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2,569,475

DEVICE FOR CONTROLLING TEXTILE MACHINES

Filed Sept. 25, 1946

2 Sheets-Sheet 1

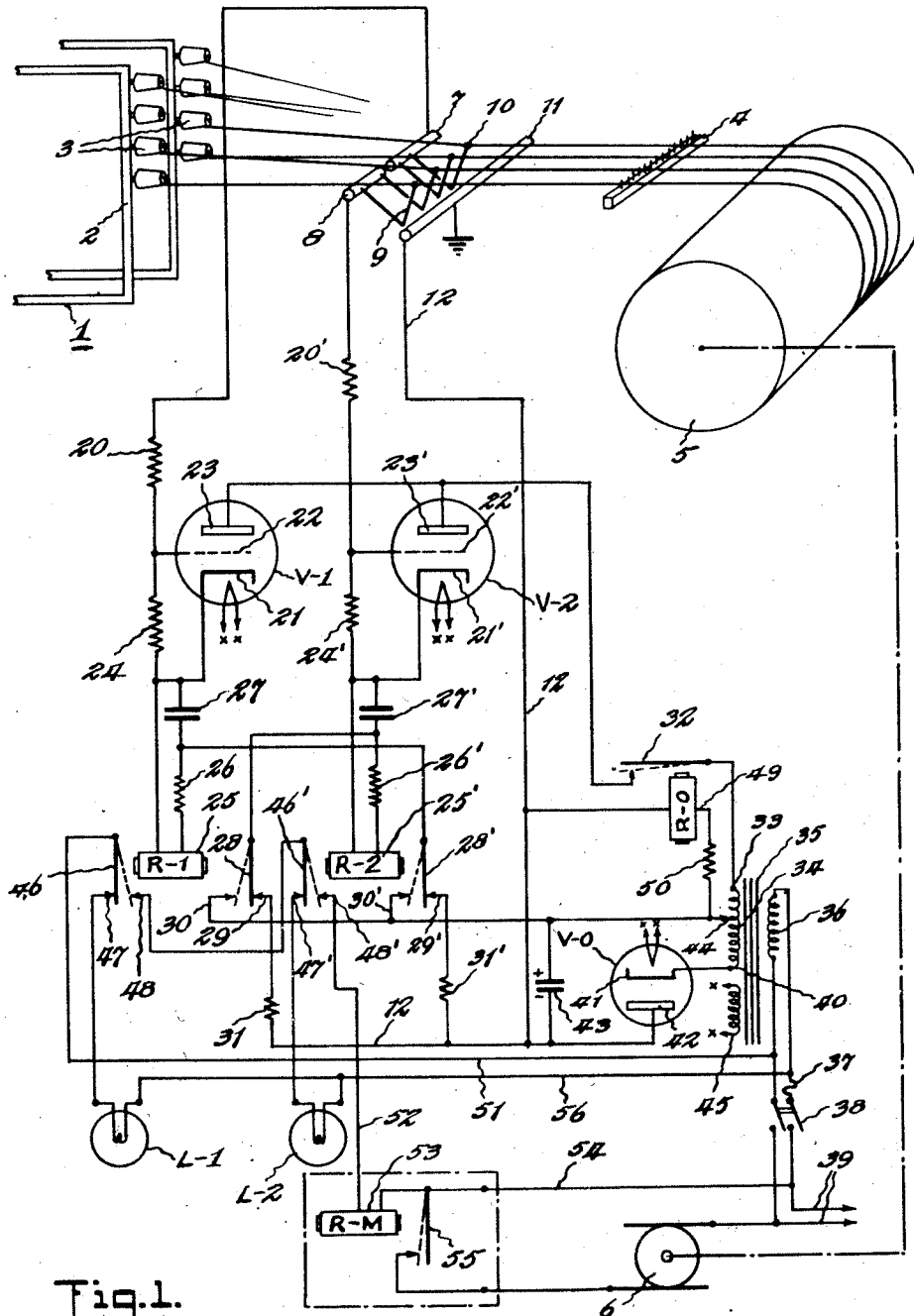


Fig. 1.

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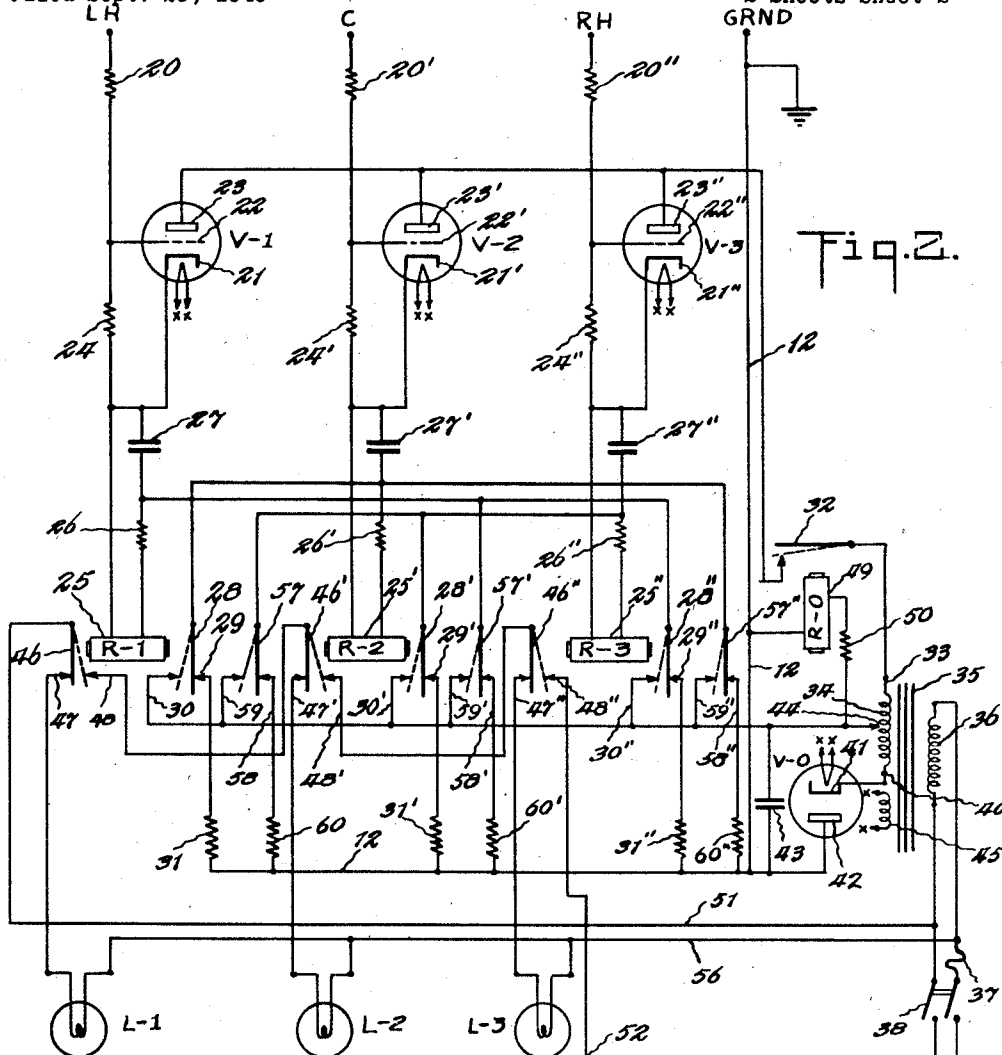


Fig. 2.

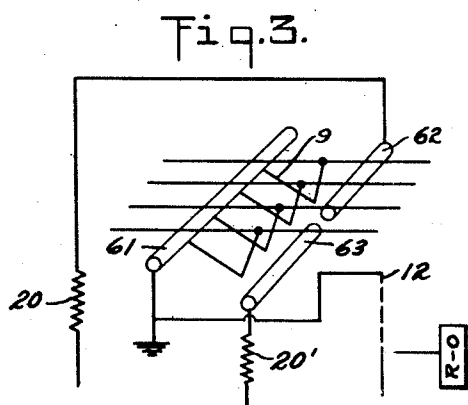
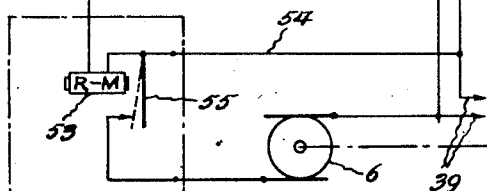


Fig. 3.



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DEVICE FOR CONTROLLING TEXTILE MACHINES

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11 Claims. (Cl. 28—51)

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The present invention relates to a novel automatic stop-motion device for use in the textile industry and, more particularly, to an improved device for arresting progress of all threads in a textile machine upon the occurrence of relaxation or loss of tension in any thread and for providing a selective indication of such relaxation.

In textile warping operations, a multiplicity of large supply packages, such as cones or cheeses of yarn or thread, are individually mounted on a creel, and a thread or yarn end is drawn from each package. These ends, usually to a number of several hundred, are gathered at approximately uniform tension into a substantially horizontal sheet of yarn, in which the yarns are about equally spaced apart at a width required by the loom in which they are destined to provide the warp. The sheet of yarn, after passing through a comb to separate the individual ends, is wound upon a warp beam or roller which is adapted for removal to a loom. This warp beam is rotated by a motor.

It has been the practice in the textile art to provide in association with the warper a stop-motion device which is supposed to function when a thread or end breaks. The prior art device most commonly employed is an electrical contact arrangement wherein each end passes through the eye of a drop wire and supports the wire in a position out of contact with a metal bar below it. When a thread breaks, the resulting lack of tension (laxity) therein permits the drop wire to make contact with the bar, making an electrical connection with a bar holding the drop wires. In some systems, rotation of the beam is stopped by completion of this circuit through an electromagnet which, by release of a powerful spring, actuates a strong brake on the beam. In others, the contact causes operation of an electrical relay which stops the motor driving the warp beam.

In high speed warper operation, the stop-motion contact system is located at the gate of the yarn creel. This places the "drops" some ten to fifteen feet behind the warper proper. A distance of this magnitude is advantageous in that it is supposed to permit early detection of a yarn break, that is, early enough to stop the warper before the yarn break disappears on the beam. Due, however, to certain faults inherent in prior art devices, contact through the drop wire is not always established, and frequently, in order to provide a better chance that a broken end be detected, an additional set of stop-motion drops is used directly on the warper near the expansion comb.

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A very common cause of faulty operation in prior art devices is the fact that the electrical contact arrangement is open and is thus exposed to dirt and lint and to the corrosive effect of moisture, any or all of which may prevent proper contact of the drop wire with the bar below it and may thus inhibit the flow of sufficient current to actuate the stop-motion. The potential or voltage employed in the prior art "drop" circuits is necessarily low in order to insure against electrical shock to the operators, and a small particle of dirt between the contacts easily prevents the operation of such a circuit. When the circuit fails to close or does so tardily, the rotation of the warper beam rapidly buries the loose, broken end. If this end be not uncovered, often at considerable trouble and loss of operating time, the resulting cloth is apt to be defective.

Another disadvantage in prior art practice is the lack of any indication to the operator as to which end has broken. As mentioned supra, there are normally several hundred ends gathered in the warper, and it is impossible for the operator standing in a position behind the beam to determine which of these ends has broken. A skilled operator can very often sight the broken end on a single trip down the length of one side of the creel, but this can be done only when he has the good fortune to chance upon the side which has the broken end; if he picks the wrong side, he must retrace his steps, go around the warper and start all the way up the length of the other side. It will be apparent that a great deal of time is thus wasted, during most of which time the warper could be in operation if indication of the position of the broken end were provided.

The use of a circuit including an indicator light for this purpose and actuated by the drop wire contact has been suggested, and such circuits may be set up for each end, for each of a number of banks of ends, or for each side of the creel. The difficulty in such an arrangement would be that the operator would have to keep his eyes fixed on the indicator panel at all times to determine which light went on first. The stopping of the beam immediately thereafter causes laxity or slackness in every end, and all the drop wires promptly fall, which would complete all the light circuits.

It is an object of the present invention to provide a novel device for arresting rotation of a beam when a thread being wound thereupon is broken.

It is another object of this invention to provide a new device for stopping the motor used to drive

a warper beam upon the breaking of a warp end.

It is also an object of the invention to provide an electrical stop-motion device for use in a warping operation wherein a new form of drop wire establishes improved contact upon the breaking of an end.

A further object of the present invention is the provision of a novel electrical stop-motion unit for use in a warping operation which is capable of overcoming the high contact resistance occasioned by dirt, lint and corrosion at the point of contact of a drop wire when an end breaks.

Moreover, this invention contemplates the provision of such novel unit capable of overcoming high contact resistance under conditions such that danger of electric shock to the operator is eliminated.

The invention also has in contemplation the provision of an improved stop-motion unit for use in a warping operation wherein an indicator system promptly designates the location of a broken end.

The present invention further provides an improved circuit for a stop-motion device in association with a warper, which circuit includes means for limiting designation of a broken end to only one of a plurality of positions.

Other objects and advantages of this invention will be apparent from the following description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 illustrates a schematic perspective view of the essential elements of a stop-motion device for use in association with a warper and includes a wiring diagram of the electrical circuit employed;

Fig. 2 shows a modified circuit diagram applicable to the invention; and

Fig. 3 is a fragmentary view illustrating an alternative contact arrangement.

According to the present invention, the threads or yarn ends running to a warp beam are individually registered for maintenance of tension therein by an electrical device which actuates both a stop-motion for the motor driving the beam and indicator lamps for designating the location of a broken thread or end. The device employed provides a plurality of terminal bars, each bar having a multiplicity of drop wires rotatably attached thereto and adapted for contact with a grounded contact bar positioned below them. These drop wires are of such length and form that contact is made with the ground bar through the side of the drop wire instead of at its end thus providing a more reliable contact than with the prior art structures. Each drop wire is provided with an aperture or eye at a portion of the wire removed from its point of attachment with the terminal bar, and a thread is drawn through this eye. The threads when in normal tension, hold the drop wires out of contact with the ground bar. The threads from a bank of supply packages are passed through individual drop wires all connected to a single terminal bar, so that the breaking of any thread in such bank grounds the respective bar.

A novel electrical circuit arrangement is employed which provides high enough voltage (at least 75 volts and preferably more than 200 volts) to "breakdown" even a faulty contact sufficiently to provide operating potentials for the vacuum tubes utilized in the circuit, while limiting the potential distribution and current flow through the drop wire mechanism to a degree such that

the peak value is insufficient to produce an electric shock should the operator inadvertently touch the drop wire structure while operating the warper. In addition, this circuit arrangement provides means for operating one of a plurality of indicators to designate the position at which the break has occurred and at the same time operates an interlocking means to prevent operation of the other indicators when all of the threads in the warper relax, a condition which occurs when rotation of the warp beam is automatically stopped upon the occurrence of the thread break indicated.

The device will now be described with respect to specific examples for the benefit of those skilled in the art, although it will be appreciated that equivalent elements and circuits may be substituted therein for accomplishing the purposes of the invention. Although the device is applicable to any number of banks of supply packages or yarn group subdivisions, as will appear hereinafter, the present example is directed for simplicity to an arrangement for indicating a yarn break in one of only two divisions of the creel, either the right side or the left side.

Referring more particularly to Fig. 1, the creel 1 is composed of vertical bars 2, each of which carries a plurality of cones of thread 3. The threads are drawn through a comb 4 to a warp beam 5, which is rotated by a motor 6. The improved device of this invention provides two terminal bars 7 and 8, which are respectively associated with the left side and right side of the creel, said bars being positioned transversely of the direction of travel of the threads. Each terminal bar has a multiplicity of drop wires 9 radially displaceable with respect to the bar and electrically connected thereto. These drop wires are upwardly bent, and each has a small aperture or eye 10 at the end remote from the connection to the terminal bar, said eye being adapted for passage therethrough of a thread. A metal contact bar 11 is positioned below and substantially parallel to the two terminal bars and at a distance therefrom such that the drop wires 9 make contact therewith when released by relaxation of the threads passing through the eyes 10 of these wires. The contact bar 11 is connected to a common ground circuit 12, and the terminal bars 7 and 8 are supported in suitable mountings (not shown) to insulate them from grounded elements of the machine.

The control circuit which is operated by the making of a contact between a drop wire 9 and ground bar 11 is made up of two similar networks, one containing a vacuum tube V-1 responsive to such contact between the ground bar and a drop wire attached to the left-hand terminal bar 7 and associated with the left-hand section of the creel 1, and the other containing a vacuum tube V-2 which is similarly responsive to closure of the circuit between the right-hand terminal bar 8 and the ground bar 11. Considering one section of this control circuit, the left-hand terminal bar 7 is connected through a current limiting resistor 20 to the control grid 22 of the vacuum tube V-1. Control grid 22 is also connected through a grid resistor 24 to the cathode 21 of the tube V-1. Cathode 21 is in turn connected to the ground circuit 12 through the energizing winding 25 of a relay R-1, a resistor 26, normally-closed contacts 28' and 29' of a set of single-pole double-throw contacts in a relay R-2 associated with tube V-2, and a biasing resistor 31'. A condenser 27 is connected across

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the winding 25 of relay R-1 and resistor 26 so as to provide an energy-storing time-delay circuit to energize relay winding 25 during the interval when a relay-energizing contact 28 positioned in relay R-1 similarly to contact 28' in relay R-2 is moving between contacts 29 and 30.

The plate 23 of tube V-1 is connected through normally-open contacts 32 of a protective relay R-0 to one end 33 of the high-voltage center-tapped secondary winding 34 of a power supply transformer 35. The primary winding 36 of this power transformer is connected in the usual manner to an alternating current power supply line 39 through a suitable fuse 37 and switch 38. The other end 40 of the high-voltage winding 34 is connected to the cathode 41 of a rectifier tube V-0. The anode 42 of this rectifier tube V-0 is connected to the ground circuit 12 and to one side of a bias voltage condenser 43. The other side of this condenser is connected to the center-tap 44 of the high-voltage winding 34. This center-tap 44 is also connected to the normally-open contact 30' of relay R-2 so as to be connected to the cathode circuit of tube V-1 through contact 28' when this relay is energized. A winding 45 on transformer 35 is provided to supply current in the usual manner to heat the cathodes of tubes V-0, V-1, and V-2 through conductors XX (not shown).

The energizing winding 49 of the protective relay R-0 is connected from the ground conductor 12 through a current limiting resistor 50 to the center-tap 44 of the high-voltage winding 34 of transformer 35. This relay is provided to protect the tubes on starting by preventing the flow of plate current until their cathodes have had time to reach the proper operating temperature.

The connection from the right-hand terminal bar 8 of the warper to the vacuum tube V-2 and the circuit connections of this vacuum tube are substantially identical to those of tube V-1. In the drawing, each element of the circuit of tube V-2 corresponding to a similar element in the circuit of tube V-1 is indicated by the same reference character followed by a prime (').

In addition to the relay energizing contacts 28, 29, and 30 connected in the cathode circuit of vacuum tube V-2, relay R-1 also carries a set of single-pole double-throw control contacts 46, 47 and 48 and relay R-2 likewise carries similar contacts 46', 47' and 48'. Contacts 46 and 48 are connected through contacts 46' and 48' and a conductor 52 to a motor control relay R-M which controls the operation of the warper beam motor 6. Contacts 46 and 47 connect an indicator light L-1 to the supply line 39 through conductors 51 and 56 to indicate the presence of a broken thread in the left-hand section of the creel 1. Similarly, contacts 46' and 47' connect a right-hand indicator light L-2 to the supply line through conductor 56 and through contacts 48 and 46 of relay R-1 and conductor 51.

The motor for driving the warper beam is connected across the power line 39 through conductor 54 and the normally open contact 55 of motor control relay R-M. The energizing circuit for this relay is connected from one side of the alternating current power supply line through conductor 51, armature contact 46 and contact point 48 of relay R-1, armature contact 46' and contact point 48' of relay R-2, winding 53 of the motor control relay R-M and conductor 54 back to the other side of the power line 39.

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With the circuit arrangement just described, when the circuit is energized by closing the line switch 38, power is applied to the heaters of vacuum tubes V-0, V-1 and V-2. At the same time voltage is applied from one half of the high-voltage winding 34 between terminals 40 and 44 across the rectifier V-0. When the rectifier cathode 41 is heated to operating temperature, a current flows through the rectifier, winding 49 of relay R-0 and resistor 50 to energize the relay R-0, thus closing its normally open contacts 32 and applying a high-voltage to the plates 23 and 23' of tubes V-1 and V-2. By the time this high-voltage is applied, the cathodes 21 and 21' of these tubes have reached operating temperature. Coincidentally, bias condenser 43 is charged from one half (40 to 44) of the high-voltage winding 34 through the rectifier V-0 to a potential substantially equal to the peak voltage developed across this half of the winding 34, with grounded terminal of the condenser assuming a negative polarity.

When the circuits between ground bar 11 and terminal bars 7 and 8 in the warper are open, no biasing voltages are applied to the grid circuits of tubes V-1 and V-2 and therefore a zero bias is applied to the control grids 22 and 22' of these tubes through grid resistors 24 and 24'. With this zero bias, a current flows from terminal 33 of high-voltage winding 34 through contacts 32 of relay R-0, vacuum tube V-1, relay winding 25 of relay R-1, resistor 26, contacts 28' and 29' of relay R-2, resistor 31' and rectifier V-0 back to the other end 40 of winding 34. Similarly, a current flows from winding 34 through tube V-2 and winding 25' of relay R-2. These currents flowing through the coils 25 and 25' of relays R-1 and R-2, respectively, cause their armature contacts 28 and 28', respectively, to move from the positions shown by the solid lines in Fig. 1 to the positions shown by the dotted lines. In this alternate position the relay windings are still energized by anode-cathode currents of the tubes V-1 and V-2, but the anode-cathode circuits are now completed through contacts 30 and 30', respectively, to the center-tap 44 of the high-voltage winding 34. In this position they are also connected to the positive terminal of bias condenser 43.

Simultaneously, the circuit described supra through the winding 53 of motor control relay R-M energizes the motor control relay, closing its normally open contacts 55 to connect motor 6 across the power supply line 39 and to start rotation of the warp beam 5.

With the circuit in the condition just described, it is ready to operate upon the occurrence of a thread break. It automatically acts to stop the rotation of the motor 6 and to cause one or the other of the indicator lights L-1 and L-2 to become illuminated and thus to indicate the portion of the creel in which the broken thread is located. When such break occurs, the drop wire 9 associated with the broken thread falls, thus connecting one of the terminal bars 7 or 8 to the ground bar 11. This connects the grounded side of the bias condenser 43 through the ground bar 11, the drop wire 9 and the particular terminal bar 7 or 8 to the grid 22 or 22' of the tube connected to that terminal bar, thus applying the negative potential of the grounded side of the condenser 43 to the control grid of the connected tube. This causes a considerable negative bias to be applied to that control grid, stop-

ping the flow of current through the tube and de-energizing its associated relay.

Assuming that the broken thread has occurred in the left-hand section of the creel 1 so that the aforementioned negative bias is applied to the grid 22 of vacuum tube V-1, this operation de-energizes relay R-1 and causes its armature contact 46 to assume its de-energized position shown by the solid line. The circuit through contact 48 to the winding 53 of motor control relay R-M is thereby opened, causing the motor control contacts 55 of said relay to open and thus breaking the power supply connection to motor 6. The rotation of the warp beam 5 is therefore stopped. Simultaneously, closure of the circuit between contacts 46 and 47 completes the circuit from one side of the power supply line 39 through a conductor 56, left-hand indicator lamp L-1 and conductor 51 to the other side of the power supply line, thus lighting this left-hand indicator lamp to show that the break occurred in the left-hand side of the creel.

De-energizing the relay also breaks the circuit between contacts 28 and 30 of relay R-1 and establishes a circuit through contacts 28 and 29, thus connecting the cathode circuit of vacuum tube V-2 through resistor 31 to the ground conductor 12. By thus grounding the cathode circuit of tube V-2, the bias voltage from condenser 43 is prevented from being applied to the control grid 22' of vacuum tube V-2 regardless of subsequent contacting of drops on the right-hand side of the creel, which contacting of course occurs immediately when the warp beam 5 stops rotating.

If a break occurs in the right-hand section of the creel 1, the first drop contact connects the control grid 22' of vacuum tube V-2 to the ground circuit 12 and the above-described sequence of operations in the networks of the two vacuum tubes is reversed, the circuit being arranged so that in either case the only indicator light to be illuminated is the one corresponding to the division of the creel in which the first thread break occurs. Subsequent closures of other drop contacts have no effect on the apparatus until it is reset.

It will be seen from the foregoing description that, when a drop wire falls, connecting either terminal bar to ground, a large negative bias is applied through the drop wire to the grid circuit of the corresponding vacuum tube. Since the corresponding grid voltage stabilizing resistor is a substantially high resistance, the current flowing through the terminal bar and the drop wire contact is consequently small. Thus, the voltage appearing at the drop wire contact just before closure is substantially that at the bias voltage condenser, that is, the peak voltage supplied by one half of the high-voltage winding 34, and this high voltage is sufficient to break down the drop wire contact resistance, even though it is very high due to corrosion, dirt and the like. However, since the resistance of the grid to ground circuit of the vacuum tube is very high due to the high values of the protective resistors 20 and 20' and the grid resistors 24 and 24', the maximum possible current flow is limited to a value which cannot cause harmful electric shock to the operator in the event that he touch the terminal bar before the fall of a drop wire completes the circuit to ground.

The principles of the present invention are also applicable, as aforementioned, to indication of the location of a yarn break at any one of

more than two sections of the creel. The circuit of Fig. 2 shows the application of this principle to a three-position system, and it is clearly apparent that the changes necessary to adapt this embodiment of the invention to an arrangement having four or more positions are such as would be apparent to anyone skilled in the art.

This circuit is substantially identical to the circuit shown in Fig. 1, except that vacuum tube V-2 and its associated circuits are connected to a terminal bar representing a central group of threads in the creel 1 and a third vacuum tube V-3 and associated relay R-3 have been added. The tube V-3 is connected to the terminal bar associated with a group of threads on the right-hand side. The circuits of vacuum tube V-3 are exactly the same as the circuits of vacuum tubes V-1 and V-2, and this similarity is shown in Fig. 2 by indicating the corresponding elements of these circuits with the same reference characters followed by a double prime ("').

Beside the connections which are similar to those shown in Fig. 1, an additional set of single-pole double-throw contacts 57, 58, and 59 are incorporated with relay R-1, and similar contacts are provided in relays R-2 and R-3. These additional contacts are connected substantially in the same manner as contacts 28, 29 and 30, normally open contact 59 being connected to the positive terminal of bias condenser 43 and center-tap 44 of high-voltage winding 34, and normally closed contact 58 being connected through a resistor 60, similar to resistor 31, to the ground conductor 12. The armature contact 57 is connected to the cathode circuit of tube V-3 to ground it and thus to render tube V-3 inoperative in the same manner that the connection from armature contact 28 to the cathode circuit of tube V-2 renders tube V-2 inoperative when relay R-1 is de-energized in response to the breakage of a thread in the section of the creel 1 associated with tube V-1. Corresponding connections are made to the added contacts on relays R-2 and R-3. Except for the addition of these extra contacts, which are designed to prevent the other two tubes from functioning subsequent to the operation of one of the tubes in the circuit, the functioning of the circuit of Fig. 2 is substantially the same as the operation described above in connection with the circuit of Fig. 1.

In the modification of the invention illustrated in Fig. 3, the terminal bars attached to the drop wires are grounded by attachment to the ground circuit, and the contact bar formerly grounded is divided into a plurality of sections. The sections of the contact bar are connected to the current limiting resistors in the grid circuits of the electronic tubes corresponding to yarn group subdivisions in the creel. As shown in Fig. 3, the drop wires 9 are attached to grounded terminal bar 61 connected through lead 12 with the protective relay R-0 and a sectioned contact bar 62, 63 is provided for engagement with the contacts 9; section 62 being connected to the current limiting resistor 20 and section 63 being connected to the current limiting resistor 20'.

The present invention has the double advantage of providing positive action of the stop-motion device when a thread or yarn end is broken and of indicating to the operator one of two or more positions in which he can find the broken thread or end. With the employment of the present invention, the chance of a broken end's being buried on the beam is practically

negligible, and the time formerly lost by an operator's having to search the entire lengths of both sides of the creel for the broken end can now be economically applied to the useful operation of the warper.

Although the present invention has been described with respect to particular embodiments, it will be apparent to those skilled in the art that variations and modifications of this invention can be made and equivalents substituted therein without departing from the spirit of the invention.

What is claimed:

1. An automatically controlled thread gathering device which comprises means for holding a plurality of yarn packages, rotatable means adapted for winding threads from said packages thereon, a plurality of guide means for leading said threads individually from said packages to said rotatable means, motor means for rotating said rotatable means to pull said threads from the packages and to wind them on said rotatable means, a plurality of pairs of electric contacts, a contact of each pair being respectively connected to one of said guide means for operation whenever its associated thread is slacked, one contact of each pair of contacts being grounded, an electronic tube having a control electrode, an anode and a cathode, an output circuit connected to said anode and cathode, a ground connection to a point of said circuit, circuit means connecting the ungrounded contacts of said pairs of electric contacts together and to said control electrode, means responsive to the operation of any one of said pairs of contacts for applying an operating bias to said control electrode, and control means responsive to the operation of said electronic tube for stopping said motor means, whereby rotation of the rotatable means is automatically stopped whenever one of the threads breaks.

2. An automatically controlled thread gathering device which comprises means for holding a plurality of yarn packages, a roller adapted for winding threads from said packages thereon, a plurality of guide means for leading said threads individually from said packages to said roller, motor means for rotating said roller to pull said threads from the packages and to wind them on said roller, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, an electronic tube having an anode, cathode and control electrode, a stabilizing resistor connected between said cathode and said control electrode, a rectifier having an anode and cathode, a condenser, a relay having an operating coil and a plurality of contacts, a transformer having a high voltage winding with a tap intermediate the ends thereof, a connection between one end of said transformer winding and the anode of said tube, a connection from the cathode of said tube through said relay coil to said tap on said transformer winding, a connection from said tap through said condenser to the anode of said rectifier and from the cathode of said rectifier to the other end of said transformer winding, a circuit connecting said electric contacts in parallel, a connection from one side of said contacts to said control electrode, a connection from the other side of said contacts to said rectifier anode, and a motor circuit connected to said relay contacts to stop the motor means when said relay is de-energized, whereby a negative bias is applied to said control electrode to de-energize said relay and automatically

to stop the rotation of said roller whenever one of the threads breaks.

3. In combination in a thread gathering device comprising means for holding a plurality of yarn packages, a roller adapted for winding thread from said packages thereon, and motor means for rotating said roller to pull said threads from said packages and to wind them on said roller, means for automatic operation of said device which comprise guide means for leading said threads individually from said packages to said roller, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, a plurality of electronic tubes each having a control electrode, circuit means connecting said electric contacts together in groups corresponding to predetermined groups of threads, means connecting each of said groups of contacts to the control electrode of one of said tubes, means responsive to the operation of any one of said contacts to apply an operating bias to its associated control electrode, control means responsive to the operation of any one of said electronic tubes for stopping said motor means, and an indicator operatively connected to each of said tubes and selectively responsive to the operation of its associated tube, whereby rotation of said roller is automatically stopped whenever one of the threads breaks and whereby the group in which it is included is automatically indicated by one of said indicators.

4. In combination in a thread gathering device comprising means for holding a plurality of yarn packages, a roller adapted for winding thread from said packages thereon, and motor means for rotating said roller to pull said threads from said packages and to wind them on said roller, means for automatic operation of said device which comprise guide means for leading said threads individually from said packages to said roller, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, two electronic tubes each having a control electrode, circuit means connecting said electric contacts together in two groups, one group corresponding to the threads on the left-hand side of said holding means and the other group to the threads on the right-hand side, means connecting said left-hand group of contacts to the control electrode of one of said tubes, means connecting said right-hand group of contacts to the control electrode of the other of said tubes, means responsive to the operation of any one of said contacts to apply an operating bias to its associated control electrode, control means responsive to the operation of either of said electronic tubes for stopping said motor means, and an indicator operatively connected to each of said tubes and selectively responsive to the operation of its associated tube, whereby rotation of said roller is automatically stopped whenever one of the threads breaks and whereby one or the other of said indicators operates to indicate on which side of said holding means the broken thread is located.

5. In combination in a thread gathering device comprising means for holding a plurality of yarn packages, a roller adapted for winding thread from said packages thereon, and motor means for rotating said roller to pull said threads from said packages and to wind them on said roller, means for automatic operation of said device which comprise guide means for leading said threads in-

dividually from said packages to said roller, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, a plurality of electronic tubes each having a control electrode, circuit means connecting said electric contacts together in groups corresponding to predetermined groups of threads, means connecting each of said groups of contacts to the control electrode of one of said tubes, means responsive to the operation of any one of said contacts to apply an operating bias to its associated control electrode, control means responsive to the operation of any one of said electronic tubes for stopping said motor means, an indicator operatively connected to each of said tubes and selectively responsive to the operation of its associated tube, and interlocking means interconnecting said tubes to prevent operation of the other tubes after the first of said tubes is operated by a thread break, whereby rotation of said beam is automatically stopped whenever one of the threads breaks and whereby the group in which it is included is automatically indicated by one of said indicators.

6. In combination in a textile warper comprising a creel for holding a plurality of yarn packages, a warp beam for winding threads from said packages thereon, and a driving motor for rotating said beam to pull said threads from said packages and to wind them on said beam, means for automatic operation of said warper which comprises a plurality of guide means for leading said threads individually from said packages to said beam, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, two electronic tubes each having a control electrode, circuit means connecting said electric contacts together in two groups, one group corresponding to the threads on the left-hand side of said creel and the other group to the threads on the right-hand side, means connecting said left-hand group of contacts to the control electrode of one of said tubes, means connecting said right-hand group of contacts to the control electrode of the other of said tubes, means responsive to the operation of any one of said contacts to apply an operating bias to its associated control electrode, control means responsive to the operation of either of said electronic tubes for stopping said motor means, an indicator operatively connected to each of said tubes and selectively responsive to the operation of its associated tube, and interlocking means connected to each of said tubes operative in response to operation of one of said tubes for preventing operation of the other tube and its associated indicator, whereby rotation of said warp beam is automatically stopped whenever one of the threads breaks and whereby one or the other of said indicators operates to indicate on which side of said creel the broken thread is located.

7. In combination, in a textile warper comprising a creel for holding a plurality of yarn packages, a warp beam for winding threads from said packages thereon, and a driving motor for rotating said beam to pull said threads from said packages and to wind them on said beam, means for automatic operation of said warper which comprises a plurality of guide means for leading said threads individually from said packages to said beam, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated

thread is slacked, a plurality of electronic tubes each having an anode, a cathode and a control electrode, circuits connecting said electric contacts in parallel in groups corresponding to predetermined groups of threads, a stabilizing resistor connected between said cathode and said control electrode of each tube, a rectifier having an anode and cathode, a condenser, a relay associated with each tube and having an operating coil and a plurality of sets of contacts, a transformer having a winding with a tap intermediate the ends thereof, a connection between one end of said transformer winding and the anodes of said tubes, a connection from the cathode of each of said tubes through the coil of its associated relay and the normally open contacts of a set of contacts in the relays associated with each of the other tubes to said tap on said transformer winding, a connection from said transformer tap through said condenser to the anode of said rectifier and from the cathode of said rectifier to the other end of said transformer winding, a connection from said rectifier anode through a resistor to the normally closed contact in each of said sets of relay contacts, a connection from one side of said guide contacts in each group to the control electrode of one of said tubes, a connection from the other sides of said contacts to said rectifier anode, a motor circuit connected to another set of said contacts in each of said relays to stop said driving motor when any one of said relays is de-energized, and an indicator connected to each of said relays to be operated thereby when its relay is de-energized, whereby a negative bias is applied to the control electrode of one of said tubes to de-energize its associated relay automatically, thereby stopping the rotation of said warp beam whenever one of said threads breaks and indicating the group of threads in which the broken thread is located.

8. In combination in a textile warper comprising a creel for holding a plurality of yarn packages, a warp beam for winding threads from said packages thereon, and a driving motor for rotating said beam to pull said threads from said packages and to wind them on said beam, means for automatic operation of said warper which comprises a plurality of guide means for leading said threads individually from said packages to said beam, an electric contact connected to each of said guide means, each of said contacts being adapted for operation whenever its associated thread is slacked, two electronic tubes each having an anode, a cathode and a control electrode, circuits connecting said electric contacts in parallel in two groups, one group corresponding to the threads on the left-hand side of said creel and the other to the threads on the right-hand side, a stabilizing resistor connected between said cathode and said control electrodes of each tube, a rectifier having an anode and cathode, a condenser, a relay associated with each tube and having an operating coil and two sets of contacts, a transformer having a high voltage winding with a tap intermediate the ends thereof, a connection between one end of said transformer winding and the anodes of said tubes, a connection from the cathode of each of said tubes through the coil of its associated relay and the normally open contacts of one set of contacts in the other relay to said tap on said transformer winding, a connection from said transformer tap through said condenser to the anode of said rectifier and from the cathode of said

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rectifier to the other end of said transformer winding, a connection from said rectifier anode through a resistor to the normally-closed contact in each of said sets of relay contacts, a connection from one side of said guide contacts in the left-hand group to the control electrode of one of said tubes, a connection from one side of said thread contacts in the right-hand group to the control electrode of the other of said tubes, a connection from the other side of said contacts to said rectifier anode, a motor circuit connected to the other set of contacts in each of said relays to stop said driving motor when either of said relays is de-energized, and an indicator connected to each of said relays to be operated thereby when its relay is de-energized, whereby a negative bias is applied to the control electrode of one of said tubes to de-energize its associated relay automatically, thereby stopping the rotation of said warp beam whenever one of said threads breaks and indicating the side of the creel in which the broken thread is located.

9. An automatically controlled thread gathering device which comprises means for holding a plurality of yarn packages, rotatable means adapted for winding threads from said packages thereon, a plurality of guide means for leading said threads individually from said packages to said rotatable means, motor means for rotating said rotatable means to pull said threads from the packages and to wind them on said rotatable means, a plurality of pairs of electric contacts, a contact of each pair being respectively connected to one of said guide means for operation whenever its associated thread is slacked, one contact of each pair of contacts being grounded, an electronic tube having a control electrode, circuit means connecting the ungrounded contacts of said pairs of electric contacts together and to said control electrode, means responsive to the operation of any one of said pairs of contacts to apply an operating bias to said control electrode, control means responsive to the operation of said electronic tube for stopping said motor means, whereby rotation of the rotatable means is automatically stopped whenever one of the threads breaks, means for impressing a potential of at least 75 volts across the electric contact connected to each guide means and its associated contact in a pair of contacts, and a current limiting resistor connected to the ungrounded contact of said pair of contacts.

10. An automatically controlled thread gathering device which comprises means for holding a plurality of yarn packages, rotatable means adapted for winding threads from said packages thereon, a plurality of guide means for leading

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said threads individually from said packages to said rotatable means, motor means for rotating said rotatable means to pull said threads from the packages and to wind them on said rotatable means, a plurality of pairs of electric contacts, a contact of each pair being respectively connected to one of said guide means for operation whenever its associated thread is slacked, one contact of each pair of contacts being grounded, an electronic tube having a control electrode, circuit means connecting the ungrounded contacts of said pairs of electric contacts together and to said control electrode, means responsive to the operation of any one of said pairs of contacts to apply an operating bias to said control electrode, control means responsive to the operation of said electronic tube for stopping said motor means, whereby rotation of the rotatable means is automatically stopped whenever one of the threads breaks, means for impressing a potential of more than 200 volts across the electric contact connected to each guide means and its associated contact in a pair of contacts, and a current limiting resistor connected to the ungrounded contact of said pair of contacts.

11. In a textile machine, the combination comprising means for advancing a plurality of threads under tension, guide means for each thread movable in response to reduction in tension of its associated thread, a normally energized electronic tube, a control circuit for said tube including electrical contacts adapted when closed to deenergize said tube, means operative to close said contacts upon movement of any one of said guide means as a result of reduction in tension of its associated thread and means responsive to deenergization of said tube for stopping said first mentioned means.

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