

Oct. 9, 1934.

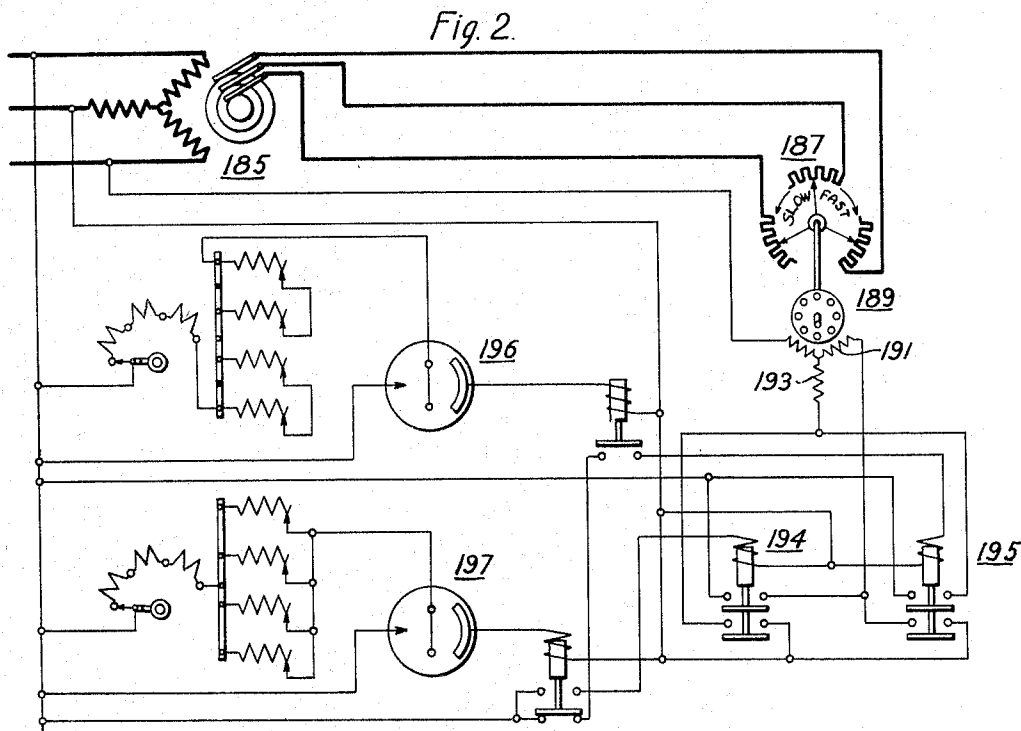
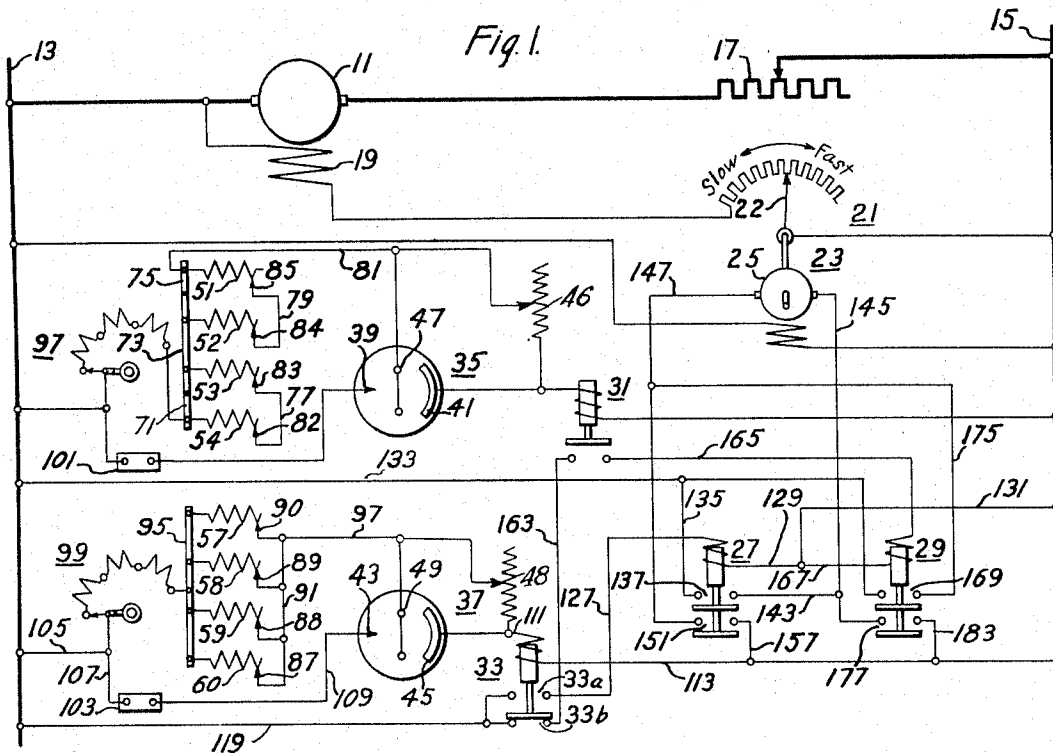
R. S. ELBERTY, JR

1,976,487

MOTOR CONTROL SYSTEM

Filed May 6, 1931

2 Sheets-Sheet 1



WITNESSES:

Arthur J. McMahon
George V. Woodling

INVENTOR

Robert S. Elbert, Jr.

BY
Wesley E. Carr
ATTORNEY

Oct. 9, 1934.

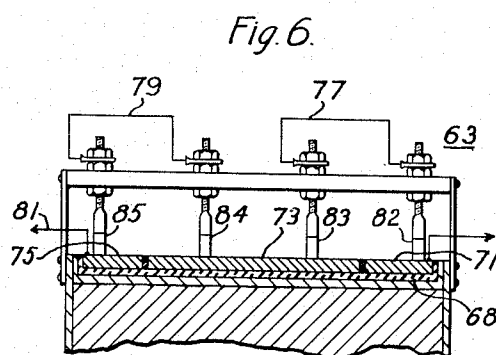
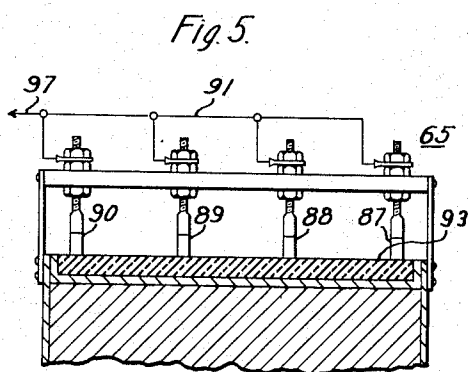
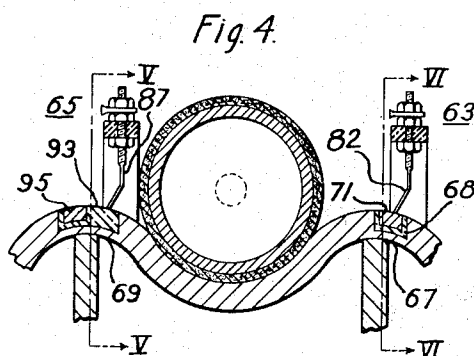
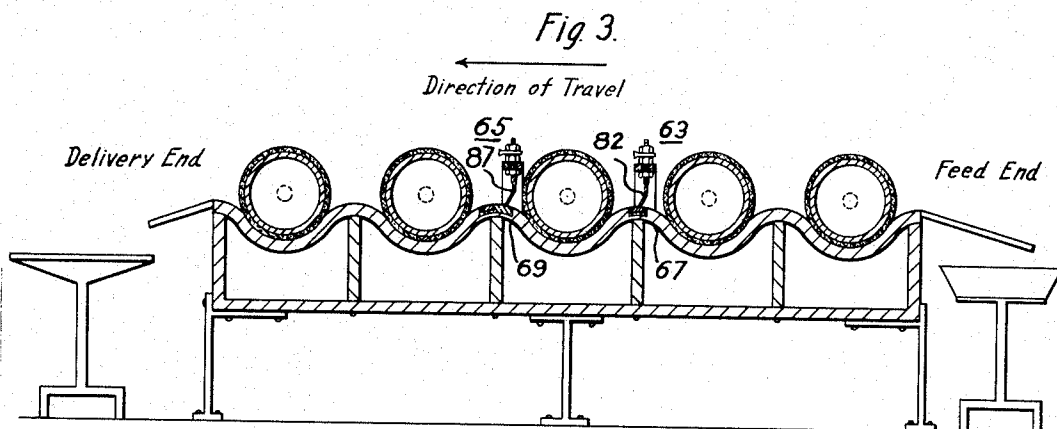
R. S. ELBERTY, JR

1,976,487

MOTOR CONTROL SYSTEM

Filed May 6, 1931

2 Sheets-Sheet 2



WITNESSES:

Arthur J. McMahon
George V. Woodling.

INVENTOR

Robert S. Elberty, Jr.

BY *Wesley E. Bear*
ATTORNEY

UNITED STATES PATENT OFFICE

1,976,487

MOTOR-CONTROL SYSTEM

Robert S. Elberty, Jr., Wilkesburg, Pa., assignor
to Westinghouse Electric & Manufacturing
Company, a corporation of Pennsylvania

Application May 6, 1931, Serial No. 535,377

9 Claims. (Cl. 68—9)

My invention relates to control systems and more particularly to control systems which may be utilized to control machines for drying material.

5 Although my invention is capable of general application, it is particularly useful to control an ironing machine for ironing textile materials, such, for example, as are known in the laundry industry as "flat work", which generally com-
10 prises sheets and the like.

Heretofore, ironing machines, because of the absence of variable-speed control systems, have been operated at constant speeds for all classes of work. By this method, any variations in the qual-
15 ity and the thickness of the material impaired the efficiency and capacity of the ironing machine. If, for instance, the speed of the machine is regulated to accommodate the lighter pieces, it is necessary to pass the heavier pieces through the
20 machine a second time in order to obtain good results. On the other hand, if the machine is regulated to accommodate the heavier pieces, the lighter pieces are kept in the machine a longer period of time than is necessary.

25 Therefore, it is apparent from the foregoing that an automatic speed-control system which will vary the speed in accordance with the moisture content of the material will materially increase the efficiency and the capacity of an ironing ma-
30 chine.

In this connection, it has been determined by tests that the electrical conductivity of cloth varies from substantially zero, when dry, to a relatively high value at 50% of moisture saturation and
35 above.

One object of my invention is to provide a control system of the class designated that shall be simple and efficient in operation and be readily and economically manufactured and installed.

40 Another object of my invention is to provide for regulating the speed of a machine for drying material in accordance with the moisture content of the material being dried.

A more specific object of my invention is to
45 provide for varying the speed of an ironing machine for ironing material whereby the speed shall be decreased when the electrical conductivity of the material as controlled by its moisture content is above some selected value and shall be increased when the electrical conductivity is be-
50 low some selected value and shall be constant when the electrical conductivity is substantially midway between the selected high and low values.

Other objects of the invention will hereinafter
55 become apparent.

The invention is disclosed in the accompanying drawings and comprises the structural features, the combination of elements and the arrange-
60 ment of parts that will be exemplified in the structure hereinafter set forth, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and the objects of the invention, reference should be had to the following detailed description, taken in
65 connection with the accompanying drawings, in which:

Figure 1 is a diagrammatic view of an electrical control system constructed in accordance with
70 my invention;

Fig. 2 is a diagrammatic view of a modified form of an electrical control system;

Fig. 3 is a longitudinal sectional view, of an ironing machine to which my invention may be
75 applied;

Fig. 4 is an enlarged fragmentary sectional view of that portion of an ironing machine to which my invention may be applied and illustrated the manner in which contact fingers may be disposed
80 to make electrical contact with the material as it passes through the machine;

Fig. 5 is a sectional view, taken along the line V—V of Fig. 4; and

Fig. 6 is a sectional view, taken along the line VI—VI of Fig. 4.
85

In order to accomplish, broadly, the objects of my invention, I provide for varying the speed of an ironing machine by utilizing a plurality of electric-discharge devices which function in ac-
90 cordance with the electrical conductivity of the material as it passes through the machine. To this end, the control electrodes of the electric-discharge devices are, respectively, connected in circuit with one of the principal electrodes through a portion of the material. In this man-
95 ner, the voltage to which the control electrode of the electric-discharge device is subjected, relative to the voltage of the principal electrodes, varies in accordance with the electrical conduc-
100 tivity of the material.

The principal electrodes of the electrical-discharge devices are connected in circuit with a plurality of current-responsive devices which function to control the speed of the ironing ma-
105 chine. If, for instance, the material is passing through the machine damp, the current-responsive devices function to reduce the speed of the ironing machine. However, if the speed is re-
110 duced to a lower value than is necessary, the current-responsive devices function to increase

the speed. Also, they function to maintain a constant speed when the material is passing through the machine at the proper speed.

Referring now to Fig. 1 of the drawings, the reference character 11 designates, generally, a driving motor of any suitable type, which may be utilized to drive an ironing machine of the type shown in Fig. 3. As shown, the motor is disposed for energization, through a starting resistor 17, from supply conductors 13 and 15 which may be connected to any suitable source of direct-current power. The field winding 19 is connected in circuit with a variable field rheostat 21 disposed to be automatically actuated by a motor 23 of any suitable type for varying the speed of the motor 11. As shown, when the rheostat arm 22 is actuated in a clockwise direction by the motor 23, the speed of the driving motor 11 increases, and, conversely, when the arm is actuated in a counter-clockwise direction, the speed of the driving motor decreases.

The direction of rotation of the motor 23 is determined by relays or directional contactors 27 and 29 designed to reverse the direction of the current traversing the winding of its armature 25. The motor 23 is disposed to actuate the arm 22 in a counter-clockwise direction when the relay 27 is energized and in a clockwise direction when the relay 29 is energized.

In order to energize the relays 27 and 29 in accordance with the electrical conductivity of the material being ironed, a plurality of electric-discharge devices designated, generally, by the reference characters 35 and 37, are provided. As illustrated, the electric discharge devices 35 and 37, sometimes referred to as grid-glow tubes, comprise, respectively, anodes 39 and 43 and cathodes 41 and 45 which are generally called the principal electrodes and control electrodes 47 and 49 associated therewith. The control electrode is sometimes called the grid of the electric discharge device. Inasmuch as the construction and functioning of the electric discharge devices 35 and 37 are similar, the description of the electric discharge device 35 will only be given. The control electrode of a grid-glow tube in contradistinction to a thermionic tube is effective only in preventing or initiating a glow discharge between the principal electrodes, but is not effective in extinguishing or controlling the discharge after it is once started. The grid in a thermionic tube at all times maintains control over the current passing between the anode and the cathode.

In the operation of the electric discharge device 35 a threshold discharge is initiated between the grid 47 and the cathode 41 when the grid potential relatively to the cathode potential attains a predetermined value, depending upon the critical grid-to-cathode voltage characteristic of the tube. The cathode-to-grid threshold discharge when once initiated is self-supporting and if sufficient voltage exists between the anode 39 and the grid 47 the said threshold discharge transfers to the anode 39, thus effecting a complete continuous discharge between the anode 39 and the cathode 41. Under this condition, that is, when a complete continuous discharge persists between the anode 39 and the cathode 41, the electric discharge device passes current between the principal electrodes thereof and the said discharge continues to exist as long as the voltage between the said electrodes does not decrease below the critical break-off value for the electric discharge device. In other words, if the potential of the grid 47 relatively to the cathode 41

increases to, or above, the critical grid-to-cathode potential for initiating a discharge, and then decreases below the said critical grid-to-cathode potential, the said discharge continues to persist. However, if the voltage between the principal electrodes decreases to or below a predetermined critical break-off value, such as it will when the voltage of alternating current passes through zero, or such as it will, in case direct current is utilized, when the said direct current is momentarily interrupted by means of a vibrating interrupter, such as those shown, generally, by the reference characters 101 and 103, the glow discharge current ceases.

An electric discharge device functions substantially as a very sensitive relay. That is to say, when a glow discharge persists between the principal electrodes, the electric discharge device functions to pass current between the said electrodes, representing the closed position of a relay, and when the glow discharge is extinguished the electric discharge device functions to pass no current between the principal electrodes, representing the open position of a relay. The electric discharge devices 35 and 47, since they function substantially as very sensitive relays, may be utilized to control the operations of the relays 31 and 33. As shown, the principal electrodes 39 and 41 of the electric-discharge device 35 are connected in circuit with the actuating coil of a relay 31, which, when deenergized, establishes a circuit for energizing the relay 29 and thereby increasing the speed of motor 11, provided relay 33 is also deenergized. Similarly, the principal electrodes 43 and 45 of the electric-discharge device 37 are connected in circuit with a relay 33, which, when energized, establishes a circuit for energizing the relay 27 and thereby decreasing the speed of the motor 11. However, it will be noted that the motor 23 is inactive when both of the relays 27 and 29 are deenergized, and, accordingly, the speed of the motor 11 is maintained constant. This latter condition prevails when the electric-discharge device 35 is operating to pass current for energizing the relay 31, and when the electric-discharge device 37 is passing no current and the relay 33 is deenergized.

In order to operate the electric-discharge devices in accordance with the electrical conductivity of the material being ironed, as controlled by its moisture content, when it passes through the ironing machine, I provide for connecting the control electrodes 47 and 49, respectively, in circuit with the anodes 39 and 43 through a portion of the material by utilizing two sets of contact fingers disposed to make electrical contact with the material. The resistance of the various portions of the material, as controlled by its moisture content, when passing under the set of contact fingers that are connected in circuit with the control electrode 47, is represented, generally, by resistor elements 51 to 54, inclusive. The resistance of the various portions of the material, as controlled by its moisture content, when passing under the set of contact fingers connected in circuit with the control electrode 49, is represented by resistor elements 57 to 60, inclusive.

The control electrodes 47 and 49 are likewise, respectively, connected in circuit with their corresponding cathodes 41 and 45 through variable impedance units, represented generally by the reference characters 46 and 48. The impedance units may be a resistor, a reactor, a capacitor, a combination of any two, or a combination of all three.

As illustrated, with reference to the electric discharge device 35, the combination of the impedance unit 46 and the resistors 51 to 54, inclusive, which represents the resistance of the material

5 being ironed, as controlled by its moisture content, constitutes a potentiometer for biasing the potential of the grid 47 relatively to the potential of the principal electrodes 39 and 41. When the resistance of the material being ironed, as controlled by its moisture content, decreases below a predetermined value the potential of the grid 47 is biased toward the potential of the anode 39, with the result that the potential between the grid 47 and the cathode 41 increases to a point
10 sufficient to initiate a glow discharge between the grid 47 and the cathode 41. The preceding description pertaining to the potentiometer circuit of the electric discharge device 35 also applies to the potentiometer circuit of the electric discharge device 37. In this connection, it may be pointed out that the employment of the impedance units 46 and 48, while usually associated with discharge devices, may be dispensed with, because the electric discharge devices will operate
15 effectively either with or without the said impedance units. This is true because, in either case, the initiation of the glow discharge is effected by biasing the potential of the grid towards the potential of the anode.

20 Referring now to Figs. 3 and 4, the set of contact fingers, designated, generally, by the reference character 63, is connected in circuit with the electric-discharge device 35, and the set of contact fingers, designated, generally, by the reference character 65, is connected in circuit with the electric-discharge device 37. The set of contact fingers 63 is positioned near the feed-end of the machine where the material is normally damp, and, accordingly, the electric discharge device 35
25 is normally disposed to glow or be conducting. The set of contact fingers 65 is positioned near the delivery-end where the material is normally dry, and, in consequence, the electric discharge device 37 is normally disposed to be non-conducting. Although I have shown the set of contact fingers 63 positioned at a nodal point 67 and the set of contact fingers 65 at a nodal point 69, it will be apparent that they may be positioned at any other nodal points which will insure the proper
30 operation.

35 By the disposition of the contact fingers, as above specified, and the control scheme discussed, the speed of the machine may be maintained constant when the material passing under the set of contacts 63 is damp and under the set of contacts 65 is dry, because the relays 27 and 29 are de-energized, by reason of the fact that the electric discharge device 35 is operating to pass current, and the electric discharge device 37 is operating not to pass current. However, if the material becomes damp, as it passes under the set of contact fingers 65, the electric discharge 37 operates to pass current for operating the relay 33, which, when energized, causes the relay 27 to operate for decreasing the speed. If the material becomes dry, as it passes under the set of contact fingers 63, the electric discharge device 35 operates not to pass current, and thus allows the armature of the relay 31 to drop for energizing the relay 29
40 which establishes a circuit for increasing the speed.

45 To effect the ironing of narrow strips of material, I provide a plurality of contact fingers for each set, which are positioned transversely of the machine. As shown, the set 65 comprises contact

fingers 87 to 90, inclusive, (see Fig. 5) and the set 63 comprises contact fingers 82 to 85, inclusive (see Fig. 6) but it is apparent that each set may comprise any number to accommodate the desired class of work.

50 The contact fingers which compose the set 63 are connected in circuit with the electric-discharge device 35 and, as shown in Fig. 6, are disposed to engage a sectionalized bus bar having three parts 71, 73 and 75 insulated from the ironing machine by being embedded in an insulating material 68 of any suitable type. A series circuit may be established from the segment 71, through the contact finger 82, conductor 77, the contact finger 83, the segment 73, the contact finger 84, a conductor 79 and the contact finger 85, to the segment 75. Therefore, the various portions of the material, as it passes under the contacts, are disposed to be connected in series, and, if all the material is damp, or if there be no material at all, the total resistance will be of a low value, and, accordingly, the electric-discharge device 35 will operate to pass current between the principal electrodes 39 and 41.

55 The contact fingers which comprise the set 65 are connected in circuit with the electric-discharge device 37 and, as shown in Fig. 5, are connected in parallel by a common conductor 91 and are disposed to engage an insulating member 93 that is imbedded in the top surface of the ironing machine. In this manner, when there is no material passing under the contact fingers, the electric-discharge device 37 is inactive, passing no current. On the other hand, when damp material is passing under the contact fingers 65, a circuit of relatively low resistance is established through the material from the contact fingers to a bus bar 95 that is imbedded in the insulating member 93. Under this condition, the potential of the control electrode 49 relatively to the anode 43 is reduced to such an extent as to initiate a glow discharge in the electric discharge device 37.

60 Referring to Fig. 1, the contact fingers 82 to 85, inclusive, and the segments 71, 73 and 75 of the bus bar, represent parts like those shown in Fig. 6. Similarly, the contact fingers 87 to 90, inclusive, and the bus bar 95, represent parts like those shown in Fig. 5.

65 In order that the electric-discharge devices may operate to vary the speed of the ironing machine for all classes of work, regardless of the fact whether a narrow strip of material is passing under fewer than all the contact members or whether a wider strip is passing under all of the contact members, I provide for connecting an external resistor in series with each set of contact members to compensate for the difference in resistance effected by a narrow strip of material and that effected by a wider strip of material. To this end, variable resistors designated, generally, by the reference characters 97 and 99 are provided. The various units of the variable resistors are calibrated to approximate a change of resistance effected by the material when passing respectively under one, two, three, or four contact fingers. Therefore, by manually operating the resistors 97 and 99 in accordance with the number of contact fingers making engagement with the material passing under them, the operation of the electric-discharge devices will be the same for either wide or narrow strips of material.

70 Since the electric-discharge devices in Fig. 1 are disposed to operate on direct current, a cur-

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

rent interrupter is connected in series with the principal electrodes of each of the discharge devices to cause them to cease operating when the voltage on the control electrode is reduced to, or below, its predetermined critical break-off value. As shown, current interrupters 101 and 103 of any conventional type are connected in circuit with the principal electrodes of the electric-discharge devices 35 and 37, respectively for producing a pulsating direct current.

In explaining the operation of the control system, it may be assumed that the supply conductors 13 and 15 are energized and that the motor 11 is driving the empty machine. Under these conditions, the electric-discharge device 35 is operating to pass current for energizing the relay 31, because the contact fingers 82 and 85, inclusive, are making contact engagement with the segments 71, 73 and 75 of the bus bar, and, consequently, the voltage impressed upon the control electrode 47, relative to the principal electrode 41, is sufficiently high to initiate a glow discharge in the electric discharge device 35. At the same time, the electric-discharge device 37 is inactive, or passing no current, because the contact fingers 87 to 90, inclusive, are insulated from the bus bar 95, with the result that the voltage impressed upon the control electrode 49, relatively to the principal electrode 45, is not sufficiently high to initiate a glow discharge in the electric discharge device 37. Therefore, the driving motor 11 is running at a constant speed, depending upon the position of the arm 22 of the rheostat 21, since the relays 27 and 29 are both deenergized, and the motor 23 is inactive.

It may now be assumed that the material is passing through the machine and making engagement with the sets of contact fingers 63 and 65, located, respectively, at the nodal points 67 and 69. If the material is damp when passing the nodal point 67 and dry when passing the nodal point 69, the driving motor will continue to run at the same constant speed, because the electric-discharge devices continue to operate in the same manner as they did when the machine was empty.

Assuming that the material is damp as it passes under the contact fingers positioned at the nodal point 69, then the conductivity of the cloth is relatively high, and, accordingly, a circuit of relatively low resistance is established between the contact fingers 87 to 90, inclusive, and the bus bar 95. Therefore, the electric-discharge device 37 operates, to pass current, because the potential between the control electrode 49 and the principal electrode 45 is high enough to initiate a glow discharge.

Operation of the discharge device 37 establishes a circuit which extends from the positive supply conductor 13, through conductors 105 and 107, the current-interrupter 103, conductor 109, the principal electrodes of the discharge device 37, conductor 111, the magnetizing coil of the relay 23, and conductor 113, to the negative supply conductor 15. This energizing circuit causes the relay 33 to operate and thereby energize the relay 27 through a circuit which extends from the energized conductor 119, through contact members 33a, conductor 127, the magnetizing coil of the relay 27 and conductors 129 and 131, to the conductor 15. Energization of relay 27 establishes a circuit for the control motor 23 which causes the motor to actuate the rheostat arm 22 in a counter-clockwise direction. The motor circuit extends from the supply conductor 13, through conductors 133 and 135, contact mem-

bers 137 of the relay 27 conductors 143 and 145, the armature 25, conductor 147, contact members 151 of the relay 27 and conductors 157 and 113, to the supply conductor 15. The motor 23 continues to operate until it has decreased the resistance for the field 19 enough to cause the driving motor 11 to slow down to such speed that the material passing nodal point 69 is dry, whereby the electric-discharge device 37 ceases to function or to pass current.

Assume that the material passing under the set of contact fingers located at the nodal point 67 is dry. In this case, the resistance of the material is high, and the voltage impressed upon the control electrode 47 is low, relative to the principal electrode 41, and, therefore, the electric-discharge device 35 ceases to operate, or to pass current, which deenergizes the relay 31. Deenergization of the relay 31, provided the relay 33 is deenergized, establishes a circuit for energizing the relay 29 which circuits may be traced from the conductor 13, through the conductor 119, contact members 33b, conductor 163, the contact members of the relay 31, conductor 165, the magnetizing coil of the relay 29 and conductors 167 and 131, to the supply conductor 15.

Therefore, the contact members of the relay 29 are closed, and a motor circuit is established which causes the motor to actuate the rheostat arm 22 in a clockwise direction, thereby increasing the speed of the driving motor 11. The circuit for energizing the motor extends from the positive supply conductor 13, through conductor 133, contact members 169 of the relay 29, conductors 175 and 147, the armature 25 of the motor 23, conductor 145, contact members 177 of the relay 29 and conductors 183 and 113, to the conductor 15. Motor 23 continues to operate until the speed of the ironing machine is increased to such value as to pass the material under the contact fingers 63 in a damp condition and thereby cause the electric-discharge device 35 to pass current again.

Therefore, the operation of the control system is such that the speed is decreased when the electrical conductivity of the material is high at the nodal point 69 and increased when the electrical conductivity is low at the nodal point 67 and constant when the electrical conductivity is substantially midway between the high and low values.

In the foregoing description, it has been assumed that the material extends over the full width of the ironing machine and thereby engages all of the contact fingers. However, by manually operating the resistors 97 and 99 in accordance with the number of contacts making engagement with the material passing under them, the operation of the electric-discharge devices will be the same for narrow strips of material as that described for strips extending over the full width of the ironing machine.

A modification of the control system shown in Fig. 1 is illustrated in Fig. 2. The results accomplished by the control system shown in Fig. 2 are the same as those accomplished by the control system shown in Fig. 1. In Fig. 2, I have shown a control system disposed for energization by alternating-current and disposed to operate an alternating-current motor for driving the ironing machine which is designated, generally, by the reference character 185. Briefly stated, the control system shown in Fig. 2 is the same as that shown in Fig. 1 except that the rheostat 187, that is connected in the circuit with the

secondary windings of the motor 185, is actuated by an alternating-current motor 189.

It is obvious that the alternating-current motor 189 in Fig. 2 may be connected to control a field rheostat of a direct-current motor, such as motor 10 in Fig. 1. Likewise, the direct-current motor 23 of Fig. 1 may be utilized to operate a field rheostat for controlling the speed of an alternating-current motor, such as motor 185 in Fig. 2.

In the embodiment, shown in Fig. 2, I provide for reversing the direction of rotation of the alternating-current motor 189 by reversing the current flowing through its stator windings 191 and 193. This is accomplished by relays 194 and 195 which are respectively connected in circuit with the electric-discharge devices 196 and 197, in the same manner as the relays 27 and 29 of Fig. 1 are connected in circuit with the electric-discharge devices 35 and 37. Operation of the relay 194 by the electric-discharge device 197 establishes a motor circuit which causes the motor 187 to rotate in one direction to decrease the speed of the motor 185, and operation of the relay 195 establishes a motor circuit which causes it to rotate in the opposite direction to increase the speed of the driving motor. Also, when both of the relays 194 and 195 are deenergized, the motor 189 is inactive.

In view of the fact that the modified control system shown in Fig. 2 is energized by alternating-current, it is not necessary to provide current interrupters to cause the electric discharge devices to cease operating when the voltage on the control electrode is reduced to, or below, its predetermined break-off value.

Therefore, it will be observed that I have disclosed a control system which provides for regulating the speed of an ironing machine in accordance with the electrical conductivity of the material passing through the machine.

Since certain changes may be made in the above-described construction, and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter contained in the above description, or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A control system for an ironing machine comprising, in combination, a source of electrical energy for the control system, an electric motor energized from the said source for driving the machine, an electric-discharge device having a plurality of principal electrodes and a control electrode, means responsive to the electrical conductivity of the material being ironed, as controlled by its moisture content for varying the potential of the control electrode relative to the principal electrodes, and means connected in circuit with the principal electrodes for varying the speed of the motor in one direction.

2. A control system for an ironing machine comprising, in combination, means for driving the machine, a source of electrical energy for the control system, means for varying the speed of the driving means, and means responsive to the electrical conductivity of the material being ironed, as controlled by its moisture content, for governing the speed varying means.

3. In combination, a machine for drying material, means for driving the machine, means for varying the speed of the driving means, means responsive to the electrical conductivity of the

material being dried, as controlled by its moisture content, for governing the speed varying means, and a source of electrical energy for the speed varying means and the electrical conductivity responsive means.

4. A control system for an ironing machine comprising, in combination, a source of electrical energy for the control system, an electric motor energized from the said source for driving said machine, means for varying the speed of the motor, and means responsive to the electrical conductivity of the material being ironed, as controlled by its moisture content, for governing the speed varying means.

5. A control system for a machine for drying material comprising, in combination, a source of electrical energy for the control system, an electric motor energized from said source for driving said machine, means for varying the speed of the motor, an electric discharge device responsive to the electrical conductivity of the material being dried, as controlled by its moisture content, and means governed by the electric discharge device for controlling the speed varying means in one direction.

6. In a control system for drying material, in combination, a machine for drying the material, a motor for the machine, an electric discharge device having a plurality of principal electrodes and a control electrode, a source of electrical energy for energizing the electric discharge device, means associated with the machine and responsive to the variation of the electrical conductivity of the material being dried, as controlled by its moisture content, as the material passes a given portion of the machine for varying the potential of the control electrode relatively to the principal electrodes, and speed control means for the motor responsive to the variations of potential of the control electrode.

7. A control system for an ironing machine comprising, in combination, a source of electrical energy for the control system, an electric motor energized from the said source for driving the machine, two electric discharge devices each having a plurality of principal electrodes and a control electrode, means including a contact finger for connecting a portion of the material being ironed in circuit with the control electrode and one of the principal electrodes of one of said discharge devices, means including a second contact finger disposed in spaced relation longitudinally of the travel of the material being ironed relatively to the first mentioned contact finger for connecting a portion of the material being ironed in circuit with the control electrode and one of the principal electrodes of the other of said discharge devices, and selectively operable means connected in circuit with the principal electrodes of the discharge devices for increasing the speed of the motor when one of the discharge devices is de-energized and for decreasing the speed of the motor when the other discharge device is energized.

8. A control system for an ironing machine, comprising, in combination, a source of electrical energy for the control system, an electric motor energized from the said source for driving the machine, a plurality of electric-discharge devices each having a plurality of principal electrodes and a control electrode, means responsive to a substantially predetermined variation of the electrical conductivity of the material as it passes one portion of the ironing machine for varying the potential of the control electrodes of one dis-

charge device relative to its principal electrodes speed control means, responsive to the operation of said one discharge device by reason of the potential variations of the principal electrodes, to effect an increase in the motor speed, means responsive to a substantially predetermined variation of the electrical conductivity of the material as it passes another portion of the ironing machine for varying the potential of the control electrodes of another discharge device relative to its principal electrodes and speed control means, responsive to the operations of said last mentioned discharge device by reason of the potential variations of its principal electrodes, to effect a decrease in motor speed.

9. A control system for an ironing machine, comprising, in combination, a source of electrical energy for the control system, an electric motor energized from the said source, an electric-discharge device, current responsive means, interconnected with said discharge device and controlled thereby to increase the speed of the motor, means responsive to variations of the moisture content of the material as it passes a given portion of the ironing machine to stop the operation of the discharge device to thus effect an increase in speed of the motor, a second electric discharge device, current responsive means, interconnected with said discharge device and controlled thereby to decrease the speed of the motor, and means responsive to variations of the moisture content of the material as it passes another portion of the ironing machine to initiate the operation of the second discharge device to thus effect a decrease in speed of the motor.

ROBERT S. ELBERTY, JR.

20

95

25

100

30

105

35

110

40

115

45

120

50

125

55

130

60

135

65

140

70

145

75

150