

(12)

EUROPEAN PATENT APPLICATION

(43)

Date of publication:

28.05.2003 Bulletin 2003/22

(51)

Int Cl.7:

D01H 13/14, D01H 13/18

(21)

Application number:

02026321.6

(22)

Date of filing:

21.11.2002

(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR Designated Extension States: AL LT LV MK RO SI	(72) Inventors: - Fujii, Yoshimasa, Kabushiki Kaisha Kariya-shi, Aichi-ken (JP) - Shinozaki, Yutaka, Kabushiki Kaisha Kariya-shi, Aichi-ken (JP) - Niimi, Kiwamu, Kabushiki Kaisha Kariya-shi, Aichi-ken (JP)
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(54)

Abnormality detecting method and device for the control of the drafting device of a spinning machine

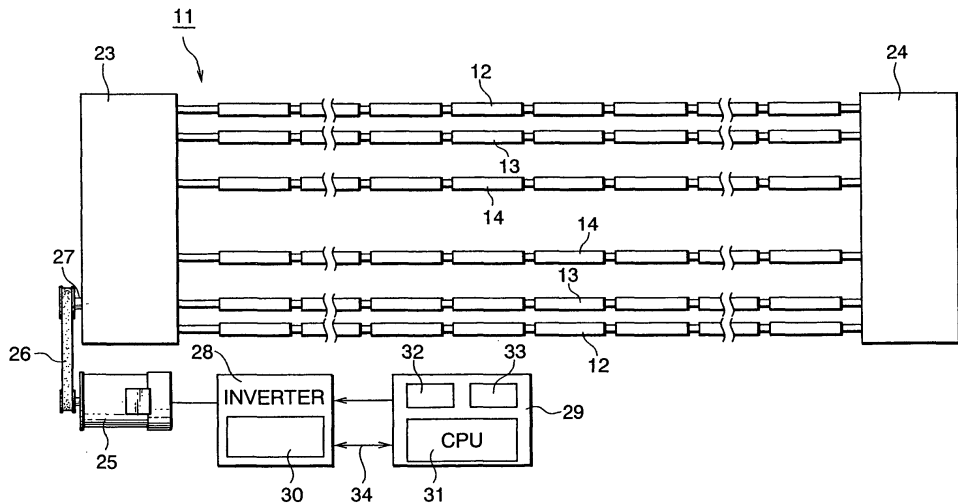
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A drafting device 11 is driven by a driving motor 25 separately from the lifting driving system and the spindle driving system. Bottom rollers 12 through 14 are driven by the driving motor 25. The driving motor 25 is connected to an inverter 28, and undergoes speed change control by a machine base control device 29 through the inverter 28. To rotate the driving motor 25 at a predetermined RPM, the inverter 28 outputs an electric current corresponding to the load. The inverter 28 is equipped with a motor electric current detecting

circuit 30 for detecting the amount of electric current supplied to the driving motor 25.

In a condition in which the acceleration or speed of the drafting rollers is fixed, a CPU 31 makes a judgment, on the basis of a detection signal from the motor electric current detecting circuit 30, as to whether the amount of electric current supplied has varied to a degree not less than a predetermined ratio, outputting an abnormality signal when the amount of electric current supplied has varied to a degree not less than the predetermined ratio.

FIG.1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an abnormality detecting method and an abnormality detecting device for the drafting device of a spinning machine and to a control device for a spinning machine and, more specifically, to an abnormality detecting method and an abnormality detecting device for the drafting device of a spinning machine in which the driving of the lifting driving system and the spindle driving system is effected by a motor separate from the one for the driving of the drafting part driving system and to a control device for such a spinning machine.

Description of the Related Art

[0002] In a ring spinning frame, roving supplied from a roving bobbin is drafted by a drafting device and sent out from a front roller before it is taken up by a bobbin rotating integrally with the spindle by way of a snail wire, an anti-node ring, and a traveler traveling on the ring.

[0003] Generally speaking, a drafting device is of a three line type consisting of front, middle, and back rollers in which front bottom, middle bottom, and back bottom rollers are driven by a single motor. Apart from this, there are a device in which, to facilitate the changing of draft ratio, the front bottom roller and the back bottom roller are driven by separate motors, and a device in which, as a result of an increase in the number of spindles, the length of the machine base is large and motors are provided at both ends of the machine base, the bottom roller being driven from both sides of the machine base.

[0004] In a roller drafting device of this type, for some reason, the supplied material can form wind around the drafting roller or the apron can get caught by the drafting roller. In such a case, if the driving is continued, there is the danger of the parts of the drafting device being damaged.

[0005] When winding of the supplied material around the drafting roller is generated, an excessive load is applied to the motor, and an over-current flows through the motor, resulting in temperature rise. Conventionally, this over-current or the increase in the motor temperature to a level not lower than a predetermined temperature is detected to stop the operation of the machine base, thereby preventing breakage of the parts.

[0006] However, in the conventional devices, the value of the over-current or the value of the motor temperature rise serving as the reference value for stopping the driving of the motor, that is, for stopping the operation of the machine base, is set to a level that will not cause damage to the motor. Thus, even when the drafting device is under an overload condition, the driving of

the motor is continued as long as the motor is not under an overload condition, which means there is the danger of the parts of the drafting device being damaged. Such a state is caused, for example, when the same motor is mounted on machine bases of different specifications and, depending on the machine base specifications, the load of the drafting device under an overload condition is smaller than the allowable load of the motor.

[0007] In an apparatus in which a large number of spinning portions are provided on the machine base as in the case of a spinning frame or a roving machine, providing a sensor for detecting winding of fiber around the drafting roller for each spindle leads to a rather high cost. It might be possible to arrange a photoelectric sensor such that its optical axis is parallel to the drafting roller, with the sensor being shared by a plurality of spindles. Even then, however, it would be difficult to accurately detect winding before overload is caused. Further, there is a problem that the possibility of erroneous detection due to lint or the like would be higher.

SUMMARY OF THE INVENTION

[0008] The present invention has been made in view of the above problem in the prior art. It is a first object of the present invention to provide an abnormality detecting method and an abnormality detecting device for the drafting device of a spinning machine which make it possible, with a simple construction, to detect that the drafting device is under an overload condition within the allowable load range of the driving motor of the drafting device. A second object of the present invention is to provide a control device for a spinning machine capable of preventing the operation of the spinning machine from being continued, with the drafting device being in an abnormal state.

[0009] To achieve the first object, this invention provides an abnormality detecting method for a drafting device of a spinning machine in which separate motors are used for the driving of the lifting driving system and the spindle driving system and for the driving of the drafting part driving system. In a condition in which the acceleration or the speed of the drafting roller is fixed, monitoring is effected to see whether there is any variation in the load torque applied to the driving motor for driving the drafting roller. When the load torque varies to a degree not less than a predetermined ratio, it is determined that there is an abnormality.

[0010] In this invention, monitoring is effected to see whether there is any variation in the load torque applied to the driving motor for driving the drafting roller, and when the load torque has varied to a degree not less than a predetermined ratio, it is determined that there is an abnormality. The amount of electric current supplied to the driving motor is in proportion to the magnitude of the load torque. Since the load torque of the drafting roller remains constant unless the spinning conditions (spinning material and drafting ratio) are changed, a

fixed amount of electric current is supplied to the driving motor in a fixed acceleration range and a constant speed range as long as the normal state is maintained. Strictly speaking, the thickness of the supplied material, such as roving or sliver, is not uniform, and the number and length of the short fiber comprising the roving or sliver are not uniform either, meaning that the load torque of the drafting roller fluctuates slightly. Therefore, in the case of a variation to a degree not less than the fluctuation ratio attribute to non-uniformity of thickness, etc. of the supplied material, it is determined that there is an abnormality. Thus, without using a sensor for detecting winding of roving or sliver around the drafting roller, it is possible, with a simple construction, to detect that the drafting device is in an overload condition within the allowable load range of the driving motor of the drafting device.

[0011] It is also possible to detect variation in the load torque from variation in the value of the electric current supplied to the driving motor. In this invention, the amount of electric current supplied to the driving motor is in proportion to the magnitude of the load torque applied to the driving motor. Thus, it is possible to detect whether there is any abnormality from variation in the electric current amount.

[0012] It is also possible to detect whether there is any variation in the load torque from variation in the torque of the rotating portion from the side end portion of the driving motor for the drafting roller to the output shaft of the driving motor. In this invention, the load torque is directly detected. Further, since the detection is effected on the rotating portion from the side end portion of the driving motor for the drafting roller to the output shaft of the driving motor, it is possible to reliably detect whether the drafting roller is in an overload condition.

[0013] Further, this invention provides an abnormality detecting device for the drafting device of a spinning machine in which the motor for driving the lifting driving system and the spindle driving system is different from the motor for driving the drafting part driving system. The abnormality detecting device comprises electric current amount detecting means for detecting the amount of electric current supplied to the driving motor for driving the drafting roller, and judgment means which, in a state in which the acceleration or speed of the drafting roller is fixed, makes a judgment as to whether the amount of the supply electric current has varied to a degree not less than a predetermined ratio on the basis of a detection signal from the electric current amount detecting means and which outputs an abnormality signal when the amount of the supply electric current has varied to a degree not less than the predetermined ratio.

[0014] In this invention, the amount of electric current supplied to the driving motor for driving the drafting roller is detected by the electric current amount detecting means. The judgment means makes a judgment, in a condition in which the acceleration or speed of the drafting roller is fixed, as to whether the supply electric cur-

rent amount has varied to a degree not less than a predetermined ratio on the basis of a detection signal from the electric current amount detecting means. When the supply electric current amount has varied to a degree not less than the predetermined ratio, an abnormality signal is output.

[0015] Further, this invention provides a control device for a spinning machine in which the lifting driving system and the spindle driving system are driven by a motor which is different from the motor for driving the drafting part driving system. Monitoring is effected to see whether there is any change in the load torque applied to the driving motor for driving the drafting roller; when an abnormality signal is output from an abnormality detecting device which determines that there is an abnormality when the load torque has varied to a degree not less than a predetermined ratio, control is effected to stop the operation of the spinning machine. In this invention, when an abnormality in the drafting device is detected, the operation of the spinning machine is stopped, so that it is possible to reliably prevent the operation from being continued under an overload condition to cause damage to the parts. Further, it is also possible to perform control to stop the operation of the spinning machine when an abnormality signal is output from the abnormality detecting device continuously for a predetermined period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] In the accompanying drawings:

Fig. 1 is a schematic diagram showing the construction of a drafting device according to an embodiment;

Fig. 2(a) is a graph showing change with passage of time in load torque (motor current) in the normal state, and Fig. 2(b) is a graph showing change with passage of time in the RPM of a driving motor;

Fig. 3(a) is a graph showing change with passage of time in load torque (motor current) in an abnormal state, and Fig. 3(b) is a graph showing change with passage of time in the RPM of a driving motor; and Fig. 4 is a schematic side sectional view of a drafting device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] In the following, an embodiment of the present invention applied to the drafting device of a spinning frame will be described with reference to Figs. 1 through 4. Fig. 1 is a schematic plan view of a drafting device, and Fig. 4 is a schematic side sectional view of the drafting device.

[0018] As shown in Fig. 4, a drafting device 11 is of a three-line type construction equipped with a front bottom roller 12 serving as the drafting roller, a middle bottom roller 13, and a back bottom roller 14. The front bottom

roller 12 is supported at a predetermined position with respect to a roller stand (not shown), and the middle and back bottom rollers 13 and 14 are supported through the intermediation of a support bracket (not shown) fixed such that positional adjustment can be effected in the longitudinal direction with respect to the roller stand. A bottom apron 15 is wrapped around a bottom tensor 16, a tensioner 17, and the middle bottom roller 13.

[0019] A front top roller 19, a middle top roller 20, and a back top roller 21 are supported by a weighting arm 18 at positions respectively corresponding to the front bottom roller 12, the middle bottom roller 13, and the back bottom roller 14 through the intermediation of a top roller support member 22. An apron 22a is wrapped around the middle top roller 20. Each of the top rollers 19 through 21 is supported as a pair consisting of two spindles.

[0020] The weighting arm 18 is equipped with a lever 18a rotatable between a pressurizing position and a rotating position. In the condition in which the lever 18a is at the pressurizing position shown in Fig. 4, the lever being in contact with a frame 18b of the weighting arm 18; a lock state is maintained in which the top rollers 19 through 21 supported by the weighting arm 18 are at pressurizing positions (spinning positions), the top rollers being pressurized against the bottom rollers 12, 13, and 14 side. In the condition in which the lever 18a has been rotated upward to the releasing position from the position shown in Fig. 4, the lock state is canceled.

[0021] While the drafting device 11 is provided symmetrically with respect to the machine base of the spinning machine, only one side thereof is shown in Fig. 4.

[0022] As shown in Fig. 1, the bottom rollers 12 through 14 forming the drafting device 11 are arranged between gear boxes 23 and 24 so as to be parallel to each other. The driving side gear box 23 contains a gear row (driving gearing) (not shown) for transmitting to the bottom rollers 12 through 14 on the right and left sides (on the upper and lower sides in Fig. 1) the rotation of a driving shaft 27 to which the rotation of a driving motor 25 is transmitted through a belt transmission mechanism 26. Further, contained in the driven side gear box 24 is a gear row (not shown) for connecting together the front bottom roller 12 and the middle bottom roller 13 on the left hand side and the front bottom roller 12 and the middle bottom roller 13 on the right hand side. The driven side of the two back bottom rollers 14 is simply supported by a bearing and is not connected to the gear row.

[0023] The driving motor 25 is connected to an inverter 28, through which it undergoes speed change control by a machine base control device 29. The inverter 28 inputs a direct current obtained by converting commercial power by an AC/DC converter (not shown) to the driving motor 25 to rotate the driving motor 25 at a predetermined RPM, so that an electric current corresponding to the load is output. The inverter 28 is equipped with a motor current detecting circuit 30 as the electric current amount detecting means for detecting the amount

of electric current supplied to the driving motor 25.

[0024] The machine base control device 29 is equipped with a CPU 31, a ROM 32, a RAM 33, an input device, and an input/output interface (not shown). The machine base control device 29 is connected to the inverter 28 through a communication line 34. The communication line 34 is constructed so as to allow serial communication using a serial interface.

[0025] In the condition in which the acceleration or the speed of the drafting roller is fixed, the CPU 31 makes a judgment, on the basis of a detection signal from the motor current detecting circuit 30, as to whether the supply electric current amount has varied to a degree not less than a predetermined ratio or not and, at the same time, constitutes judgment means for outputting an abnormality signal when the supply electric current amount has varied to a degree not less than a predetermined ratio. Thus, in this embodiment, an abnormality detecting device for the drafting device 11 is formed by the motor current detecting circuit 30 and the CPU 31. Note that the expression: "variation to a degree not less than a predetermined ratio" refers to a variation beyond the ratio of fluctuation attributable to non-uniformity of thickness, etc. of the supplied material (roving).

[0026] Further, the CPU 31 also controls a motor (not shown) for driving the lifting driving system and the spindle driving system, functioning also as a control device for the spinning machine. When the above-mentioned abnormality signal is output, the CPU 31 performs control so as to stop the operation of the spinning machine. Thus, the CPU 31 constitutes a control device which stops the operation of the spinning machine when an abnormality detection signal is output from the abnormality detecting device for the drafting device 11.

[0027] The ROM 32 stores program data and various items of data necessary for the execution thereof. The program data includes various fiber materials, spinning conditions, such as count of spinning yarn and number of twist, spindle rotating speed during normal operation, correspondence data regarding the rotating speeds of the motors for the draft driving system and the lifting driving system, a map indicating the relationship between RPM and supply electric current amount at various winding amounts, etc. The RAM 33 temporarily stores data input from the input device, results of computation processing in the CPU 31, etc. The input device is used to input spinning condition data, such as spinning yarn count, fiber type (material), maximum spindle RPM during spinning operation, spinning length, lift length, chase length, and the length of the bobbin used.

[0028] Next, the operation of the device, constructed as described above, will be illustrated. Prior to the operation of the spinning frame, the spinning conditions, such as fiber material, spinning yarn count, and number of twist, are input to the machine base control device 29 by the input device. When the operation of the spinning frame is started, the driving motor 25 is rotated and controlled through the inverter 28 in correspondence with

the spinning conditions on the basis of a command from the machine base control device 29. Further, the driving motor for the spindle driving system and the lifting system is also controlled such that it attains a predetermined rotating speed.

[0029] As shown in Fig. 4, when the spinning frame is operated, roving R runs from the back rollers 14 and 21 of the drafting device 11 and passes between the front rollers 12 and 19 to be thereby drafted, and is then taken up in a take-up portion (not shown) by a bobbin rotated integrally with the spindle.

[0030] As shown in Fig. 1, the motor current value detected by the motor current detecting circuit 30 is input to the machine base control device 29 through the communication line 34. The CPU 31 constantly monitors the current value thereof. Then, it makes a judgment as to whether the current value has varied to a degree not less than a predetermined ratio; when the current value has varied to a degree not less than the predetermined ratio, it determines that there is an abnormality, and outputs an abnormality signal. On the basis of this abnormality signal, the control for stopping the operation of the machine base is executed, and informing means, such as a buzzer or an alarm lamp, is driven to inform the operator of the abnormality.

[0031] Fig. 2 is a graph showing change with passage of time in the RPM and torque (motor current) of the driving motor 25 in the condition in which the drafting device 11 is being driven in the normal manner, and Fig. 3 is a graph showing change with passage of time in the RPM and torque (motor current) of the driving motor 25 in the case in which an abnormality has occurred in the drafting device 11. In the period as shown in Figs. 2 and 3, the taking-up speed of the spinning frame has not reached the maximum rotating speed.

[0032] The amount of electric current supplied to the driving motor 25 is in proportion to the magnitude of the load torque. Further, the load torque of the drafting roller is fixed unless the spinning material and the drafting ratio are changed. The drafting device is driven by the driving motor 25 independently of the spindle driving system and the lifting driving system. Thus, as shown in Fig. 2, when the drafting device 11 is normal, the motor current is fixed when the rotating speed varies at a fixed ratio, that is, when the acceleration is fixed. Also when the rotating speed is fixed, the motor current is fixed. However, when the load torque applied to the drafting roller increases as a result of the roving being wound around the drafting roller or the apron getting caught, the value of the motor current supplied to the driving motor 25 increases as shown in Fig. 3. Thus, even when the driving motor 25 is not in an overload condition, an abnormality in the load of the drafting roller is detected.

[0033] This embodiment provides the following advantages:

- (1) In the condition in which the acceleration or the speed of the drafting roller is fixed, monitoring is ef-

fected to see whether there is any change in the load torque applied to the driving motor 25 driving the drafting roller, and when the load torque has varied to a degree not less than a predetermined ratio, it is determined that there is an abnormality. Thus, without using a sensor for directly detecting winding of roving around the drafting roller, it is possible, with a simple construction, to detect that the drafting device 11 is in an overload condition within the allowable load range of the driving motor 25 for the drafting device 11. As a result, it is possible to prevent the parts of the drafting device 11 from being damaged.

(2) Any change in the load torque applied to the driving motor 25 is detected from a change in the value of the current supplied to the driving motor 25. Thus, as compared with the construction in which change in the torque of the drafting roller is directly detected, the construction of the detecting means is simplified.

(3) When an abnormality detection signal is output from the abnormality detecting device, the machine base control device 29 performs control so as to stop the operation of the spinning machine. Thus, it is possible to reliably prevent the operation of the drafting device 11 from being continued under an overload condition to cause damage to the parts.

(4) The judgment as to whether there is any abnormality is made by the machine base control device 29, so that it is possible at the time of judgment to easily obtain information as to whether the driving motor 25 is driving the drafting roller either at a fixed acceleration or at a fixed speed or not. Thus, the construction is simplified as compared with the case in which the judgment means is provided on the inverter 28 side.

[0034] The above embodiment should not be construed restrictively; for example, the following modifications are also possible.

[0035] It is also possible to provide, instead of the electric current detecting means, torque detecting means for detecting changes in the torque of the rotating portion between the output shaft of the driving motor 25 and the side end portion of the driving motor for the drafting roller as the detecting means for detecting the load torque applied to the driving motor 25. As the torque detecting means, a torque converter, for example, is used. The torque converter converts torque into an electric signal (e.g., voltage). Further, it is also possible to attach a distortion gauge to the end portion of the drafting roller on the driving motor 25 side. In these constructions, it is possible to directly detect the load torque. In addition, since the detection is performed on the rotating portion from the driving motor side end portion of the drafting roller to the output shaft of the driving motor 25, it is possible to reliably detect the load of the drafting roller.

[0036] It is also possible to provide the inverter 28 with

judgment means which performs monitoring to see whether there is any change in the load torque applied to the driving motor 25 and which determines that there is an abnormality when the load torque has varied to a degree not less than a predetermined ratio.

[0037] Instead of the construction in which the electric current value is directly detected, it is also possible to use a sensor for detecting a voltage corresponding to the electric current value as the electric current amount detecting means for detecting the amount of electric current supplied to the driving motor 25.

[0038] Instead of the construction in which all the drafting rollers are driven by a single driving motor 25, a construction may be adopted in which the front bottom roller 12 is driven by a single driving motor and in which the middle bottom roller 13 and the back bottom roller 14 are driven by another single driving motor. Then, the load torques applied to the driving motors are separately detected to make a judgment as to whether the device is under an overload condition or not. In this case, the changing of the drafting ratio is facilitated.

[0039] The arrangement in which a reference value for determining that there is an abnormality when the load torque applied to the driving motor 25 has varied to a degree not less than a predetermined ratio is previously stored as data in the ROM 32, etc. of the machine base control device 29 may be adopted but should not be construed restrictively. It is also possible to adopt an arrangement in which an arbitrary value can be set as the reference value by the input device, etc.

[0040] The reference value is not necessarily a spinning condition; it may also be a fixed value. In this case, instead of using the CPU, it is also possible to use a comparator to make a judgment as to whether the value of the electric current supplied to the driving motor 25 has attained a predetermined value at which it is determined there is an abnormality. Further, it is also possible to compare the voltage value or the current value which is the output signal of the torque converter with a reference value to make a judgment as to whether there is any abnormality.

[0041] Instead of the arrangement in which when an abnormality detection signal is output from the abnormality detecting device, the operation of the spinning machine is immediately stopped by the machine base control device 29, it is also possible to perform control such that the operation of the spinning machine is stopped when the abnormality detection signal has continued for a predetermined period of time. In this case, when the abnormality in the load torque is of a transient nature, there is no need to stop and re-start the machine base.

[0042] The drafting device 11 is not restricted to the three-line type one. It may also be a device having four or more drafting rollers on one side.

[0043] The arrangement in which the bottom rollers 12 through 14 are driven by the driving motor 25 from one side of the machine base should not be construed

restrictively; it is also possible to adopt an arrangement in which they are driven from both sides of the machine base.

[0044] The present invention is applicable not only to a ring spinning frame but also to other types of spinning machines equipped with a drafting device, such as a ring spinning frame, a roving machine or the like, in which fine spinning thread is directly spun by drafting sliver omitting the roving stage.

[0045] It is also possible for the abnormality detecting device to have, as the electric current detecting means for detecting the amount of electric current supplied to the driving motor for driving the drafting roller, judgment means which, in the condition in which the acceleration or the speed of the drafting roller remains constant, makes a judgment as to whether the supply electric current amount has varied to a degree not less than a predetermined ratio on the basis of a detection signal from the electric current amount detecting means and which outputs an abnormality signal when the supply electric current amount has varied to a degree not less than the predetermined ratio.

Claims

1. An abnormality detecting method for a drafting device of a spinning machine in which different motors are used for the driving of a lifting driving system and a spindle driving system and for the driving of a drafting part driving system,

characterized in that monitoring is effected to see whether there is any change in a load torque applied to a driving motor (25) for driving drafting rollers (12, 13, 14) in a condition in which the acceleration or speed of the drafting rollers (12, 13, 14) is fixed, and that a determination is made that there is an abnormality when the load torque has varied to a degree not less than a predetermined ratio.

2. An abnormality detecting method for a drafting device of a spinning machine according to Claim 1, **characterized in that** any change in the load torque is detected from a change in the value of electric current supplied to the driving motor (25).

3. An abnormality detecting method for a drafting device of a spinning machine according to Claim 1, **characterized in that** any change in the load torque is detected from a change in the torque of a rotating portion from the driving motor side end portion of the drafting rollers (12, 13, 14) to an output shaft of the driving motor (25).

4. An abnormality detecting device for a drafting device of a spinning machine in which different motors are used for the driving of a lifting driving system and a spindle driving system and for the driving of

a drafting part driving system, **characterized by** comprising:

electric current amount detecting means (30) 5
for detecting the amount of electric current supplied to a driving motor (25) for driving drafting rollers (12, 13, 14); and judgment means (31) 10
which makes a judgment, on the basis of a detection signal from the electric current amount detecting means (30), as to whether the amount of electric current supplied has varied to a degree not less than a predetermined ratio in a condition in which the acceleration or speed of the drafting rollers (12, 13, 14) is fixed and 15
which outputs an abnormality signal when the amount of electric current supplied has varied to a degree not less than the predetermined ratio.

5. A control device for a spinning machine in which different motors are used for the driving of a lifting driving system and a spindle driving system and for the driving of a drafting part driving system, 20

characterized in that monitoring is effected to see whether there is any change in a load torque applied to a driving motor (25) for driving drafting rollers (12, 13, 14), and that control is performed so as to stop the operation of the spinning machine when an abnormality detection signal is output from an abnormality detecting device (30, 31) which determines that there is an abnormality when the load torque has varied to a degree not less than a predetermined ratio. 25 30

6. A control device for a spinning machine according to Claim 5, **characterized in that** control is performed so as to stop the operation of the spinning machine when the abnormality detection signal from the abnormality detecting device (30, 31) has continued for a predetermined period of time. 35 40

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FIG.1

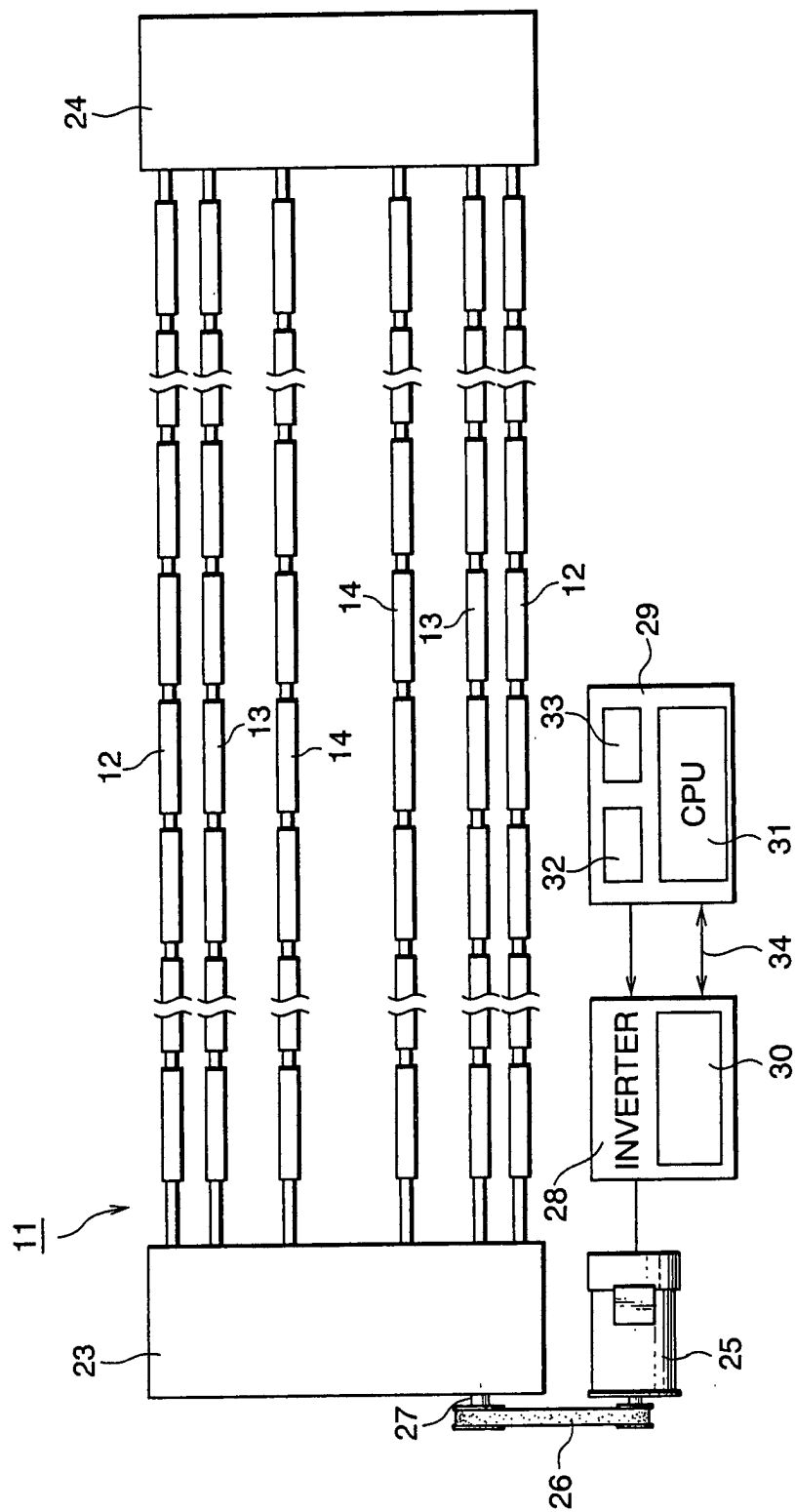


FIG.2

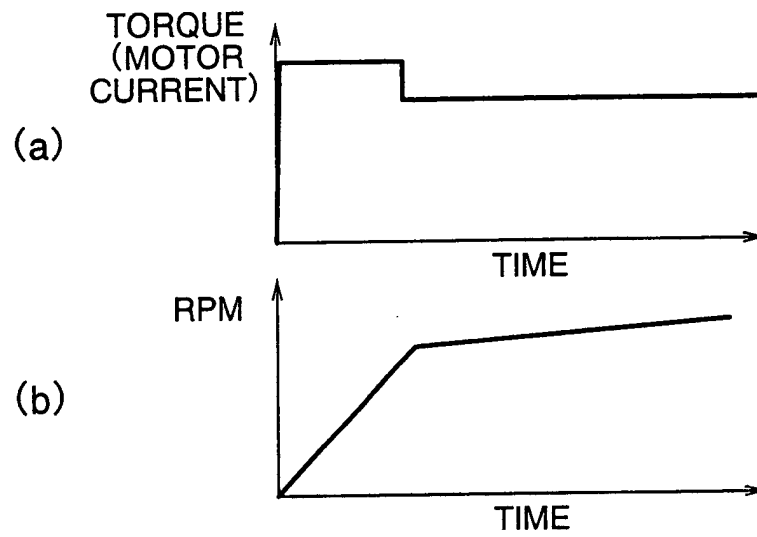


FIG.3

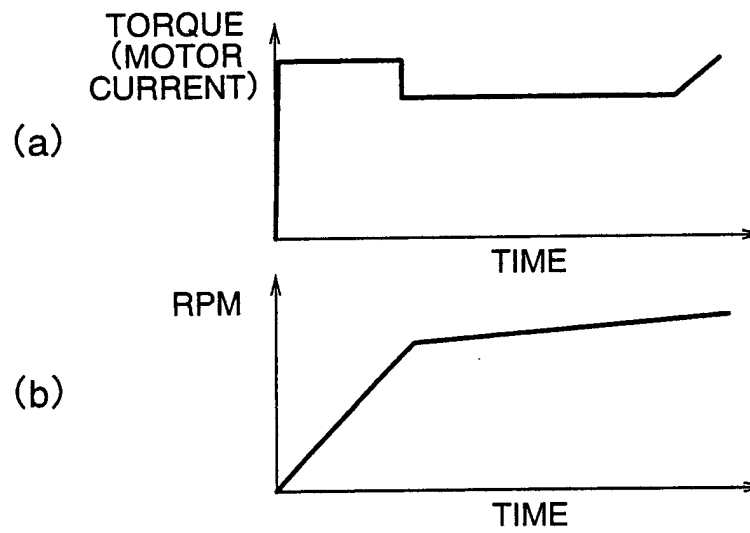
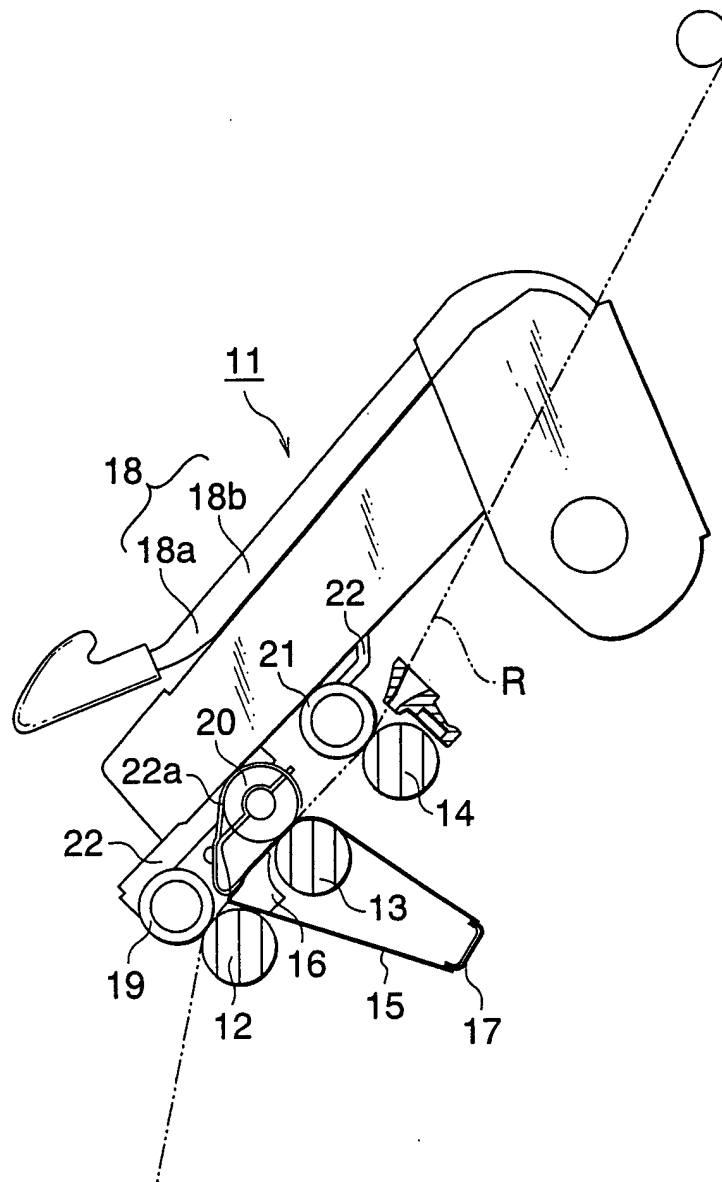


FIG.4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 02 6321

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.7)
X	US 4 646 391 A (WOLF HORST) 3 March 1987 (1987-03-03) * column 1, line 33-42 * * column 1, line 64 - column 2, line 55 * * column 4, line 61 - column 5, line 50; figure 1 * ---	1-6	D01H13/14 D01H13/18
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 4 February 2003	Examiner Dreyer, C
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 02 6321

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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