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F. B. BAILEY

2,930,179

CONTROL SYSTEM FOR TEXTILE MACHINES

Filed Nov. 3, 1958

2 Sheets-Sheet 1

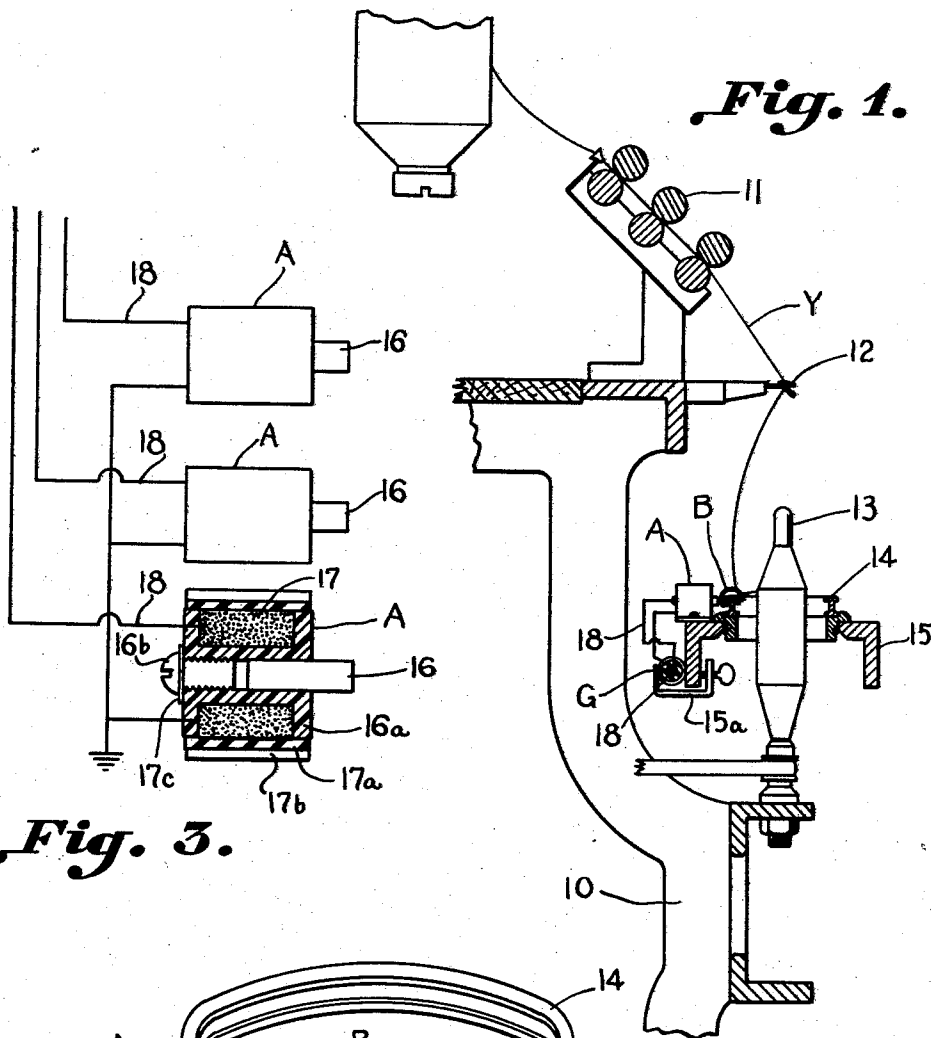


Fig. 3.

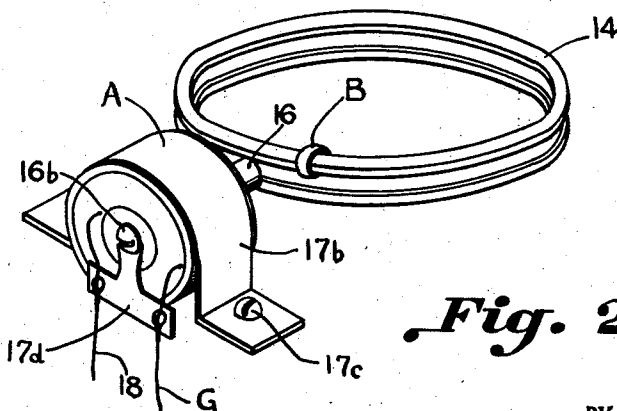


Fig. 2.

INVENTOR.
FELTON B. BAILEY
BY 
ATTORNEY

March 29, 1960

F. B. BAILEY

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2 Sheets-Sheet 2

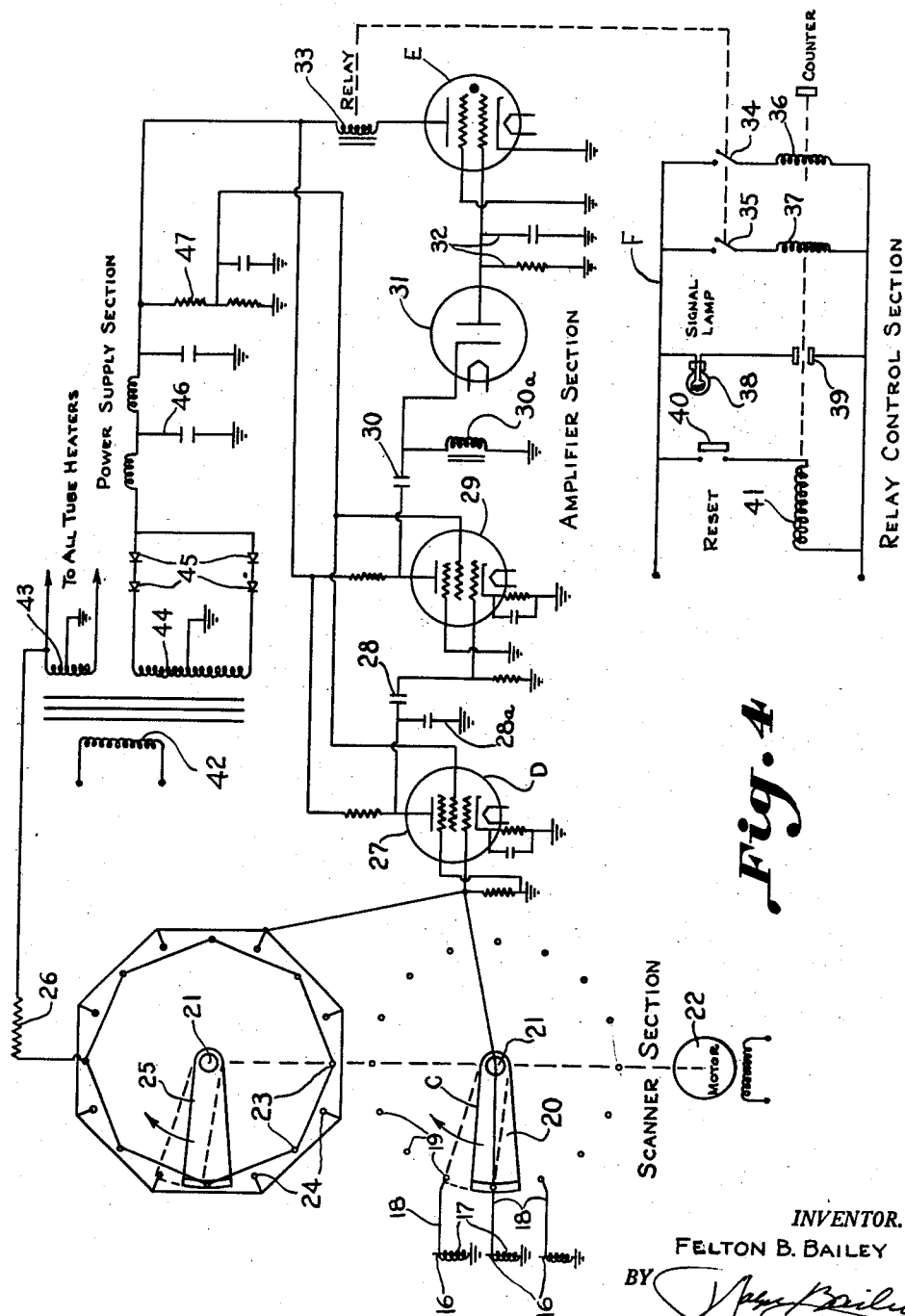


Fig. 4

INVENTOR.
FELTON B. BAILEY
BY *F. B. Bailey*
ATTORNEY

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CONTROL SYSTEM FOR TEXTILE MACHINES

Felton B. Bailey, Greenville, S.C., assignor to Adams, Inc., Greenville, S.C., a corporation of South Carolina

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9 Claims. (Cl. 57—75)

This invention relates to an improved control system for a textile machine, having a plurality of strand controlling devices, which utilizes electrical sensing means positioned adjacent each strand sensing slack or broken strands by establishing a differential in output when such condition occurs.

More specifically this is an improvement in the control system illustrated in the application of Adams et al., Serial No. 753,897, filed August 8, 1958, entitled Ring Frame Control Device, in which the action of the traveler upon breakage or excessive slackness of the yarn is utilized to actuate a signaling device and the like. The control device shown in this prior application is not applicable to ring frames and the like having standard rings unless the ring structure is considerably altered or new rings embodying the teachings of the invention are installed. The embodiment of the invention shown in the prior application is subject to a further limitation in that electrical contacts must be made which might be prevented should a ring or traveler become clogged with lint or otherwise obstructed. In the event the traveler became broken no contact would be made and since the system must be operated at low voltage it must be very sensitive and a false indication may be made when no end is faulty.

Accordingly, it is an object of this invention to provide an improved control system for a textile machine having a ring and a traveler for sensing slack ends and ends down responsive to the action of the traveler upon the occurrence of such a condition.

An important object of this invention is the provision of an improved ends down and slack ends indicator in which a magnetic coil pick-up and the like is positioned closely adjacent the traveler so as to establish a voltage during normal operation of the machine and in which sensing means is actuated by the lessening or absence of such voltage when the traveler slows down or stops resulting from a slack end or a broken end.

Another important object of the invention is to provide an improved control system for a textile machine in which electrical sensing means are positioned adjacent each strand and in which scanning means are provided to monitor individual strands.

Another object of this invention is the provision of an improved sensing circuit for indicating or signaling ends down or slack ends.

Another object of this invention is to provide a versatile control system for indicating ends down or slack ends which includes a variety of indicators such as a counting mechanism for indicating the total time ends are down and a visible signaling device.

Another object of this invention is to provide a sensing device for indicating ends down and slack ends which operates at an exceedingly low voltage established by the action of the traveler and a sensing circuit capable of positively and effectively utilizing such small voltage for actuating a variety of indicating means.

Still another object of the invention is the provision of

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an ends down indicator which may be easily installed on textile machines of standard types without modification of the machines and which will be economical and yet give a variety of information concerning the operation of the machine.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

Figure 1 is a schematic transverse sectional view of a ring frame and the like showing an embodiment of the present invention in use therewith,

Figure 2 is an enlarged perspective view of the ring and sensing device shown in Figure 1,

Figure 3 is a schematic view showing the electrical connections for the sensing devices including a sectional plan view of one of such devices, and

Figure 4 is a schematic diagram showing a circuit constructed in accordance with an embodiment of the present invention.

The embodiment of the invention shown and described below generally contemplates the use of electrical sensing means in the form of a magnetic coil pick-up and the like positioned closely adjacent each strand for establishing a differential in voltage or electromotive force when a faulty condition occurs and utilizing this differential in voltage to actuate various indicating mechanisms giving desirable information concerning ends down and slack ends. In addition the embodiment of the invention contemplates the use of a scanner mechanism for sensing the voltage across any one of the magnetic coil pick-up mechanisms and an amplifier section for amplifying the voltage to a useable voltage for actuating mechanism which in turn actuate relays for operating desirable indicating devices for giving and recording information.

A plurality of magnetic coil pick-up devices or variable reluctance pick-up devices A are shown in the drawing as being positioned closely adjacent the traveler B of a spinning frame and the like. A scanning mechanism C in the form of what is known in the trade as a shorting type switch operates to sense the electromotive force being established by the magnetic coil pick-ups A. An amplifier D includes two high gain vacuum tubes and a rectifier tube for placing the amplified voltage established by the magnetic coil pick-up upon the control grid of the relay tube E which serves as a sensitive switch controlling the operation of the relay circuit F. The relay tube is shown to be of the gas filled type, but may be of any other suitable type which will function as a switch, so that when the voltage on the control grid reaches a predetermined value the tube will fire and maintain a maximum output almost instantaneously. The tube E shown in the drawing is rated to fire when the voltage on the control grid drops below a predetermined value so that the relay mechanism may be actuated thereby. It is evident that the magnetic coil pick-up A will establish a reduced voltage should the traveler be slowed down or stopped due to a slack or broken end so that the scanning mechanism C will sense a reduced voltage which will result in a reduced output from the amplifier D and hence reduce the voltage maintained on the control grid of the relay tube E below the predetermined value at which the tube will fire to thus actuate the various indicating mechanisms F which will be described in greater detail below.

Referring more particularly to Figure 1, a textile machine in the form of a twisting frame is indicated at 10 carrying the usual drafting system 11 for attenuating

the strand Y which passes therethrough. Each end of yarn Y passes through a pigtail guide 12 before being wound on bobbins 13. The usual travelers B are carried by rings 14 for applying twist to the strand Y which is being applied to the bobbins 13. A magnetic coil pick-up A is shown schematically positioned on the ring rail 15 sufficiently close to the traveler that movement of the traveler in its normal circular path will intermittently distort the magnetic field established by the magnetic coil pick-up A.

A magnetic coil pick-up is best shown in Figures 2 and 3 to include a permanent magnetic core 16 and a coil 17 surrounding the magnetic core 16. In theory the magnetic core 16 establishes a stable magnetic field around the core and the coil 17. Since the variable reluctance pick-up mechanism is positioned closely adjacent the traveler in its normal movement during normal operation of the machine the traveler will pass through the flux lines established by the magnetic core. The magnetic field will become alternately distorted and then return to its original shape. The magnetic field is distorted because the traveler is constructed of material which offers less resistance or reluctance to the passage of flux lines than does air so that the flux lines tend to follow the path momentarily established therefor by the traveler and tends to follow the traveler in its circular path so that the field is distorted until the traveler passes to a more remote position on the ring. Since the magnetic field is distorted flux lines will cut across the coil to establish a very small electromotive force and upon the return of the field to its normal shape after the traveler has moved on another electromotive force will be produced so that an alternating voltage obtains across the coil 17 resulting from the normal movement of the traveler.

By reference to Figures 2 and 3 it is seen that the magnet 16 is carried within the core of a spool 16a and that the coil 17 of insulated wire is wound upon the spool. The coil is preferably covered with insulating material 17a. A suitable fastening in the form of a strap 17b secures the sensing device A to the ring rail 15 by screws 17c. A terminal strip 17d is secured to the device A by a screw 16b which is threaded into the core of the spool 16a. One of the ends of the coil 17 is grounded to a common ground G in the form of shielding which surrounds the insulated leads 18 from the other end of the coil. The leads 18 are each connected to one of the spaced contact points 19 of the scanning mechanism C. The ground G and the insulated leads 18 carried thereby are supported by the rail 15 by suitable fastenings 15a.

The scanning mechanism C is shown schematically in Figure 4 as including a plurality of spaced contact points 19 each of the contact points being connected respectively to one of the coils 17 of the variable reluctance pick-up mechanism A as described above. As has previously been pointed out a variable reluctance pick-up mechanism A is positioned closely adjacent each of the rings 14. The scanning mechanism is for the purpose of sensing the voltage on each of the contact points 19 to ultimately determine whether or not that end of yarn is being wound properly on its respective bobbin 13.

The scanning mechanism includes a rotor 20 which is carried by the shaft 21 which is driven by a motor 22. The motor 22 performs the function of driving the scanning mechanism at a fixed rate of speed. The shaft 21 is also driven by this motor. The motor 22 may be of any desired type which will maintain a constant speed, preferably of a synchronous type, which may be geared down to operate at a low rate of speed to save wear on the parts. The preferred speed is about ten revolutions per minute since the relays to be described below must have time to operate to give the desired indication of the operation of the individual spindles. The rotor 20 engages the contacts 19 successively to transfer the voltage

obtaining thereon through a slip ring arrangement (not shown) to the grid of the first amplifier tube D.

Since the amplifier is sensitive to no voltage conditions it is necessary that the rotor 20 be of sufficient width to engage one of the contacts 19 and its next adjacent contact 19 as well, as shown in dotted lines in Figure 4, since the mechanism would indicate should the rotor pass over a space between the contacts so that no voltage is detected thereby. An artificial injection voltage for resetting the relays as will be described in greater detail below is provided should two successive ends come down. This injection voltage is applied to an inner set of alternately spaced rings 23. Each of the rings 23 are electrically connected and an outer set of electrically connected rings 24 is also provided. Voltage is taken off the outer ring of spaced contacts 24 and applied to the control grid of the amplifier tube D. Since the rotor 25 of the artificial injection voltage system is operated also off of the shaft 21, this rotor 25 is synchronized with the rotor 20. The rotor 25 is so constructed and the points 23 and 24 are so spaced, as shown in dotted lines in Figure 4, that should two adjacent ends come down at the same time the relay mechanism described below will be reset due to a voltage received from this artificial injection system. The voltage which is applied to the inner ring comes from the power supply section which will be described below through a resistor 26 which has a high rating so that the voltage will be comparable to that received from the magnetic coil pickups A and the contacts 19.

The amplifier section D consists essentially of two electronic tubes 27 and 29. The voltage is amplified in the first tube and fed to the control grid of the second tube through a coupling condenser 28 which is provided with a suitable filter 28a. The coupling condenser 28 is provided for the purpose of eliminating the D.C. component of the A.C. voltage which is applied to the control grid of the second amplifier tube 29. The voltage from the plate of the second amplifier tube 29 is fed through another coupling condenser 30 provided with an induction filter 30a to the cathode of a rectifier tube 31. The rectifier tube 31 is so oriented as to furnish a negative output from the plate.

This negative voltage is then placed on the control grid of a keying tube E which serves as a sensitive switch mechanism to operate the relays. This tube E is preferably of the type known in the trade as a thyatron tube. The negative D.C. voltage which is applied to the control grid of the thyatron tube E is filtered through the resistance and capacitance filter 32 to filter out the pulsating voltage which is applied to the D.C. output of the rectifier tube 31. The thyatron in the embodiment described is rated to fire as the potential on the grid approaches zero voltage or greater in a positive direction. Once the thyatron fires a maximum output is obtained and the relay coil 33 is placed across the high potential side of the power supply and ground through the tube E which acts as a short.

The relay coil 33 operates double relay switches 34 and 35. The relay contact 34 operates the coil 36 of a counting mechanism to count ends down time while the relay contact 35 closes a locking relay 37 for closing contacts 39 to close the circuit across a signal lamp 38. A reset switch mechanism 40 is used to open or unlock the latching mechanism actuated by the coil 37 by energizing coil 41 and open the relay contacts 39 thus de-energizing the signal lamps.

The power supply for the amplifier and relay sections is shown in the upper portion of Figure 2 and the primary coil 42 of a transformer is shown in inductive relation to a low voltage secondary coil 43 and a high voltage secondary coil 44. The low voltage secondary coil 43 is connected in such a manner as to supply electrical energy to the heaters of the tubes. The high voltage coil 44 is connected across a number of silicon rec-

tifiers 45 which deliver a pulsating D.C. output to the filtering circuit 46 for filtering out A.C. components. This high potential D.C. output is then placed across a voltage divider 47. The high potential side of the voltage divider 47 is connected to the plate of the triggering tube E through the relay coil 33 while the intermediate voltage side of the voltage divider is connected to the screen grids of the amplifier tubes 27 and 29. The high potential side of the voltage divider is also connected through resistors having relatively high resistances to the plates of the amplifier tubes 27 and 29.

It should be noted that the thyatron E must be extinguished by placing a changing voltage on the plate so that the grid thereof may regain control following actuation of the relays preparatory to further operation. For this purpose the resistance and capacitance of the voltage divider 47 may be so chosen as to provide a frequency or time constant such as will extinguish the tube E and this in effect makes a relaxation oscillator of the tube. This frequency is sufficiently high that the relay will not be triggered thereby.

It is evident that upon the occurrence of an excessively slack end or ends down condition that the voltage established by the magnetic coil pick-up A will drop below a predetermined value so that the scanner C will cause such voltage to be delivered to the amplifier section D which will be insufficient to maintain the control grid of the thyatron tube sufficiently negative to prevent firing of the tube and actuation of the relay mechanism. Upon closing the relay switch 34 the coil 36 will move its core to operate the counter shown adjacent thereto for the purpose of counting ends down time. Upon the closing of the switch 35 the locking relay coil 37 closes the contacts 39 and places the signal lamp 38 across the line.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

What is claimed is:

1. In a textile machine having a traveler which is normally moved in a circular path by the strand being wound thereby during normal operation of the machine, the improvement including, means positioned closely adjacent the traveler establishing electrical energy resulting from movement of the traveler, and a sensing circuit connected across such means giving a signal and the like upon a predetermined drop in the magnitude of said electrical energy, whereby upon breakage or excessive slackness of the strand a reduction in the speed of the traveler will result in actuation of the sensing circuit upon such a predetermined drop in electrical energy.

2. In a textile machine having a traveler which is normally moved in a circular path by the strand being wound thereby during normal operation of the machine, the improvement including, a variable reluctance pick up mechanism positioned closely adjacent the traveler so that a voltage is established thereby resulting from movement of the traveler, and a sensing circuit connected across such voltage giving a signal and the like upon a predetermined drop in the voltage, whereby upon breakage or excessive slackness of the strand a reduction in the speed of the traveler will result in a reduction of the voltage and actuation of the sensing circuit upon such a predetermined drop in the voltage.

3. In a control system for a textile machine having a plurality of strand controlling devices each controlling an individual strand, the combination including, electrical sensing means positioned adjacent each strand sensing slack or broken strands by establishing a differential in output of electrical energy when said strand breaks or becomes excessively slack, a scanning device successively detecting such differentials in output, means indicating slack or broken strands, switch means actuating

the means indicating slack or broken strands, means amplifying the electrical energy detected by said scanning device actuating the switch means controlling the means indicating slack or broken ends.

4. In a control system for a textile machine having a plurality of strand controlling devices each controlling an individual strand, the combination including, electrical sensing means positioned adjacent each strand sensing slack or broken strands normally establishing a predetermined output of electrical energy when said machine is operating properly and establishing a reduced output when a strand breaks or becomes excessively slack, a scanning device successively detecting such output, means indicating slack or broken strands, switch means actuating the means indicating slack or broken strands, means amplifying the electrical energy detected by said scanning device actuating the switch means controlled the means when such electrical energy falls below a predetermined magnitude thus indicating slack or broken ends.

5. In a control system for a textile machine having a traveler which is moved in a circular path by the strand being wound thereby during normal operation of the machine, the combination including, electrical sensing means positioned adjacent each strand sensing slack or broken strands by establishing a differential in output of electrical energy responsive to traveler action when said strand breaks or becomes excessively slack, a scanning device successively detecting such differentials in output, means indicating slack or broken strands, switch means actuating the means indicating slack or broken strands, means amplifying the electrical energy detected by said scanning device actuating the switch means controlling the means indicating slack or broken ends.

6. In a control system for a textile machine having a traveler which is moved in a circular path by the strand being wound thereby during normal operation of the machine, the combination including, an electrical sensing means positioned adjacent each traveler normally establishing a predetermined output of electrical energy responsive to the traveler action when said machine is operating properly and establishing a reduced output when a strand breaks or becomes excessively slack, a scanning device successively detecting the output of the sensing means, means indicating slack or broken strands, switch means actuating the means indicating slack or broken strands, means amplifying the electrical energy detected by said scanning device actuating the switch means controlling the means indicating slack or broken ends.

7. In a control system for a textile machine having a plurality of winding devices each controlling an individual strand, the combination including, electrical sensing means positioned adjacent each strand sensing slack or broken strands, a scanning device having a plurality of spaced contacts each electrically connected to respective electrical sensing means and a rotor making and breaking said contacts in predetermined timed sequences, means indicating slack or broken strands, relay means actuating the means indicating slack or broken strands, means amplifying the voltage sensed by the rotor, and means utilizing the voltage thus amplified for closing the relays controlling the means indicating slack or broken strands.

8. In a textile machine having a traveler which is moved in a circular path by the strand being wound thereby during normal operation of the machine, a device for sensing slack and broken strands including, means establishing a magnetic field adjacent the traveler, a coil positioned in inductive relation to said magnetic field so that the distortion of the magnetic field resulting from movement of the traveler across such field establishes a voltage across the coil, means amplifying such voltage, means giving a signal and the like, and switch means actuating the means giving a signal when the voltage drops below said predetermined magnitude.

9. In a textile machine having a traveler which is

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moved in a circular path by the strand being wound thereby during normal operation of the machine, a device for sensing slack and broken strands including, a magnet positioned closely adjacent the traveler, a coil positioned in inductive relation to said magnet so that the distortion of the magnetic field set up by the magnet resulting from movement of the traveler across such field establishes a voltage across the coil, means amplifying

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such voltage, means giving a signal and the like, and switch means open during the maintenance of voltage of a predetermined magnitude and closed upon a voltage drop resulting from the slowing down of the traveler upon the occurrence of a slack or broken strand to actuate the means giving a signal when the voltage drops below said predetermined magnitude.

No references cited.