** According to the first embodiment the conjugate yarn comprises two yarns but naturally the number of yarns comprising the conjugate yarn is not necessarily limited to two. The cutter 2 operated by a single untwisting tension detection device 1 may be set corresponding to the number of yarns comprising the conjugated yarn.

**[0036]** Also, the sensors 5 inside the single untwisting tension detection device 1 are not limited to two and are preferably in the same number as the number of yarns

comprising the conjugated yarn.

**[0037]** A second embodiment will now be described with reference to Figure 4.

**[0038]** There is a single sensor 5 in the untwisting tension detection device 1, a single yarn groove in the fixed guide roller 7, and a single moving guide roller 8. Two yarns Y which have been false twisted by the false twister 9 pass through the sensor 5 and the untwisting tension T of the entire conjugated yarn is measured. Under normal tension changes, a target range is set in the untwisting tension detection device 1 so that the tension is adjusted to the target value  $T_0$  of the untwisting tension and an operating lower limit value of the allowable range is entered in the control part 6. As the false twister 9 is of the belt type, the relationship between the contact pressure of the false twister 9 and the untwisting tension T is as follows.

**[0039]** When the contact pressure of the contact pressure control means increases, the untwisting tension T decreases as the yarn delivery speed becomes slower relative to the contact pressure of the belt. In reverse, if the contact pressure of the contact pressure control means decreases, the slippage between the yarn and belts increases, the delivery amount is reduced and the untwisting tension T rises.

**[0040]** The control of the contact pressure of the belts of the false twister 9 will be described with reference to Figure 5.

**[0041]** The vertical axis is the unwinding tension T and the horizontal axis is the time. The control of the contact pressure of the belts is carried out by control of the contact pressure control means by signals from the control part 6. If the value of the untwisting tension T detected by the untwisting tension detection device 1 and sent to the control part 6 increases and exceeds the upper limit  $T_u$ , a signal is sent to the contact pressure control means from the control part 6, the contact pressure between the false twister 9 and the yarn Y is increased and the contact pressure of the belts rises. Accordingly, the increased untwisting tension T starts to fall and falls below the upper limit  $T_u$ .

**[0042]** Furthermore, a signal is continuously sent to the contact pressure control means from the the control part 6 targeting the target value  $T_0$ , the contact pressure increases and the untwisting tension T decreases. In reverse, if the value of the untwisting tension T sent to the control part 6 decreases and exceeds the lower limit  $T_d$ , a signal is sent from the control part 6, the contact pressure of the contact pressure control means is lowered and the belt contact pressure drops. Accordingly, the lowered untwisting tension T starts to rise and rises above the lower limit  $T_d$ . The contact pressure of the belts is further lowered thus increasing the untwisting tension T thus targeting the target value  $T_0$ .

**[0043]** Controlling the untwisting tension T to the target value  $T_0$  is carried out by the repetition of the control of this contact pressure control means. As the untwisting tension T of the entire conjugated yarn is the sum of the

single yarns comprising the conjugated yarn, when a yarn breakage occurs, the untwisting tension becomes the sum minus the untwisting tension of the broken yarn. The target value  $T_0$ , the upper limit  $T_u$ , the lower limit  $T_d$  and the operating lower limit  $T_{min}$  are determined by the entire conjugated yarn. If a single yarn breaks, the value of the untwisting tension decreases only by the value of the untwisting tension of the broken yarn thus it is correct to judge a yarn breakage when the operating lower limit  $T_{min}$  has been exceeded.

**[0044]** For example, it is supposed that a conjugated yarn YC is comprised of two single yarns being a 150 denier yarn YA and a 75 denier yarn YB, a yarn breakage of yarn YB occurs the yarn end wraps around the shaft of the first feed rollers F1, the untwisting tension of the yarn YA is 70g and the untwisting tension of the yarn YB is 30g. The untwisting tension T of the conjugated yarn YC is 100g being the sum of the untwisting tensions of each of yarns YA and YB. Accordingly, the target value  $T_0$  is 100g. When the untwisting tension T is approximately 100g, the normal change would be  $\pm 3$  to 5g, the untwisting tension T would be kept within the target range by controlling the false twister 9 so that the upper limit  $T_u$  would be 105g and the lower limit  $T_d$  would be 95g if the change was 5g. When a yarn breakage occurs, the untwisting tension detection device 1 would then register an untwisting tension value which has a change range at around 70g instead of 100g and the range should then be from 75g to 65g. Supposing the operating lower limit  $T_{min}$  was set at 90g, a yarn breakage would be judged and the cutter 2 operated thus cutting yarns YA and YB as the untwisting tension had fallen below the operating lower limit  $T_{min}$ .

**[0045]** As can be understood from above, the detected value shown by the dotted line in Figure 5 would be obtained if the other yarn YA breaks.

**[0046]** The above described embodiment only refers to the production of a conjugated yarn but a single frame needs not only to process a conjugated yarn but also performs the false twisting of single yarn. In this kind of single yarn processing, a yarn breakage is detected based on the detection value of the untwisting tension detection device 1 thus reducing the operating efficiency of and causing unnecessary operations of the cutter 2.

**[0047]** For example, as shown in Figure 3, in the case of an untwisting tension detection device that detects the untwisting tension of one yarn by one sensor, the basic value of the untwisting tension T detected when false twist processing an especially fine yarn is low as there are only single yarns. This may then be erroneously interpreted as yarn breakage. In order to prevent this error, a doubled yarn false twisting machine may be used also in the processing of single yarns by the arrangement of a structure that engages/disengages the gearing of the cutter 2. It should be noted that a yarn breakage of this kind is detected by a electrical capacitance type yarn breakage detection device 3 similar to a conventional device.

## Claims

1. Doubled yarn false twisting machine for producing a false twist processed doubled yarn comprising a control device (6) for cutting all the yarns forming the doubled yarn when one of the yarns is broken, and an untwisting tension detector (1) that detects a decrease of the untwisting tension below a predetermined value the result of which is entered in the control device (6), and which is arranged downstream of the false twister (9).
2. Twisting machine according to claim 1, **characterized in that** the untwisting tension detector (1) is arranged between the false twister (9) and the entangling device (IL) of the twisting machine.
3. Twisting machine according to claim 1 or 2 comprising a cutter (2), a first feed roller (F1), a texturing device (H1, L2) a false twister (9), a second feed roller (F2) and the entangling device (IL), **characterized in that** the untwisting tension detector (1) is arranged between the false twister (9) and the second feed roller (F2).
4. Twisting machine according to one of the claims 1 to 3, **characterized by** a measuring device that measures the combined untwisting tension of a plurality of yarns that are doubled, and in that a yarn breakage is judged to have occurred when the combined untwisting tension drops out of an predetermined operating range.

## Patentansprüche

1. Mehrfachfaden-Falschdrahtmaschine zur Herstellung eines Falschdrahtbehandelten Mehrfachfadens, bestehend aus einer Steuervorrichtung (6) zum Schneiden aller den Mehrfachfaden bildenden Fäden, wenn einer der Fäden gebrochen ist, und einem Aufdrehspannungsdetektor (1), der eine Abnahme der Aufdrehspannung unter einen vorbestimmten Wert ermittelt, dessen Ergebnis in die Steuervorrichtung (6) eingegeben wird und der stromabwärts der Falschdrahtvorrichtung (9) angeordnet ist.
2. Falschdrahtvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** der Aufdrehspannungsdetektor (1) zwischen der Falschdrahtvorrichtung (9) und der Verschlingungsvorrichtung (IL) der Falschdrahtmaschine angeordnet ist.

3. Falschdrahtmaschine nach Anspruch 1 oder 2, aufweisend eine Schneidvorrichtung (2), eine erste Zuführrolle (F1), eine Texturiervorrichtung (H1, L2) einer Falschdrahtvorrichtung (9), eine zweite Zuführrolle (F2) und die Verschlingungsvorrichtung (IL) **dadurch gekennzeichnet, daß** der Aufdrehspeisedetektor (1) zwischen der Falschdrahtvorrichtung (9) und der zweiten Zuführrolle (F2) angeordnet ist.
4. Falschdrahtvorrichtung nach einem der Ansprüche 1 bis 3, **gekennzeichnet durch** eine Meßvorrichtung, die die kombinierte Aufdrehspeise mehrerer Fäden, die dubliert werden, mißt, und daß ein Fadenbruch als aufgetreten beurteilt wird, wenn die kombinierte Aufdrehspeise aus einem vorbestimmten Arbeitsbereich fällt.

5

10

15

20

### Revendications

1. Machine à conférer une fausse torsion à un retors pour produire un retors traité à fausse torsion comprenant un dispositif de commande (6) pour couper tous les fils formant le retors lorsque l'un des fils est cassé, et un détecteur de tension de détorsion (1) qui détecte une diminution de la tension de détorsion en dessous d'une valeur prédéterminée, dont le résultat est entré dans le dispositif de commande (6) et qui est agencé en aval du dispositif de fausse torsion (9).
2. Retordeuse selon la revendication 1, **caractérisée en ce que** le détecteur de tension de détorsion (1) est disposé entre le dispositif de fausse torsion (9) et le dispositif d'entrelacement (IL) de la retordeuse.
3. Retordeuse selon la revendication 1 ou 2, comprenant un dispositif de coupe (2), un premier rouleau d'amenée (F1), un dispositif à texturer (H1, L2), un dispositif de fausse torsion (9), un deuxième rouleau d'amenée (F2) et le dispositif d'entrelacement (IL), **caractérisée en ce que** le détecteur de tension de détordage (1) est agencé entre le dispositif de fausse torsion (9) et le deuxième rouleau d'amenée (F2).
4. Retordeuse selon l'une des revendications 1 à 3, **caractérisé par** un dispositif de mesure qui mesure la tension de détorsion combinée de plusieurs fils qui sont doublés, et en ce que la survenue d'une rupture de fils est supposée lorsque la tension de détordage combinée sort d'une plage de fonctionnement prédéterminée.

25

30

35

40

45

50

55

FIG. 1

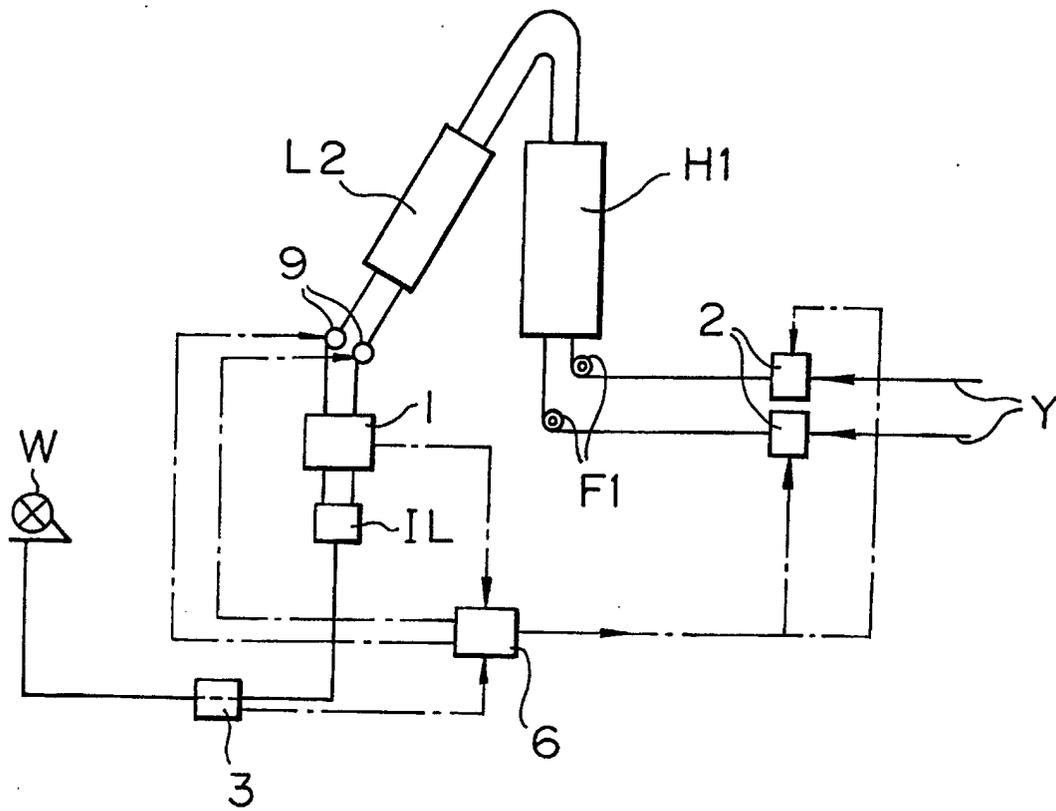


FIG. 2

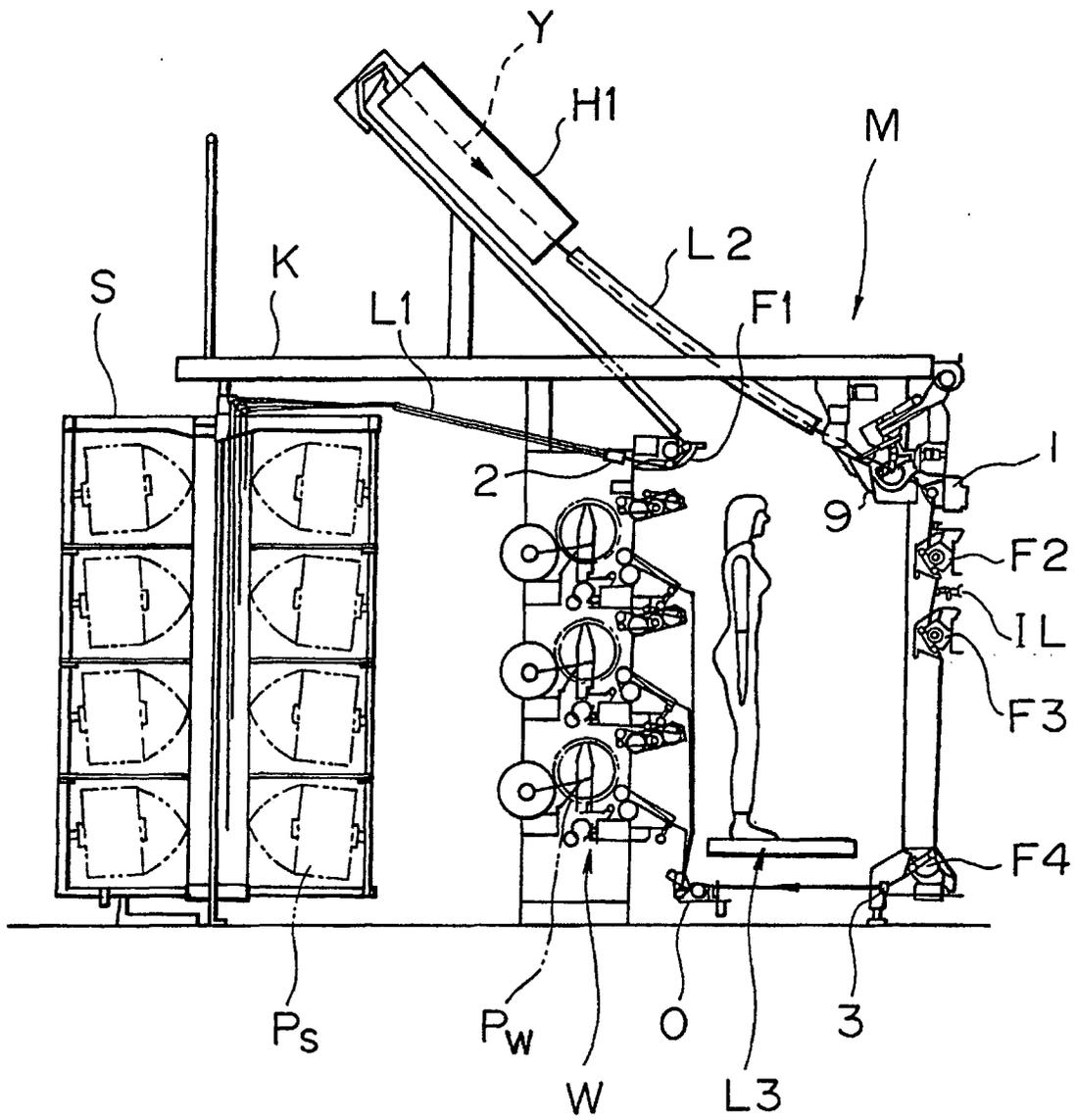


FIG. 3

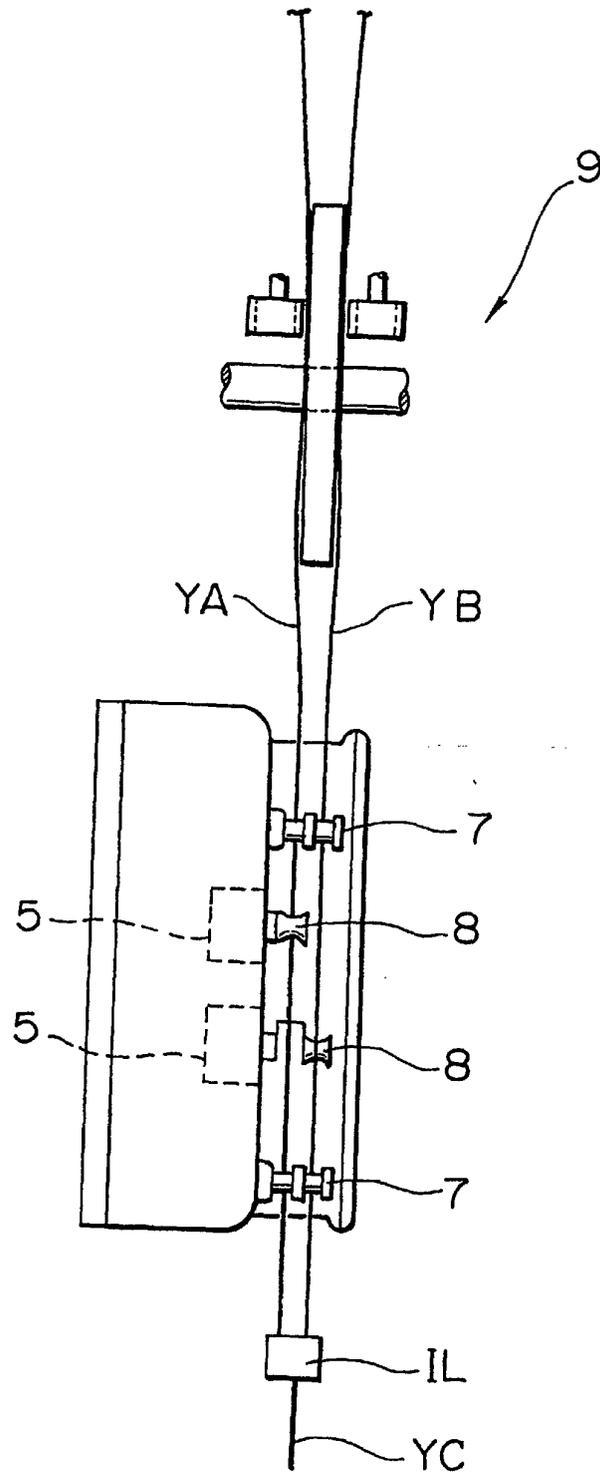


FIG. 4

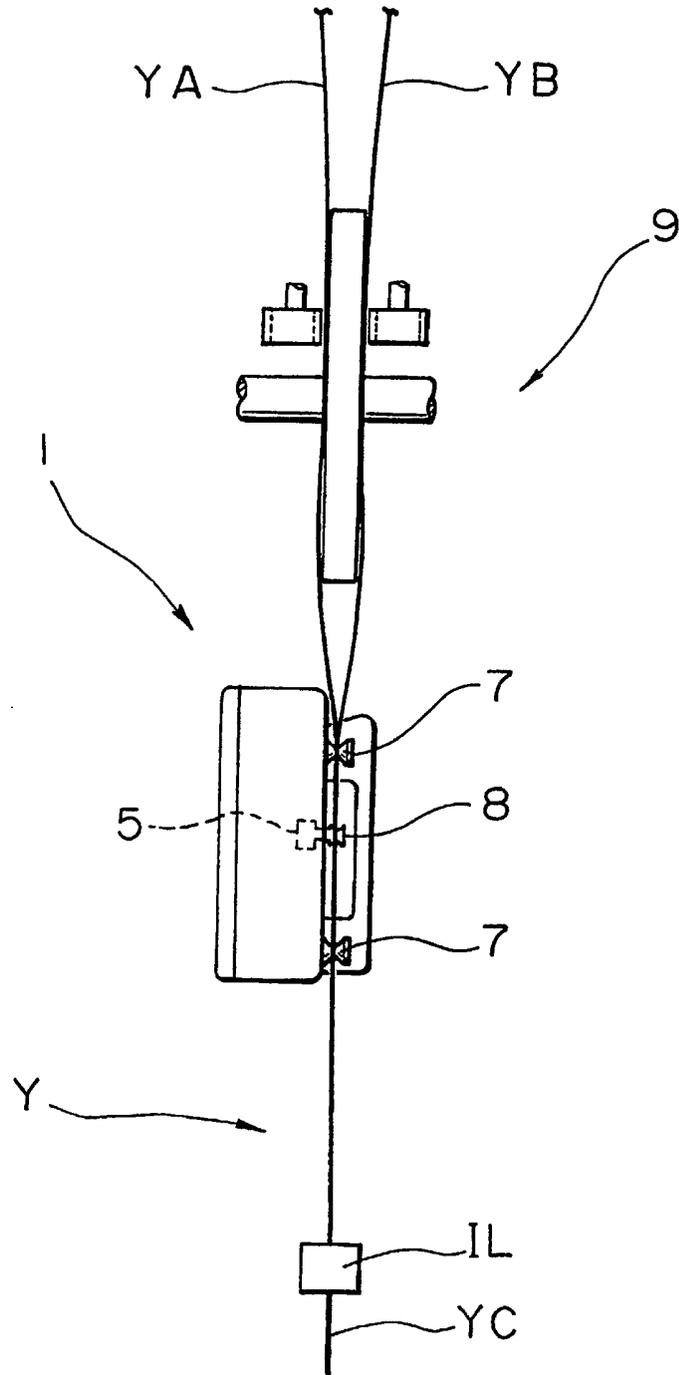


FIG. 5

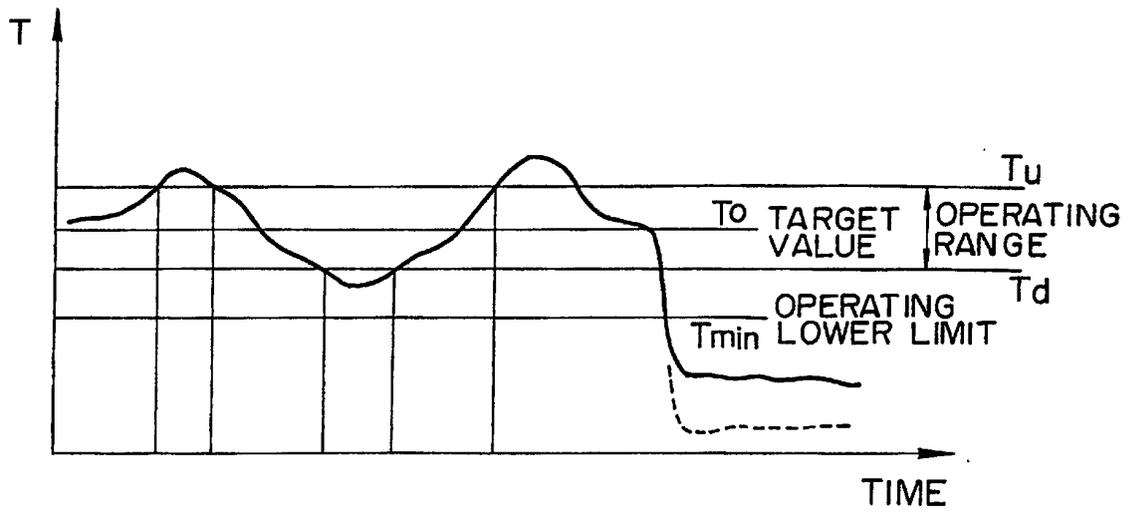


FIG. 6

