Jan. 25, 1938. E. G. PARVIN 2,106,490

CONTROL MEANS FOR WEB WRAPPING MACHINES

Filed Dec. 10, 1936 2 Sheets-Sheet 1

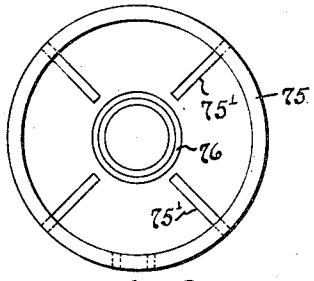

Fig. 2.

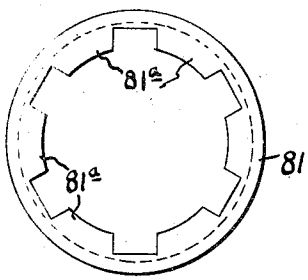

Fig. 4.

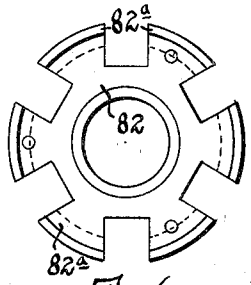

Fig. 6.

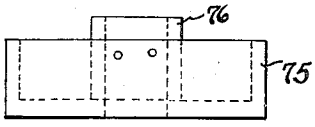

Fig. 3

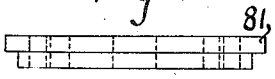

Fig. 5.

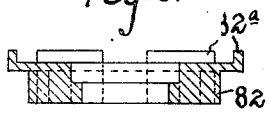

Fig. 7.

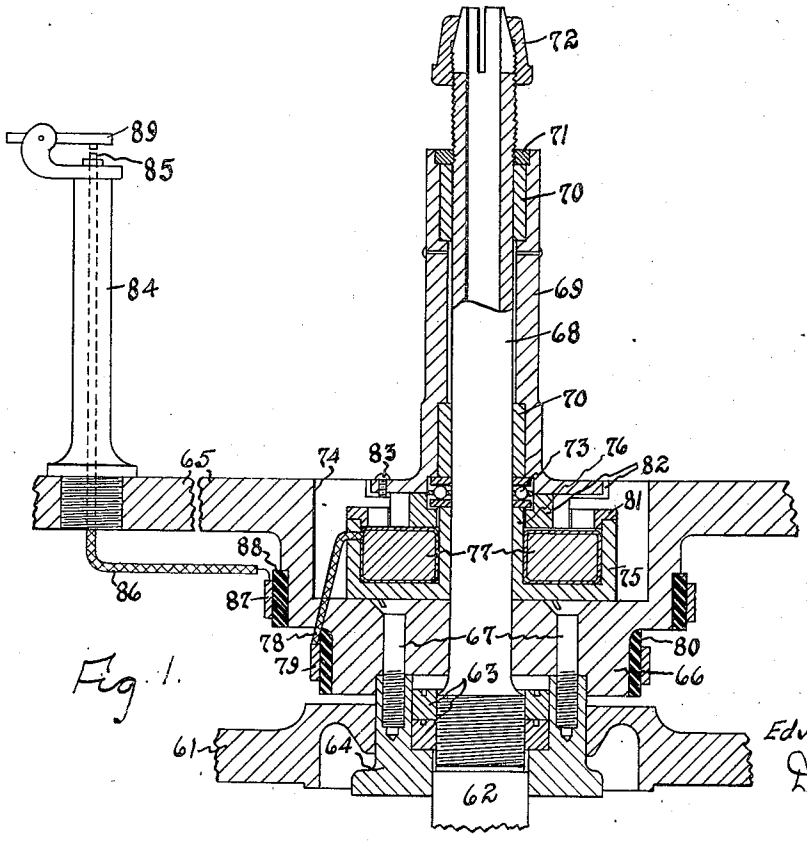

Fig. 1.

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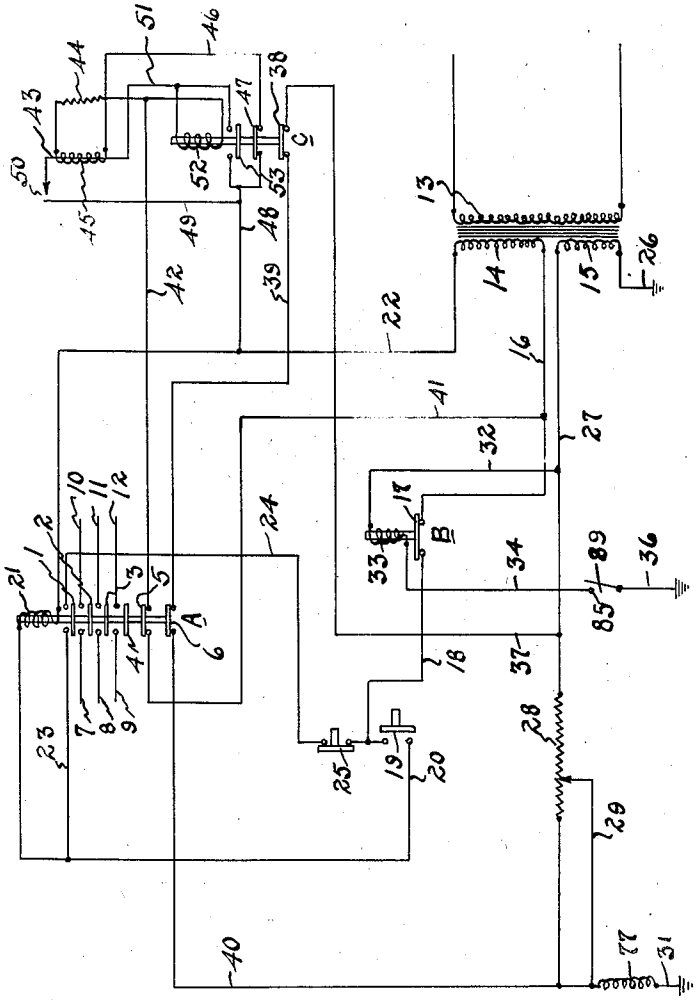

Fig. 8

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Patented Jan. 25, 1938 2,106,490

UNITED STATES PATENT OFFICE

2,106,490

CONTROL MEANS FOR WEB WRAPPING MACHINES

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Application December 10, 1936, Serial No. 115,134

13 Claims. (Cl. 117—45)

This invention relates to control apparatus by means of which the tension on a wire or strand wrapping machine may be maintained substantially uniform and includes means for converting the tensioning means into a braking device automatically upon the breakage of the web or strand.

The full nature of the invention and the objects attained thereby will best be understood from the following detailed description of one form of mechanism in accordance with the invention herein disclosed.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all in accordance with the following description.

In the accompanying drawings,

Figure 1 is a vertical, central, cross-sectional view with some parts broken away of a portion of a winding machine flyer embodying a structure comprising part of this invention;

Figures 2 and 3 are plan and side elevational views of the stator of the magnetic portion of the device;

Figures 4 and 5 are plan and side elevational views of the pole piece for the stator core;

Figure 6 is a plan view of the rotor pole piece;

Figure 7 is a vertical, central, cross-sectional view therethrough; and

Figure 8 is a diagrammatic layout of the circuit combination of this invention.

The subject matter of this disclosure is particularly adapted for use in machines of which a wire insulating machine is an example. A wire insulating machine to which this invention may be applied is of the type wherein a longitudinally moving strand such as a wire, for example, has applied thereto a web or tape of insulating material in a helical wrap comprising contiguous or overlapping convolutions. A machine of this type is disclosed in United States Patent No. 1,955,908 of April 24, 1934 to Fantone and Jameson, entitled "Method and apparatus for applying web coverings to strands".

The machine of this patent preferably includes a magnetic brake comprising a full core and magnetizing winding acting upon a magnetizable disc secured to the cop spindle or sleeve for rotation with the cop. The circuit for this winding is controlled by means of a switch which is positioned to be held in open position by the web fed from the cop sleeve. When the web or tape breaks this switch closes completing the circuit to the winding and causing the cop sleeve and the cop mounted thereon to immediately stop rotating. Such a mechanism is shown in Patent No. 2,003,354 of June 4, 1935 to Fantone and Parvin for "Machine for applying a web to a strand".

This machine also preferably includes a tensioning means to maintain a uniform tension on the strand or web being fed from the cop while the machine is in normal operation. In this case the magnetizable field core and disc are provided with poles. A suitable form of mechanism of this type will be found in the disclosure in application Serial No. 62,591, filed February 6, 1936, in the name of Edward G. Parvin for "Magnetic means and method of tensioning".

The present invention involves the conception of the combination of both the tensioning and the braking means in a single mechanism included in control circuits and primarily controlled by a switch which closes when the web or tape breaks to set the circuits in operation. It may be noted that the switch which closes when the tape breaks may be of several different types. It may for example be of the type which is operated by direct engagement with the cop sleeve, as shown in the above noted Patent No. 2,003,354. On the other hand it may be a centrifugally operated switch of the type disclosed in Patent No. 2,044,160 of June 16, 1936 to Fantone and Jameson for "Centrifugal switch".

In order to fully understand the circuit combinations of this invention there has been included herein in Figures 1 to 7 inclusive a description of the mechanism disclosed in the above mentioned application Serial No. 62,591, which employs the centrifugal type of switch. As will be apparent however to those skilled in the art the other form of switch as disclosed in Patent No. 2,003,354, as well as other suitable types of switches may be employed.

The mechanism of Figures 1 to 7 inclusive comprises a portion of a support **61** to which is to be attached the serving head or flyer motor not shown in the drawings. This motor is attached to the support so as to depend therefrom and permit of attachment to the spindle **62**. Locked on this spindle by means of a pair of threaded lock nuts or rings **63** is a collar **64**. This collar is connected by means of the machine screws **67** to a plate or turntable **65** so that it will revolve with the spindle **62**. The collar **64** is seated in a central recess in the central depending boss or hub **66** of the plate **65**.

The spindle **62** is provided with an extension **68** of reduced diameter which passes up through the plate **65** and through a central recess **74** in the top thereof. Journaled on suitable bearing members, as illustrated at **70** is the cop sleeve **69** which

is locked in place on the spindle by means of the threaded ring 71. The cop sleeve 69 is provided with a flange at the lower end thereof. The upper end of the portion 68 of the spindle is provided with a suitable form of clutch and locking nut 72 by means of which a nose piece, not shown, but usually employed with serving heads of this type is mounted in place.

Attached to the plate 65 within the recess 74 is a stator core 75 of magnetizable material such as iron or steel built in the form of a flanged disc having a central sleeve 76. Resting on the upper end of the sleeve 76 is an end thrust ball bearing 73 upon which the loaded cop sleeve 69 rests so as to be freely rotatable on the portion 68 of the spindle. As shown in Figure 2, the stator core is provided with a series of slots 75' for the purpose of reducing the eddy current losses in the core in accordance with common practice in the electrical arts. At 81 is a disc shaped cover for the stator 75 built somewhat in the form of a ring of magnetic material and notched at the circumference to provide the pole pieces 81a. This cover is secured to the cop 75 and serves to enclose the stator winding 77. One terminal 78 of the winding 77 is connected to a ring 79 mounted upon an insulating ring 80 secured to the hub 66. A brush, not shown, is provided for completing the circuit to the ring 79. The other terminal of the winding 77, although not shown in Figure 1 is grounded on the frame of the machine. Secured to the flanged end of the cop sleeve 69 is a magnetic rotor 82 which is constructed in the form shown in Figures 6 and 7 and is notched at the periphery to provide the pole pieces 82a. This rotor is secured to the flanged end of the cop sleeve by means of the machine screws 83 for rotation therewith. The rotor is constructed so as to coincide axially with the stator poles 81a, as is clear from Figure 1.

It is hardly necessary to point out to those skilled in the art that where the cop sleeve is itself made of magnetizable material the flanged end thereof may be employed as the rotor and may be notched at the periphery in a manner similar to that shown in Figure 6, thus dispensing with the necessity of a separate rotor.

At 84 is shown one of the several guide spindles commonly employed on a serving head or flyer around which the web passes in traveling from the cop or spool mounted on the cop sleeve to the nose piece. Mounted on the top of the guide is a contact 85 which is insulated therefrom and connected by means of the insulated conductor 86 to a sector ring 87 mounted on the insulating ring 88. The other wire of the control circuit is grounded on the machine. A switch lever 89 is pivotally mounted on the guide 84 and positioned so that it may engage the contact 85. As shown in Patent No. 2,044,160 referred to above, the web or tape in passing from the cop around the guide to the nose piece engages the lever or switch arm 89 to hold it out of engagement with the insulated contact 85 until the web breaks.

The novel circuit combination of this invention as employed with a mechanism as described above will now be set forth in detail.

The relay A comprises a set of contacts 1, 2, 3, 4, 5 and 6 mounted to move together and each cooperating with a pair of fixed contacts. The movable contacts 2, 3 and 4 are arranged to complete a circuit from a suitable current source connected to the wires 7, 8 and 9 to the wires 10, 11 and 12 which control the capstan motor as disclosed in Patent No. 2,003,354 supra. The relay A is normally in the position shown in Figure 8, at which time winding 21 is de-energized. At 13 is the primary of a suitable transformer for energizing the control circuits. It is provided with a pair of secondaries 14 and 15. One terminal of the secondary 14 is connected by wire 16 through relay B, the movable contact 17 of which controls the circuit including that wire. The other wire 18 of that circuit goes to the common terminal of a pair of switches 19 and 25. Switch 19 is normally open and is the starting switch of the mechanism, while switch 25 is normally closed and is the stop switch thereof. The other terminal of switch 19 is connected by wire 20 to the winding 21 of relay A, and by wire 22 to the other terminal of the secondary 14. Wire 20 is connected by wire 23 to one of the fixed contacts which cooperate with the movable contact 1. The other contact of the fixed type is connected by wire 24 to the other terminal of switch 25.

One terminal of secondary 15 is grounded as indicated at 26. The other terminal of this secondary is connected by wire 27 to a resistance 28. A movable contact for this resistance is connected by wire 29 to the tensioning and braking winding 77, the other terminal of which is grounded on the machine as noted above. Resistance 28 is also connected by wire 40 to one of the pair of fixed contacts which cooperate with the movable contact 6.

Wire 27 is also connected to winding 33 of relay B by wire 32. The other terminal of this winding is connected by wire 34 to the contact 35 of the centrifugal switch, the arm 89 of which is grounded on the machine, as indicated at 36.

Wire 27 is also connected by wire 37 to one of the pair of fixed contacts of relay C controlled by the movable contact 38 thereof. The other contact of this fixed pair is connected by wire 39 to the other contact of the fixed pair controlled by the movable contact 6. Wire 16 is connected by wire 41 to one of the fixed contacts of the pair controlled by movable contact 5. The other contact of the fixed type being connected by wire 42 to one terminal of the winding 52 of relay C, and to one terminal of a resistance 44. The other terminal of resistance 44 is connected to the heater coil 45 of a thermal relay which may be of any suitable form. The heating coil 45 is also connected by wire 46 to one of the pair of fixed contacts that cooperates with the movable contact 47. The other contact of this pair is connected by wire 48 to wire 22 and also to one of the contacts of the fixed pair cooperating with the movable contact 53. The other contact of this pair is connected by wire 51 to the other terminal of winding 52 and to the movable arm 43 of the thermal relay. Wire 48 is connected by wire 49 to the fixed contact of the switch and the thermal relay as indicated at 50. As is common with relays of this type, when the arm 43 is distorted, as its temperature increases, it moves over to close the switch 50.

This circuit works as follows:

To start the machine switch 19 is momentarily closed. Current then flows from secondary 14 through wire 16, contact 17 of relay B, wire 18, switch 19, wire 20, winding 21 and wire 22 back to the secondary 14. Relay A then operates from the position shown to break the circuits made by 5 and 6 and to make the circuits through 1, 2, 3 and 4. A holding circuit for

winding 21 is then completed from wire 18 through normally closed switch 25, wire 24, contact 1 and wire 23 to winding 21. Thus relay A remains operated. Contacts 2, 3 and 4 close the energizing circuit to the capstan motor.

In a general sense this sets the machine in operation, although there are additional motors and circuits involved which are energized at the same time in accordance with the more complete circuit as illustrated in Patent No. 2,003,354 supra. It is of course understood that the circuit here disclosed is but a part of the complete circuit disclosed in that patent. As a result the flyer is in operation, the flyer motor connected to spindle 62—68 (not shown) being also energized. The web or tape being fed to the nose piece holds switch arm 89 out of engagement with contact 85. The tensioning winding 77 is energized by reason of the fact that current is flowing to it from secondary 15 through wire 27, resistance 28 and wire 29. The strength of the magnetic field on the rotor 82 may be varied by adjusting the movable contact of resistance 28 connected to wire 29. The machine continues to operate in this manner until the web or tape breaks, or until switch 25 is opened. The stator and rotor cooperate to maintain a uniform tension on the web as the cop loses diameter because the resulting increase of speed of rotation of the cop sleeve 69 causes a reduction in resistance to rotation of the rotor in the field of the stator.

It may be here noted that to stop the machine in its normal operation it is merely necessary to open switch 25, breaking the holding circuit to winding 21 with the result that relay A returns to the position shown in Figure 8.

However, when the web or tape breaks switch arm 89 moves into engagement with contact 85 so that current flows from wire 27 through wire 32, winding 33 of relay B, wire 34 to stop the stop switch, and to ground by wire 36. This causes relay B to open the stop circuit of the machine by disconnecting wire 16 from wire 18, which is the equivalent of tending to stop switch 25. Thus relay A returns from operated position to the position shown in the drawings. With the relay in this position a circuit is completed from wire 27 through wire 37, movable contact 38 of relay C, wire 39, movable contact 6 of relay A, and wire 40 to winding 77. Through this circuit the winding 77 is energized with a larger current by reason of the fact that resistance 28 is not included in this circuit. Thus winding 77 becomes strongly energized attracting rotor 82 with sufficient force to bring the cop sleeve and the cop mounted thereon to an almost immediate stop. The advantage of this is that the web or tape is not wasted by being unrolled. The cop and cop sleeve revolve at a high speed and if the tape breaks it will be seen that the free end will be projected into place and a considerable quantity of it unwound if the cop and sleeve are permitted to rotate unrestrained. Thus almost immediately upon the breakage of the web the tensioning coil is strongly energized to impart to it a braking function which brings the cop sleeve to an immediate stop. The return of relay A to normal position also completes a circuit to the heating coil and the thermal relay as follows: From wire 16 to wire 41, capacity contact 5 of relay A, wire 42, resistance 44, heating coil 45, wire 46, movable contact 47 of relay C, wire 48 and wire 22. Thus the heating coil 45 begins to heat up the arm 43 which is preferably of bimetallic construction so that it will readily distort. At the end of a predetermined period of time arm 43 is distorted sufficiently to close the contacts 50, with the result that current flows from wire 22 to wire 48, wire 49, contacts 50, arm 43, wire 51, winding 52, wire 42, movable contact 5 of relay A, and by wire 41 to wire 16. Thus relay C is operated to break the circuits at 38 and 47 and to make a holding circuit for winding 52 through contact 53, which holding circuit interconnects wires 48 and 51. The breaking of circuit by movable contact 38 interrupts the supply of current to the coil 77. By this time, of course, the cop sleeve has come to a stop and the circuit to the winding is broken to prevent overheating, and to initiate restoration of the circuits to normal condition. The breaking of circuit at 47 interrupts the supply of current to the heating coil 45 so that arm 43 begins to cool off, and when it opens the circuit at contacts 50 relay C is held closed by the holding circuit which is made by contact 53. Contact 38 breaks the circuit across the resistance so that the tape can be re-threaded.

When the machine is started by closing switch 19 relay A is lifted which breaks the holding circuit of relay C and allows it to drop.

From the above description it will be apparent to those skilled in the art that the principles of this invention may be embodied in other physical forms without departure from the scope thereof. I do not, therefore, desire to be strictly limited to the disclosure as given for purposes of illustration, but rather to the scope of the appended claims.

What I seek to secure by United States Letters Patent is:

1. In a machine for feeding a web from a cop, the combination comprising a rotatable cop sleeve having at least a magnetizable portion, a stator positioned adjacent the cop sleeve having a winding, means including an alternating current source for energizing the winding whereby the tension on the web fed from the cop remains constant as the cop loses diameter, and automatic means for increasing the magnetization of the winding when the web breaks to bring the cop sleeve to an immediate stop.

2. In a winding machine the combination of a rotatable cop sleeve from which a web or strand is fed from a coil mounted thereon, a magnetizable rotor mounted on said sleeve, a stator having a magnetizing winding positioned adjacent said sleeve, a circuit for said winding including an adjustable resistance, a current source connected to said circuit, a second circuit to said winding, and means automatically operated by the breaking of the web for completing the second circuit to increase the magnetization of said winding.

3. In a winding machine the combination of a rotatable cop sleeve from which a web or strand is fed from a coil mounted thereon, a magnetizable rotor mounted on said sleeve, a stator having a magnetizing winding positioned adjacent said sleeve, a circuit for said winding including an adjustable resistance, a current source connected to said circuit, a second circuit to said winding, a switch normally open when the web is being fed from the cop, a circuit for said switch, and means in said circuit for completing the second circuit to said winding when the strand breaks to increase the magnetization of the winding.

4. In a machine of the type described the com-

bination comprising a rotatably supported cop sleeve forming a magnetic rotor having poles, a magnetizable stator having poles positioned adjacent said rotor and having a winding, means for energizing said winding to cause said rotor and stator to become magnetized and to maintain a uniform tension on a web being fed from the sleeve as the coil supported by the sleeve decreases in diameter, and automatic means for increasing the energization of the winding when the web breaks to bring the sleeve to a stop.

5. In a machine of the type described the combination comprising a rotatably supported cop sleeve forming a magnetic rotor, a magnetizable stator positioned adjacent said rotor and having a winding, means for energizing said winding to cause said rotor to rotate in the field of said stator and to resist change in relative rates of rotation to maintain a uniform tension on a web being fed from the sleeve as the coil supported by the sleeve decreases in diameter, means for increasing the energization of the winding when the web breaks to bring the sleeve to a stop, and means for rendering said last means inoperative at the end of a predetermined period of time.

6. In a machine for feeding a web from a cop the combination comprising a rotatably supported cop sleeve having at least a portion thereof magnetizable, a magnetizable field member supported adjacent the sleeve having a winding, a circuit for said winding including a resistance, means for energizing said circuit, means for increasing the energization of said circuit when the web breaks, and means for rendering said last mentioned means inoperative at the end of a predetermined period of time after the energization of the winding has been increased.

7. In a machine of the type described the combination comprising a rotatable cop sleeve, a magnetizable rotor therefor, a stator positioned adjacent the rotor having a winding, a circuit for said winding including a resistance, means for energizing said circuit, a second circuit connected to said winding for energizing it, means for completing said circuit when the web breaks, and means for opening said circuit after the expiration of a limited period of time.

8. In a machine of the type described the combination comprising a rotatable cop sleeve, a magnetizable rotor therefor, a stator positioned adjacent the rotor having a winding, a circuit for said winding including a resistance, means for energizing said circuit, a second circuit connected to said winding for energizing it, means for completing said circuit when the web breaks, and means for causing said first means to open said circuit after the expiration of a limited period of time.

9. In an apparatus of the type described the combination comprising a rotatably supported cop sleeve, a magnetizable rotor secured thereto having a plurality of poles, a magnetizable stator mounted adjacent the rotor having a plurality of poles, a winding for said stator, a circuit for said winding including a resistance, a current source connected to said circuit, a second normally open circuit connected to said winding, relay means for completing said second circuit, a switch controlled means for deenergizing said relay means when the web breaks to complete said second circuit, and means for energizing said relay means at the end of a predetermined period to open said second circuit.

10. In an apparatus of the type described a rotatably supported cop sleeve having a portion thereof at least magnetizable, a stator adjacent said cop sleeve, a winding for said stator, a circuit for said winding including a resistance, a current source connected to said circuit, a second circuit for said winding normally open, means for closing said circuit, and means for causing said first mentioned means to open said circuit at the end of a predetermined period of time.

11. In an apparatus of the type described a rotatably supported cop sleeve having a portion thereof at least magnetizable, a stator adjacent said cop sleeve, a winding for said stator, a circuit for said winding including a resistance, a current source connected to said circuit, a second circuit for said winding normally open, means for closing said circuit when de-energized, said means being normally energized, means for de-energizing said first mentioned means, a circuit for said second means, and a switch for completing said circuit when a web being fed from the sleeve breaks.

12. In an apparatus of the type described a rotatably supported cop sleeve having a portion thereof at least magnetizable, a stator adjacent said cop sleeve, a winding for said stator, a circuit for said winding including a resistance, a current source connected to said circuit, a second circuit for said winding normally open, means for closing said circuit when de-energized, said means being normally energized, means for de-energizing said first mentioned means, a circuit for said second means, a switch for completing said circuit when a web being fed from the sleeve breaks, and means for again energizing said first mentioned means at the end of a predetermined period of time.

13. In an apparatus of the type described a rotatably supported cop sleeve having a portion thereof at least magnetizable, a stator adjacent said cop sleeve, a winding for said stator, a circuit for said winding including a resistance, a current source connected to said circuit, a second circuit for said winding normally open, means for closing said circuit, and thermostatic means for causing said first mentioned means to open said circuit at the end of a predetermined period of time.

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