

June 13, 1933.

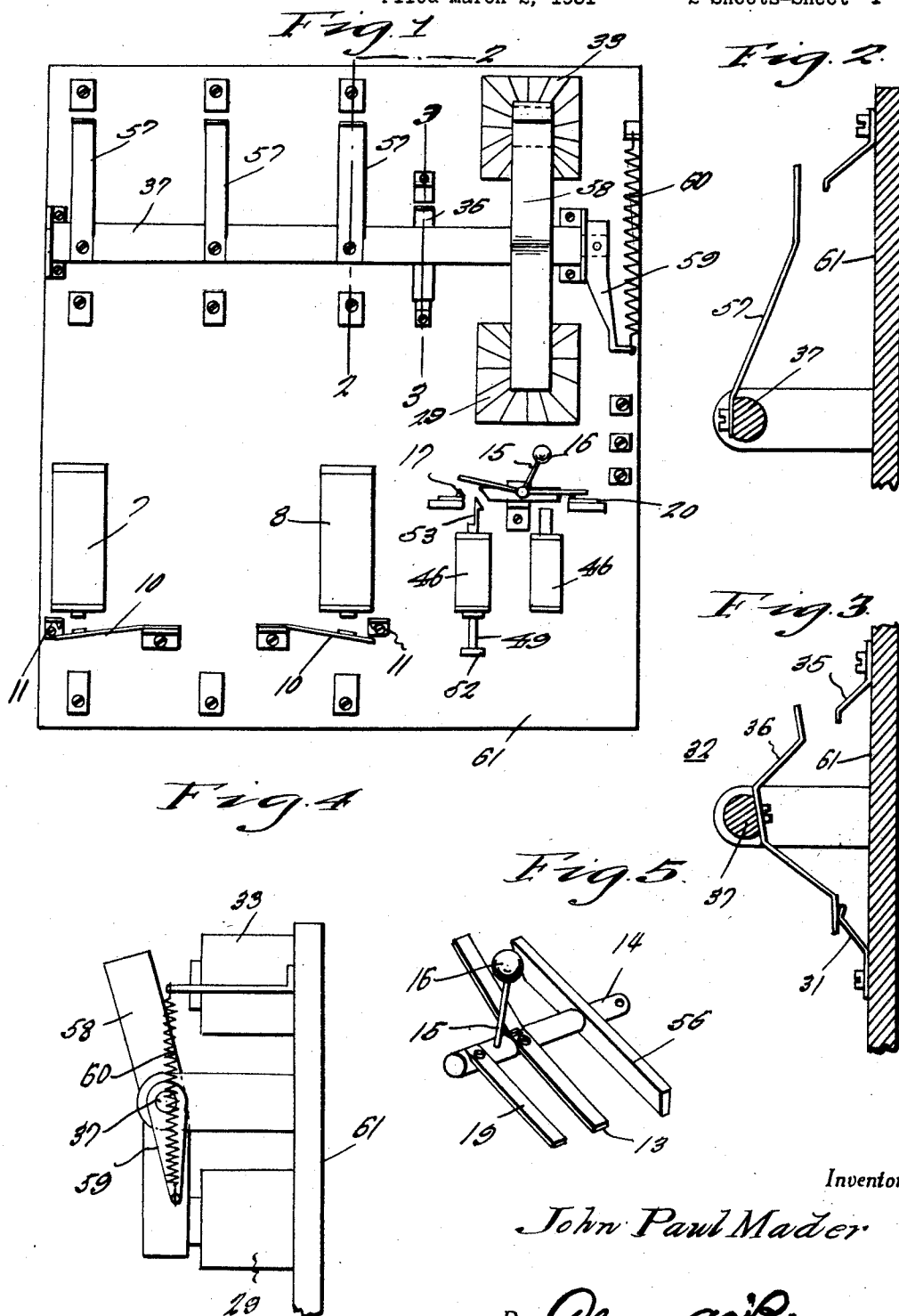
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MOTOR STARTING RELAY SWITCH

Filed March 2, 1931

2 Sheets-Sheet 1



Inventor

John Paul Mader

By

Clarence A. O'Brien

Attorney

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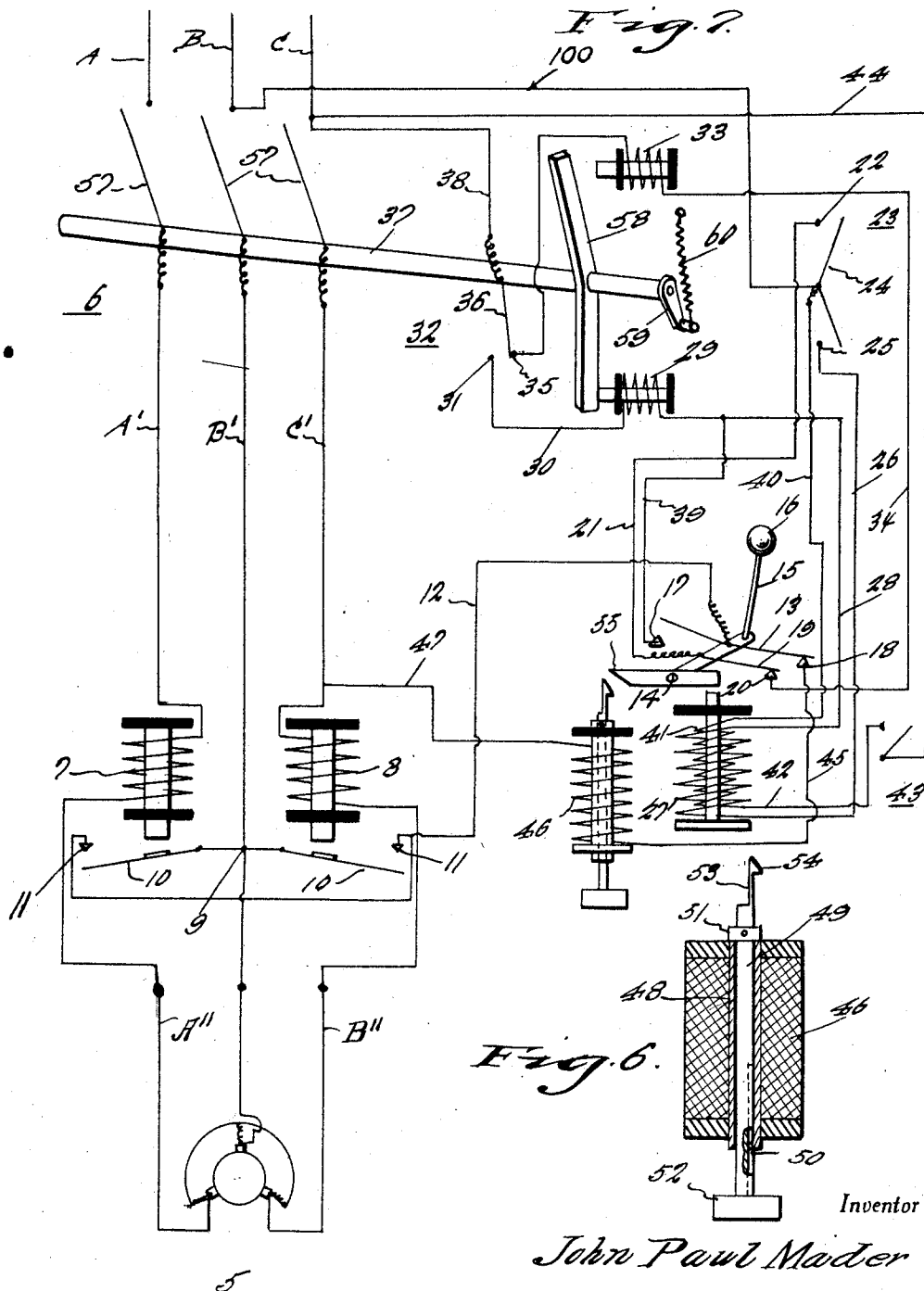
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By *Clarence A. O'Brien*
Attorney

UNITED STATES PATENT OFFICE

JOHN PAUL MADER, OF LA CROSSE, WISCONSIN

MOTOR STARTING RELAY SWITCH

Application filed March 2, 1931. Serial No. 519,707.

This invention relates to motor starting relay systems, the principal object of this invention being to provide a motor starting relay system wherein the controlling magnets are normally de-energized, thus saving current as well as wear and tear on the magnet.

The principal object of this invention is to provide a motor starting relay circuit wherein the magnets are normally de-energized.

Another important object of the invention is to provide a motor starting relay circuit wherein an overload cut-out is employed.

During the course of the following specification and claims, other important objects and advantages of the invention will become apparent to the reader.

In the drawings:—

Figure 1 represents a front elevational view of a panel with the instruments of the system mounted thereon.

Fig. 2 represents a sectional view taken substantially on the line 2—2 of Fig. 1.

Fig. 3 represents a sectional view taken substantially on the line 3—3 of Fig. 1.

Fig. 4 represents an end elevational view of the motor circuit switch and controlling magnet.

Fig. 5 represents a perspective view of the switch operated by the overload magnet and reset magnet.

Fig. 6 represents a vertical sectional view through the trip magnet.

Fig. 7 represents a diagrammatic view disclosing the electrical connections between the electrical devices involved.

Referring to the drawings wherein like numerals designate like parts, it can be seen that A, B and C represent the wires of a three phase current supply to the motor 5. These wires A, B and C are interrupted by the line switch generally referred to by numeral 6. The wires A' and B' connect to coils 7 and 8 respectively and extending from these coils, the wires A'' and B'' continue to the motor 5.

The wire B'' connects at 9 to the armature contacts 10 in the magnetic field of the coils 7 and 8. These armature contacts 10

are cooperative with the stationary contacts 11, the same being connected by the conductor 12 to the switch blade 13 on the di-electric shaft 14.

This shaft 14 has a radially disposed stem 15 thereon carrying a weight 16 at its outer end. The blade 13 on the shaft 14 is adapted for alternate engagement with the contacts 17 and 18 and as is clearly shown in Fig. 1, a short blade 19 projecting from the shaft 14 is engageable with the contacts 20.

A connection 21 is interposed between this blade 19 and the contact 22 of the starting switch generally referred to by numeral 23. This switch includes the blade 24 and the additional contact 25. A connection 26 is interposed between the contacts 25 and the coil 27. The conductor 28 extends from this coil 27 to connect to one side of the topping magnet 29, the opposite side of the magnet being connected by the wire 30 to the contact 31 of the switch designated by numeral 32 and clearly shown in Fig. 3.

Interposed between the aforementioned contact 20 and one side of the starting magnet 33 is the connection 34, the opposite side of the magnet 33 being connected to the contact 35 of the switch 32. The switch 32 includes the blade 36 carried by the di-electric shaft 37 and has a connection 38 to the wire C of the current supply line.

A jumper 39 affords a connection between the contact 17 and the connector 28, while a conductor 40 extending from the switch blade 24, leads to the coil 41. The conductor 42 extends from this coil 41, to one side of the switch generally referred to by numeral 43, the opposite side of the switch being connected by way of the conductor 44 to the wire C of the current supply. Extending from a contact 18 is a wire 45, leading to one side of the coil 46, the other side of the coil 46 being connected by way of the jumper 47 to the wire C of the current supply.

As is clearly shown in Fig. 6, the coil 46 is left on a tube 48 through which the core 49 is slidable. A pin slot connection 50 is provided between the tube 48 and the core 49. A collar 51 on the core 49 limits the

downward movement of the core while the magnetic body 52 on the lower end of the core is within the magnetic path of the coil and also serves as a weight to gravitate the core when the coil 46 becomes de-energized.

The upper end of the core is reduced to provide a springy extension 53 provided with a beveled head 54 engageable over the beveled end portion 55 on the bar 56 projecting from the shaft 14. (See Fig. 5.)

Now referring to Fig. 7, it can be seen that on the shaft 37 are the switch blades 57 of the switch 6 for continuing the wires A, B and C. These blades 57 are on the dielectric shaft 37 as is the armature 58, the ends of which are alternately within the magnetic fields of the coils 29 and 33. A crank 59 on one end of the shaft 37 is connected to a spring 60 which acts to retain the bar in a position either engaged against the coil 33 or the coil 29, obviously making it unnecessary that the particular coil be energized.

It can now be seen that all of these instruments can be mounted on a dielectric panel board 61 in substantially the manner shown in Fig. 1.

In operation, the starting switch 23 is operated by engaging the blade 24 against the contact 22. As the blade 36 of the switch 32 is normally engaging the contact 35 when the switch 6 is opened, current will flow from the wire C through the wire 38 and switch 32, to the magnet 33, from where it flows along the conductor 34 through the contact 20, and blade 19 by way of the wire 21 to the contact 22, through the blade 24, and completes the circuit by way of wire 100 causing the coil 33 to be energized.

This results in the energization of the coil 33 to attract the armature bar 58. The blade 57 continues the wires A, B and C and simultaneously, the blade 36 disengages from the contact 35 and engages the contact 31 disconnecting current from coil 33. The lever is held in position for running by double acting spring and lever 60 and 50 respectively.

The coils 7 and 8 are now energized when the supply connection is established by the closing of the switch 6 and attract the armatures 10. This results in a flow of current through the wire C and through the conductor 47 and magnet 46 by way of the connector 45, blade 13, and wire 12, to one of the contacts 11, resulting in the energization of the coil 46 and the elevation of the core 49, so that the head 54 thereof will engage over the bar 56.

When the motor gains its normal speed, the magnets 7 and 8 will de-energize sufficiently to permit the dropping of the armatures 10, which will result in the de-energization of the coil 46. The core 49 will drop and obviously swing the shaft 14 so

that the weight 16 thereon will maintain the shaft in a position with the blades 19 and 13 spaced from their contacts 20 and 18, while the blade 13 will engage with the contact 17. In case of an overload contacts 10 will be drawn up to meet contact 11. Current will then flow to stop coil 29 and disconnect the blades 57 stopping the motor.

The stopping of the motor necessitates a reversal of operation, the switch blade 24 being swung to the normal contact 25, obviously resulting in the exact reversal in operation of the several magnets and switches.

In the event, there is a failure of current the switch is automatically turned off when the current starts to flow again so when this occurs the flow of current through the magnets 7 and 8 will attract the armatures 10 so that said armatures will engage the contacts 11 and thus current will be supplied to the magnet 29 by way of conductor 38, switch 36, contact 31, the wire 30, through the magnet and thence through conductor 39, contact 17, switch 13, conductor 12 and through contact 11 and armature 10 to the return line. Thus the magnet 29 will attract the arm 58 and move the main switch 6 to open position. Then of course, it will be necessary to restart the motor through means of the switch 23 or moving the arm 24 against the contact 22 as above explained. When it is desired to return the secondary switch to the position it occupies in Figure 7, the switch 43 is closed so as to energize coil 41 to adjust the arm 56 and of course the placing of the switch arm 24 against the contact 25 will energize the coil 27 to reset the secondary switch to the position it occupies in Figure 7. The weight 16 connected by the bar 15 to the shaft 14, will hold the secondary switch in either one of the two positions as is clearly understood. Of course, before the motor can be started after it has been automatically stopped by failure of current and the current has again started to flow, the reset switch 43 must be closed in order to turn the secondary switch shown in Figure 5 to the position it occupies in Figure 7.

The switch and blades are brought back to normal or starting position and automatically when stop button is pressed, if overload does not cut the switch off.

Current flows from C through connector 38 and 31 then coil 29 and connector 28 through coil 27 and connection 26 through blades 24 and back over connector 100 to wire B, energizing the coils 29 and 27, this action drawing the blade assembly 6 back to normal as shown, and also brings arm 14 back to normal position as shown.

While the foregoing specification sets forth the invention in specific terms, it is to be understood that numerous changes in the shape, size and materials may be resorted to

without departing from the spirit and scope of the invention as claimed hereinafter.

Having thus described by invention, what I claim as new is:—

5 1. In combination with a main circuit and a switch for controlling the same, a magnet moving the switch to closed position, a magnet for moving the switch to open position, means for holding the switch in
10 either one of its two positions, circuits for the two magnets, a switch connected with the main switch for connecting the circuit of the closing magnet to the main circuit when the main switch is open and for con-
15 necting the circuit of the opening magnet to the main circuit when the main switch is closed, a secondary switch located in the magnetic circuits, and normally connected with the circuit of the closing magnet, a
20 manually operated switch for controlling the circuit of the closing magnet, means operated by the initial flow of current through the main circuit, upon closing of the main switch, for moving the secondary switch to
25 a position to break the circuit through the closing magnet and close the circuit to the opening magnet, and a manually operated switch for closing the circuit to the opening magnet and resetting the secondary switch.

30 2. In combination with a main circuit and a switch for controlling the same, a magnet moving the switch to closed position, a magnet for moving the switch to open position, means for holding the switch in either one
35 of its two positions, circuits for the two magnets, a switch connected with the main switch for connecting the circuit of the closing magnet to the main circuit when the main switch is open and for connecting the
40 circuit of the opening magnet to the main circuit when the main switch is closed, a secondary switch located in the magnetic circuits, and normally connected with the circuit of the closing magnet, a manually
45 operated switch for controlling the circuit of the closing magnet, means operated by the initial flow of current through the main circuit, upon closing of the main switch, for moving the secondary switch to a position to
50 break the circuit through the closing magnet and close the circuit of the opening magnet, and a manually operated switch for closing the circuit to the opening magnet and resetting the secondary switch, and
55 means for energizing the opening magnet when an overload occurs in the main circuit.

3. In combination with a main circuit and a switch for controlling the same, a magnet moving the switch to closed position, a mag-
60 net for moving the switch to open position, means for holding the switch in either one of its two positions, circuits for the two magnets, a switch connected with the main switch for connecting the circuit of the
65 closing magnet to the main circuit when

the main switch is open and for connecting the circuit of the opening magnet to the main circuit when the main switch is closed, a secondary switch located in the magnetic circuits, and normally connected with the circuit of the closing magnet, a manually
70 operated switch for controlling the circuit of the closing magnet, means operated by the initial flow of current through the main circuit, upon closing of the main switch, for moving the secondary switch to a position
75 to break the circuit through the closing magnet and close the circuit to the opening magnet, and a manually operated switch for closing the circuit to the opening magnet and resetting the secondary switch, and
80 means for energizing the opening magnet when an overload occurs in the main circuit, and a reset switch for returning the secondary switch to normal position.

85 4. In combination with a motor and its starting system, a main switch for controlling the circuit of the motor, a switch opening magnet, a switch closing magnet, means for holding the switch in either one of its
90 two positions, a circuit for each magnet, a switch connected with the main switch for connecting the closing magnet circuit to the main circuit when the switch is in open position, and connecting the circuit of the
95 opening magnet to the main circuit when the switch is in closed position, a secondary switch for controlling the magnetic circuit and which when in normal position closes the circuit of the closing magnet, and man-
100 ually operated for closing the circuit of the closing magnet, a solenoid in the main circuit, means controlled thereby for moving the secondary switch from its normal position upon the initial flow of current through
105 the main circuit upon the closing of the main switch, whereby the circuit to the closing magnet is open and the circuit through the opening magnet is closed at the secondary switch, means whereby an overload
110 in the main circuit will energize the circuit of the opening magnet, a double solenoid for moving the secondary switch to normal position, a manually operated switch connected therewith for energizing the same
115 and at the same time energizing the opening magnet, and a reset switch connected with the double solenoid for returning the secondary switch to normal position, and
120 means for holding said secondary switch in either one of its two positions.

In testimony whereof I affix my signature.

JOHN PAUL MADER.

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